FASHION INSTITUTE OF TECHNOLOGY
SCIENCE DEPARTMENT RENOVATION
INVITATION FOR BID NUMBER C1762

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SECTION I:
NOTICE TO BIDDERS

SECTION I: NOTICE TO BIDDERS

FASHION INSTITUTE OF TECHNOLOGY
SCIENCE DEPARTMENT RENOVATION
INVITATION FOR BID NUMBER C1762

For the purposes of this project (the "Project") the Fashion Institute of Technology and its auxiliary dormitory organization, the F.I.T. Student Housing Corporation, shall hereinafter be collectively referred to as "FIT" unless otherwise distinguished herein. Neither the Fashion Institute of Technology nor F.I.T. Student Housing Corporation will be responsible for receipt of any Bid which does not comply with the instructions as set forth further in this document.

FIT is **ONLY** accepting electronic scanned bids for the subject project. You must email your bid to purchasingbids@fitnyc.edu in PDF format and it should include all the requested documents (See Attachment A – Bid Checklist) including a scanned image of your bid security (Certified Check of 2 percent or Bid Bond of 10 percent of your total bid price).

The package containing the original bid security must be received and time-stamped at the FIT Purchasing Office, located at 333 Seventh Avenue (16th Floor), New York, NY 10001, on or before **12:00:00 P.M. on November 23, 2026**. The time stamp from the FIT Purchasing Office is the only official record of receipt; no other time stamp will be recognized. If you choose to mail the bid security, it must still arrive at the FIT Purchasing Office by the deadline. FIT is not responsible for any delivery delays, including delays by USPS, FedEx, UPS, or other carriers, that cause the bid security to be received or time-stamped after 12:00:00 P.M.

Only those bids received in the FIT Purchasing Dept. inbox by **12:00:00 P.M. on November 23, 2026**, will be considered. The timestamp on the FIT server shall serve as the official time of receipt. Bids received after 12:00:00 P.M. on the bid due date will be considered late and will not be considered.

The public opening, reading, and disclosure of bids will be conducted by livestream as specified in Section VII – Bid Designation. Bid results are not official until each package has been fully reviewed.

ATTACHMENT A - BID CHECKLIST

FASHION INSTITUTE OF TECHNOLOGY
SCIENCE DEPARTMENT RENOVATION
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Bidder shall meet all requirements stated in the Bid and shall submit all required documents and information with the Bid**. Each Bid must be complete and stand on its own. Documents or information previously submitted to FIT in connection with another procurement, project, or prior Bid do not satisfy the requirements of this Bid and must be submitted again with the current Bid.** Bidders are responsible for reviewing the Bid documents and this checklist carefully and ensuring that their Bid is complete at the time of submission.

Failure to submit a required document or information **may result in rejection of the Bid**. FIT reserves the right to determine whether a Bidder has substantially complied with the Bid requirements and whether any missing or incomplete information may be requested or accepted after the bid deadline, in accordance with applicable FIT and SUNY procurement requirements.

Bidder should confirm that the following items are included with the Bid:

☐ **Did you attend the mandatory site inspection?**

☐ **Did you include all required documentation?**
(See Bidder Requirements, including proof of being in business, permits, licenses, certifications, and other required documentation.)

☐ **Did you include the completed and signed Form of Bid?**
(See Section VIII.)

☐ **Did you include the completed and signed Non-Collusive Bidding Certification?**
(See Section IX.)

☐ **Did you complete the Bid Analysis Form in full?**
(See Attachment C.)

☐ **Did you sign and acknowledge each Addendum issued for this project?**
(It is the Bidder's responsibility to check FIT's "Current Bid Opportunities" webpage (https://www.fitnyc.edu/about/administration/finance/purchasing/current-bids.php) for any addenda issued prior to submitting its Bid.)

☐ **Did you complete the Contractor Reference Sheet by providing references to at least five (5) different prior contracts that have been successfully completed within the past five (5) years that are similar in size, scope, and nature to the project indicated for this Contract?**
(See Attachment B. Do not list FIT as a reference for projects of similar size and scope.)

☐ **Can you provide the required levels of insurance coverage?**
(See General Conditions – Article 15.)

☐ **Did you include the required Bid Security?**

☐ Did you include a valid New York State Department of Labor Certificate of Contractor Registration with your Bid, as required by New York State Labor Law Section 220-i?

☐ Did you provide proof of years in business/date of incorporation?

☐ If subcontractors will be used, does the proposed subcontracting percentage comply with the requirement that subcontracting shall not exceed 50% of the project cost?

☐ Did you include an audited or reviewed financial report for the last two (2) years with your Bid?

IMPORTANT

Bidders are responsible for ensuring that all required documents and information are submitted with their Bid by the bid deadline. FIT strongly recommends that Bidders review this checklist and the complete Bid documents before submitting their Bid.

ATTACHMENT B - CONTRACTOR REFERENCE SHEET
FASHION INSTITUTE OF TECHNOLOGY
SCIENCE DEPARTMENT RENOVATION
INVITATION FOR BID NUMBER C1762

FIT requests a minimum of three references for **completed** projects of similar size and scope. Please complete the following information for each reference: **(Do not list FIT as your projects of similar size and scope.)**

1) Contact Name/Title: _____
Company Name/Address: _____
Phone Number: _____
Project Name: _____
Project Cost: _____
Project Start/End Date: _____
For FIT Use Only – Reference Responses
Quality of Work: _____ Site Maintenance: _____
Scheduling: ___ Cooperation: ___ Safety Standards: _____
Permits: _____ Report Submittals: _____Payments: _____
Other Relevant Factors: _____
Overall Performance Rating: Excellent___ Satisfactory___ Marginal___ Unsatisfactory___

2) Contact Name/Title: _____
Company Name/Address: _____
Phone Number: _____
Project Name: _____
Project Cost: _____
Project Start/End Date: _____
For FIT Use Only – Reference Responses
Quality of Work: _____ Site Maintenance: _____
Scheduling: ___ Cooperation: ___ Safety Standards: _____
Permits: _____ Report Submittals: _____Payments: _____
Other Relevant Factors: _____
Overall Performance Rating: Excellent___ Satisfactory___ Marginal___ Unsatisfactory___

3) Contact Name/Title: _____
Company Name/Address: _____
Phone Number: _____
Project Name: _____
Project Cost: _____
Project Start/End Date: _____
For FIT Use Only – Reference Responses
Quality of Work: _____ Site Maintenance: _____
Scheduling: ___ Cooperation: ___ Safety Standards: _____
Permits: _____ Report Submittals: _____Payments: _____
Other Relevant Factors: _____
Overall Performance Rating: Excellent___ Satisfactory___ Marginal___ Unsatisfactory___

4) Contact Name/Title: _____
Company Name/Address: _____
Phone Number: _____
Project Name: _____
Project Cost: _____
Project Start/End Date: _____
For FIT Use Only – Reference Responses
Quality of Work: _____ Site Maintenance: _____
Scheduling: ___ Cooperation: ___ Safety Standards: _____
Permits: _____ Report Submittals: _____Payments: _____
Other Relevant Factors: _____
Overall Performance Rating: Excellent___ Satisfactory___ Marginal___ Unsatisfactory___

5) Contact Name/Title: _____
Company Name/Address: _____
Phone Number: _____
Project Name: _____
Project Cost: _____
Project Start/End Date: _____
For FIT Use Only – Reference Responses
Quality of Work: _____ Site Maintenance: _____
Scheduling: ___ Cooperation: ___ Safety Standards: _____
Permits: _____ Report Submittals: _____Payments: _____
Other Relevant Factors: _____
Overall Performance Rating: Excellent___ Satisfactory___ Marginal___ Unsatisfactory___

FIT
Interviewer: _____ Signature: _____Date: _____

SECTION II:
BID TERMS AND CONDITIONS

SECTION II. BID TERMS AND CONDITIONS

SPECIFICATIONS FOR
FASHION INSTITUTE OF TECHNOLOGY
SCIENCE DEPARTMENT RENOVATION
INVITATION FOR BID NUMBER C1762

I. INTRODUCTION

The Fashion Institute of Technology, a community college of art and design, business and technology of the State University of New York, currently has an enrollment of approximately 10,000 full and part-time students. Located in the Chelsea area of Manhattan, FIT's facilities are composed of a twelve-building complex containing administrative/academic offices, classrooms, computer labs, galleries, and studios. FIT is located at West 27th Street, between 7th & 8th Avenues in New York City. There are three (3) residence halls located on West 27th Street that currently house approximately 1,250 students and one (1) residence hall located at 406 West 31st Street that houses approximately 1,100 students. F.I.T. Student Housing Corporation is a separate, not-for-profit corporation that was established pursuant to the laws of the State of New York to own and operate these residence halls for the benefit of the College and its students. For purposes of this project all references to FIT shall be recognized to refer to the Fashion Institute of Technology (hereafter, "FIT" or the "College"), the F.I.T. Student Housing Corporation, and the FIT Museum together, unless specifically designated otherwise. The successful responsive and responsible bidder (hereinafter "Contractor") shall be required to enter into a contract with FIT based on the Contract Documents, (including Notice to Bidders, Bid Terms and Conditions, Contract Terms and Conditions, General Requirements, General Conditions, Labor & Material Payment Bond, Performance Bond, Form of Bid, Non-Collusive Bidding Certification, Substitution Form Request, Contract, Affirmative Action Form, Change Order, Form, Contractor's Trade Payment Breakdown, Safety EHS Plan, Prevailing Wage Schedule, Specifications, and Drawings), attached hereto and incorporated herein.

Under no circumstances will FIT be liable for any costs incurred by Bidders in preparation and/or production of a bid submission nor for any Work performed prior to FIT's written authorization to proceed on Contract.

II. SUMMARY OF SCOPE OF WORK

The Work of the Project is defined by the immediately following Project Description herein below and by the Contract Documents.

Project Description**:** Provide labor, materials, tests, tools and equipment to complete the Renovation of FIT Science Department on the Third Floor of the Dubinsky Building. The work includes related mechanical, electrical, general construction, fire suppression and fire alarm work, selected portions of work on other floors (Floors 4 – 8, Roof, & Basement) having to do with Mechanical, Electrical & Plumbing infrastructure in support of interior renovations. Contractor to schedule and work with FIT's On-Call IT, Fire Alarm, and Security Devices & Wiring Contractor. Contractor shall be responsible for providing all labor, materials, equipment, accessories, services and tests necessary to complete and

make ready for operation by the Owner, as per attached specifications and drawings. Contractor may begin survey and procurement of materials immediately following award.

The installation of all equipment in accordance with the Manufacturer's Installation/Operation & Maintenance Manuals & Instructions shall be followed.

III. BIDDER REQUIREMENTS

Bidder shall meet all of the following requirements and shall submit all information and documentation required herein with the Bid. Failure to comply with any of these requirements shall be grounds for rejection of the Bid. FIT reserves the right to reject Bids that contain incomplete information or bid security, conditions not specified in these Bid Terms and Conditions, or documents submitted on a form other than that provided by FIT. FIT reserves the right to determine whether a Bidder has substantially met all Bid requirements and to request additional information prior to making such a determination. **The written Bid Documents govern and cannot be modified orally.**

A. **Bidder shall have been primarily a General Contractor in business for a minimum of five (5) years as of the Bid Opening Date. Proof shall be submitted with the Bid.**

B. Bidder shall have satisfactorily performed work of the complexity, size, scope and nature, and total project value to be performed under this Contract, as evidenced by **references from at least five (5) different successfully completed contracts in an installation similar to those indicated for this Contract in the past five (5) years.** At least one (1) of these projects must have been completed for a Science Lab construction and HVAC work similar to that indicated for this contract. Bidder shall complete Attachment B – Contractor Reference Sheet for each reference, including project location, dollar value of contract, initiation and completion date, name, title, address and telephone number of contact person. References cannot be members of FIT staff or FIT consultants.

C. **Bidder shall attend the mandatory pre-bid meeting and site inspection. Failure to comply with this requirement shall be grounds for rejection of the Bid.**

D. Bidder is responsible for all necessary field measurements, all necessary data on the existing conditions and verification of all quantities and dimensions listed in the Project Specifications and Drawings, if applicable.

E. By submitting a Bid, Bidder agrees that s/he has examined the Contract Documents, visited the site, noted all conditions and limitations affecting the Work, and fully understands the nature of the Work. Bidder is required to inform FIT in writing immediately of any instance where changed conditions are encountered.

F. Bidder shall submit documentation of financial viability, including balance sheets and profit and loss statement for the prior two (2) years, with the

Bid.

G. Bidder, upon request, shall submit copies of current licenses and certifications applicable to the work, including, but not limited to, licenses issued by the Commissioner of Buildings of the City of New York. Proof of the following certificates will also be required: 10 Hour OSHA Outreach Training Program; Asbestos Awareness Training, FDNY Certificate of Fitness, with the Bid.

IV. APPROVAL OF SUBCONTRACTORS

Subcontracting shall be permitted **not to exceed 50%** of the work of the Project as determined by FIT. The ratio of the contractors and subcontractors work must be included with your bid submission. All subcontractors are required to gain prior written approval by FIT's Facilities Director. The General Contractor will be the Prime Contractor (hereinafter "Contractor) and shall be permitted to Subcontract the following types of Services:

- Services to develop, amend and/or upgrade EHS Plan
- Demolition
- Carpentry
- Exterior Storefront Fabrication
- Miscellaneous Metals Fabrication
- Concrete flooring contractor
- Painting and Finishing
- Mechanical
- Electrical
- Fire Protection
- Fire Alarm
- Automatic Temperature Controls

The Contractor will require that the terms of this Contract apply to the sub-contractors and shall cause all sub-contractors to comply with the terms of this contract.

V. BID SECURITY

Failure to provide Bid Security in the prescribed manner shall result in the rejection of the Bid.

The Bidder shall provide Bid Security in the form of either a bid deposit or a bid bond, at Bidders option. The bid deposit shall be in the form of a certified check made payable to "Fashion Institute of Technology" in an amount no less than two percent (2%) of the total bid price. The bid bond shall be in an amount no less than ten percent (10%) of the total bid price.

FIT does not provide a specific bid bond form. Bidders shall obtain the appropriate bid bond documentation from their bonding company or surety. AIA Document A310 (Bid Bond) is an example of a form that has been submitted by bidders in previous solicitations.

VI. PRE-BID SITE INSPECTION AND QUESTIONS

A **mandatory** Pre-Bid Site Inspection for prospective Bidders will be held on **November 4, 2026 at 12:15 P.M.** at the Fashion Institute of Technology, Feldman Building "C Building" Lobby, located at 227 W27th Street, New York, NY 10001 (between 7th and 8th Avenues). **(If this bid is a rebid and you attended the original mandatory walkthrough, you are still required to attend the mandatory rebid walkthrough to remain eligible to bid.) Failure to attend shall be grounds for rejection of your Bid. Please also bring a business card.**

Bidder shall examine the Bid documents carefully. Before bidding, Bidder shall make any requests for interpretation of Bid documents or clarification of any ambiguity therein that should have been detected by a reasonably prudent Bidder. Questions shall be submitted in writing to the attention of Purchasing Department via email: purchasingbids@fitnyc.edu, no later than **November 9, 2026 on or before 3:00 P.M**. Answers shall be provided in the form of an Addendum and be posted on the FIT purchasing department website. Reference Bid number **C1762.**

VII. BID DESIGNATION

A. FIT is **ONLY** accepting electronic scanned bids for the subject project. You must email your bid to purchasingbids@fitnyc.edu in PDF format and it should include all the requested documents (See Attachment A – Bid Checklist) including a scanned image of your bid security (Certified Check of 2 percent or Bid Bond of 10 percent of your total bid price

The package containing the original bid security must be received and time-stamped at the FIT Purchasing Office, located at 333 Seventh Avenue (16th Floor), New York, NY 10001, on or before **12:00:00 P.M. on November 23, 2026**. The time stamp from the FIT Purchasing Office is the only official record of receipt; no other time stamp will be recognized. If you choose to mail the bid security, it must still arrive at the FIT Purchasing Office by the deadline. FIT is not responsible for any delivery delays, including delays by USPS, FedEx, UPS, or other carriers, that cause the bid security to be received or time-stamped after 12:00:00 P.M.

Only those bids received in the FIT Purchasing Dept. inbox by **12:00:00 P.M. on November 23, 2026**, will be considered. The timestamp on the FIT server shall serve as the official time of receipt. Bids received after 12:00:00 P.M. on the bid due date will be considered late and will not be considered.

All bids received will be publicly opened and read, and the identity of all bidders will be publicly disclosed by means of livestreaming on a publicly accessible website at 12:15 P.M. on **November 23, 2026**. The livestream will be available the following link: C1762 Bid Opening. A record of the bids received will be posted on FIT's website within five (5) days of the bid opening at: FIT Current Bid Opportunities

Bid results are not official until each package has been fully reviewed

VIII. PREPARATION OF THE BIDS

A. Bids must be submitted on the forms supplied by FIT in the Bidder's full legal name or the Bidder's full legal name plus a registered assumed name. All blank spaces for bid prices must be filled in, using both words and figures, words to take precedence over figures. **Conditional bids shall not be accepted.** Bids shall not contain any recapitulation of the Work to be done. Bidder exclusions shall be grounds for bid rejection. Do not modify the bid forms supplied by FIT

B. Bids that are illegible or that contain omission, alterations, additions or items not called for in the bidding documents may be rejected as not responsive. Any bid which modifies, limits, or restricts all or any part of such bid, other than as expressly provided for in the Notice to Bidders, Bid Terms and Conditions, and Contract Terms and Conditions, may be rejected as not responsive.

C. FIT may reject any bid not prepared and submitted in accordance with the provisions of the Notice to Bidders, Bid Terms and Conditions, and Contract Terms and Conditions. Neither FIT nor the FIT Student Housing Corporation will be responsible for receipt of any Bid which does not comply with these instructions. **Only those Bids received in the FIT Purchasing Dept. inbox (purchasingbids@fitnyc.edu) by 12:00:00 PM on November 23, 2026, will be considered. The timestamp on the FIT server shall serve as the official time of receipt.**

D. Any bid may be withdrawn prior to the scheduled time for the opening of bids or authorized postponement thereof and any bid received after such time and date shall not be considered.

E. No Bidder may withdraw a bid within ninety (90) days after the actual date of the opening thereof.

IX. AWARD OF CONTRACT

A. The award of the Contract shall be made to the Bidder submitting the lowest responsible bid if, in the opinion of FIT, the bid is responsive to the bid solicitation, and such Bidder is responsible and qualified to perform the work involved in the sole discretion of FIT. The lowest bidder will be considered the contractor with the lowest bid for the base bid. In case FIT will decide to include the 'alternate' in the scope of work, the lowest bidder will be considered the contractor with the lowest total of the base bid plus the alternate bid.

B. FIT reserves the right to reject any bid or all bids, to waive any informalities or irregularities or omissions in any bid received.

C. FIT reserves the right to limit the number of concurrent projects awarded to any one contractor.

D. During the term of the Contract, the Contractor shall promptly notify FIT of any change in the ownership of the Contractor. Failure to notify FIT may result in termination of the Contract.

E. FIT reserves the right, exercisable in its sole discretion, to cancel and withdraw from the Project at any time in advance of the award.

F. Prior to the opening of the bids, Bidder shall promptly notify FIT of Change in ownership of the Bidder. Failure to notify with this bid shall be grounds for rejection of the Bid.

X. DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful Bidder, upon failure or refusal to execute and deliver the Contract and bond required within ten (10) days after such Bidder has received notice of the acceptance of such bid, shall forfeit to FIT as damages for such failure or refusal, the security deposited with the Bid or the sum of the difference between the total bid of the successful Bidder and the total bid of the Bidder submitting the next lowest bid, whichever sum shall be higher.

XI. PREVAILING WAGE

This contract is subject to New York State Labor Law 220, Article 8 Prevailing Wage Schedules. The Contractor shall submit with, each invoice, certified payrolls for all labor. Submission of a Certified Payroll with invoice in full compliance with labor laws is a condition of payment.

Contractor and its subcontractors shall pay at least the prevailing wage rate and pay or provided the prevailing supplements in accordance with the Labor Law.

A copy of the prevailing wage schedule, for New York County, can be found at the New York State Department of Labor website. (PRC# **2026025093)**

www.labor.ny.gov

Bidder must also comply with all applicable federal, state, and local laws rules, regulations, requirements, and codes, including but not limited to, the statues regulations, laws, rules and requirements specifically referenced in the documents annexed hereto.

XII. M/WBE AND SDVOB

FIT encourages minority and women business enterprise participation in this project by contractors, subcontractors and suppliers, and all bidders are expected to cooperate with that commitment. Also, bidders are encouraged to use Service-Disabled Veteran-Owned Businesses (SDVOB). A directory of New York State Certified Minority and Women's Business Enterprises is available from: Empire State Development Corporation, Minority and Women's Business Development Division at: http://www.esd.ny.gov/mwbe.html to assist potential bidders in locating sources of M/WBE subcontractors and reaching these goals. SDVOBs can be readily identified on the directory of certified businesses

at: https://online.ogs.ny.gov/SDVOB/search."

XIII. MISCELLANEOUS

A. FIT reserves the right to request clarifications from bidders for purposes of assuring a full understanding of responsiveness and further reserves the right to permit revisions from all bidders who might be, in FIT's sole discretion determined to be viable bidders for contract award, prior to the award.

B. FIT reserves the right to reject separable portions of any offer, to negotiate terms and conditions consistent with the bid, and to make an award for any or all remaining portions.

C. FIT reserves the right to eliminate mandatory requirements unmet by all bidders.

D. Any additional vendor terms which are attached or referenced with a submission shall not be considered part of the bid or proposal, but shall be deemed included for informational purposes only.

E. Unless otherwise specifically stated in the Bid Terms and Conditions, all specifications and requirements constitute minimum requirements. All bids must meet or exceed stated specifications and requirements.

F. FIT reserves the right to make an award to the responsive and responsible bidder whose product or service meets the terms, conditions, and specifications of the Bid and whose bid is considered to best serve FIT's interest. In determining the responsiveness and responsibility of the bidder, FIT may consider the following factors, including but not limited to: the ability, capacity, and skill of the bidder to perform as required; whether the bidder can perform promptly, or within the time specified without delay or interference; the character, integrity, reputation, judgment, experience and efficiency of the bidder; the quality of past performance by the bidder; the previous and existing compliance by the bidder with relevant laws and regulations; the sufficiency of the bidder's financial resources; the availability, quality, and adaptability of the bidder's equipment, supplies and/or services to the required use; and the ability of the bidder to provide future maintenance, service, and parts.

SECTION III:
CONTRACT TERMS AND CONDITIONS

SECTION III. CONTRACT TERMS AND CONDITIONS

I. COMPLIANCE REQUIREMENTS

All work hereunder, including but not limited to material and installations, shall be in compliance with the Contract Documents including both specifications and drawings, as well as all applicable state and local building codes (such as the New York City Building Code) and the rules, regulations of governmental agencies and utility companies having jurisdiction over the work.

The following additional notes shall be considered as part of the officially filed drawings:

NONE

THE WORK:

Unless modified by the Contract Documents, the work of each section of the specifications shall include all labor, materials, testing, tools and equipment necessary and reasonably incidental to **the FIT Science Department Renovation.**

WORKMANSHIP:

All work shall be performed by persons skilled in the work. Work shall be installed true to dimension, plumb and level with neat, accurate cutting and fitting of all materials in accordance with recognized standards of workmanship.

ON-SITE VERIFICATION:

The Contractor shall verify all dimensions and site conditions prior to commencing the work. Dimensions may not be scaled from drawings. Should there be a discrepancy, Contractor is to notify FIT Facilities Director and Architect immediately for clarification.

COORDINATION OF THE WORK:

The Contractor shall be responsible for the coordination of the work and the means and methods of construction and provide FIT with the resume of Contractor's project manager ("Project Manager"). FIT's Facilities Director shall approve the Project Manager and reserves the right to request a replacement Project Manager upon reasonable notice.

WORK HOURS:

Regular work hours are from **7:00 am to 5:00 pm, Monday through Friday** unless otherwise specified in the Contract Documents. Contractor will have reasonable access to the site in order to complete the work in the given time frame. Contractor shall comply with FIT's additional work rules related to such extended access. All labor costs required to meet this deadline are the sole responsibility of the Contractor and shall be included in the contract price. FIT reserves the right to put the work on hold for any reason as many as three (3) occasions during the course of construction for a total duration of not more than 20 workdays.

PERFORMANCE AND PAYMENT BONDS

In addition to the insurance and bond requirements specified in the General Conditions, Performance and Payment Bonds shall be required for the Work of this Contract.

A. Simultaneously with the delivery of the executed Contract, Contractor shall furnish to FIT and maintain, at its own cost and expense a Performance Bond in an amount at least equal to one hundred percent (100%) of the contract price as security for faithful performance of the Contract and also a Labor and Material Payment Bond in an amount at least equal to one hundred percent (100%) of the Contract price for the payment of all persons performing labor on the project under the contract or furnishing materials in connection with the Contract. The surety on such bonds shall be a surety company rated B+ or better by A.M. Best Company, shall be licensed to do business in the State of New York, and shall hold a certificate of authority as an acceptable surety on federal bonds or otherwise satisfactory to FIT.

B. Attorneys-in-fact who sign said bonds on behalf of a surety must affix to each bond a certified and effectively dated copy of their power of appointment.

CONFLICTS, ERRORS AND OMISSIONS:

1. The Contract Documents and typical details apply throughout the work unless noted otherwise.

2. In the event that certain features of the work are not fully shown on the drawings, Contractor must obtain clarification from the FIT Facilities Director and Architect through the use of an AIA Standard RFI form (copies can be obtained from the Architect) before proceeding with the work.

3. In the event of conflicts with the drawings and/or specifications, the Contractor must promptly notify the FIT Facilities Director and Architect. The Architect will determine which shall govern.

MANUFACTURER'S PRODUCTS AND FABRICATIONS:

1. All manufacturers and fabricators printed warnings for handling of their products must be strictly observed.

2. All products and materials must be provided and installed in strict accordance with the recommendations of the manufacturer. In the event of conflict between the drawings or the specifications and the manufacturer's recommendations, Contractor must notify FIT Facilities Director and Architect to obtain clarification before proceeding with the work.

3. Contractor must verify all materials and manufactured items to be in conformance with applicable codes and regulations.

DELIVERY AND STORAGE OF MATERIALS:

1. All materials shall be new and delivered to the site in original, unbroken containers.

2. All materials shall be inspected by the Contractor at time of delivery and Contractor shall reject material evidencing damage or other defects.

3. Contractor shall provide secure and environmentally compatible storage facilities for all materials in accordance with the recommendations of the manufacturer.

PROJECT SCHEDULE:

1. Contractor shall attend a Project Initiation Conference, prior to the commencement of work at the site. Attending this Conference on behalf of the Contractor shall be a representative of FIT and the Project Manager assigned to the project. Contractor shall submit at this Conference a detailed timeline indicating the important milestones of the project and establishing an estimated date of substantial completion in accordance with Contract Documents. He/she shall also present all submittals required by the Contract Documents, such as Insurance Certificates, product tear sheets (not at the initial conference), copy of the General Liability insurance policy (amended to reflect required additional insureds), etc. Project access, storage locations, required crew size and other relevant issues shall also be addressed at this Conference.

2. Time is of the essence. Contractor shall be required to commence work of **The FIT Science Department Renovation w**ithin five (5) working days of receipt of a Notice to Proceed or Purchase Order (PO) from FIT. The shop drawings process and ordering need to proceed first. Work shall commence on or about **early January 2027**. However, Abatement (by Owner) and Demolition (by Contractor) should be scheduled starting 23 December and run for the 2 weeks of winter break. **The project shall be Substantially Completed no later than December 13, 2027.** Contractor must be de-mobilized and leave the job site on the ending date of work period. Only close- out, administrative tasks may continue beyond the closing date. Unless otherwise specified, the work is to be performed solely between the hours of **7:00 A.M. to 5:00 P.M.,** Monday through Friday, legal and union holidays excluded. All labor costs encountered to meet this deadline are the sole responsibility of the Contractor and shall be included in the Bid Price. FIT reserves the right, at no financial liability associated with the same, to put the Project work on hold for any reason on as many as three (3) occasions during the course of the construction for a total duration of not more than 20 workdays.

3. On Monday of each week during the construction period, the Contractor shall email to FIT's Facility Director (or such other individual as FIT may designate at its sole discretion) a written report outlining the work completed during the preceding week and the work planned for the upcoming week. Included will be any unforeseen or anticipated problems regarding implementation of the work, in addition to Change Order requests, submission data, etc. Daily reports **MUST** be submitted to the CM and or the Facilities Department Designee.

4. Job meetings will be held at the site on dates to be determined by Architect and FIT.

These meetings shall be attended by an officer of the Contractor, the Project Manager, FIT's representative, and the Architect. The purpose of these meetings will be to review the status of the project, discuss any potential changes to the project scope, and resolve any problems relating to successful completion of the work.

5. Owner's meetings will be held weekly via zoom and in person when needed. The dates to be determined by the Architect and FIT. These meetings shall be attended by the Contractors Project Manager, FIT, and the Architect. The purpose of these meetings is to keep the Owners informed of the process and to discuss any issues relating to the successful completion of the work.

PAYMENT:

In accordance with, and in addition to, the payment requirements of the Contract Documents, the Contractor shall provide sufficient and appropriate documentation for all invoices to FIT including submittal of invoices for actual cost of materials, labor rates, and certified payrolls. Filing of such payrolls shall comply with the New York State Labor Law and is a condition precedent to payment. FIT reserves the right to request additional information and/or documentation at any time.

Contractor is required to submit Monthly Contractor's Compliance Form (as attached in Section XII. Affirmative Action Form) with each Payment Requisition.

Contractor is required to submit a Certificate of Monthly Payment/Lien Waiver signed by each Sub-contractor with each Payment Requisition.

Contractor is required to submit Waste Management Form with each Payment Requisition.

LABOR HARMONY:

A. Contractor is advised that he/she must maintain labor harmony throughout the duration of the Contract. All labor disputes, slowdowns, strikes and/or sympathy actions will be the sole responsibility of the Contractor to resolve in order to maintain harmony.

B. All costs, delays and scheduling impacts associated with any labor dispute that arises from such action or inaction will be borne by the Contractor.

C. Contractor will also be responsible for all costs, damages and scheduling impacts which affect and disrupt any other workers on site as well as FIT employees.

D. It will be the Contractor's responsibility to resolve all labor disputes immediately.

Contractor is further advised that FIT has a large union presence on the campus. All work performed by the Contractor must provide the required labor harmony to perform work without labor incident or dispute which can delay, obstruct or effect the

work and project schedule, or interfere with FIT's ability to operate.

II. GENERAL NOTES

In accordance with, and in addition to, the requirements of the Contract Documents:

1. All work listed on the construction notes and shown or implied on all drawings shall be supplied and installed by the Contractor unless otherwise noted on drawings and/or in specifications.

2. Contractor to determine coordination of trades.

3. Contractor shall verify all dimensions and conditions shown on drawings and shall notify FIT Facilities Director and Architect of any discrepancies, omissions, and/or conflicts before proceeding with the work.

4. Contractor must comply with the rules and regulations of agencies having jurisdiction and shall conform to all construction and safety codes, statutes and ordinances. All fees, taxes, permits and applications to be obtained through governmental agencies shall be the responsibility of the Contractor.

5. Contractor shall comply with the rules and regulations of the building as to hours of availability of loading docks and elevators for the purposes of delivery, waste removal and other needs related to the work. Coordination with FIT Facilities Department is required for the handling materials, movement in and out of building, equipment and debris to avoid conflict and interference with normal building operations.

6. All drawings and construction notes are complementary and what is called for by any will be binding as if called for by all.

7. Contractor shall maintain a current and complete set of construction documents on the construction site during all phases of construction.

8. Do not scale drawings; dimensions shown govern. Larger scale drawings shall govern over smaller scale.

9. Contractor shall maintain a current and complete set of shop drawings on the construction site

10. Contractor shall maintain a current and complete RFI (Request for Information) log on the construction site.

11. Contractor shall submit for approval, prior to commencing work, a list of all sub-contractors to FIT's Facilities Director, with the name, address and phone number of the principal contact of each sub-contractor. In addition, he will file with the owner the emergency numbers available for 24-hour contact.

12. All work shall be performed by skilled and qualified workmen in accordance with the best practices of the trades involved and in compliance with building regulations and/or governmental laws, statutes or ordinances.

13. All materials shall be new, unused and of professional quality, unless otherwise noted, installed as per manufacturer's recommendations and instructions.

14. For purposes of the Specifications and Drawings sections in the Contract, the use of the words "Supplied By" or "Provided" in connection with any item specified is intended to mean that such item shall be furnished, installed and connected where so required.

15. All approvals of submittals shall be for design intent only. Contractor shall be responsible for quantities, dimensions and compliance with Contract Documents and for information pertaining to fabrication processes or techniques of first-class construction and for coordination with other trades.

16. All work shall be erected and installed plumb, level, square, true and in proper alignment.

17. Contractor shall be responsible for cutting, patching and restoration required for this work.

18. If, during the course of construction, Contractor believes materials that might contain asbestos may be disturbed during performance of the work, Contractor shall immediately notify FIT of the area(s) of concern, and stop work if that area would be disturbed by the continuing work.

19. All correspondence to FIT shall be directed to the attention of the FIT Facilities Director with a copy of the same forwarded to the Architect.

20. Contractor shall at all times keep the premises free of accumulation of waste materials and rubbish; premises to be broom swept clean daily. At the completion of the work, Contractor shall leave the job site free of construction debris and materials, and "broom clean" including thorough cleaning of toilets, bathrooms, electrical closets, stairwells, and all areas of work or staging, etc.

21. Contractor shall provide all necessary protection against dirt and damage within the premises, as well as public areas, and shall be responsible for keeping these areas clean and free of materials at all times.

22. Contractor shall verify location of existing utilities and coordinate with location shown on drawings.

23. During construction, security and fire exit doors must remain unobstructed at all times.

24. Contractor shall take every precaution to properly protect all existing construction to remain. Contractor shall be responsible for all damaged areas to be returned to original condition.

25. Contractor shall schedule construction, in such a manner so as not to disturb areas outside of the area under construction during normal operating hours. The Contractor shall coordinate with FIT Facilities Director minimum of 24 hours prior to any disruption of services to those areas not under construction even if such a disruption occurs during or after normal operating hours.

26. Contractor shall staff the project with a Project Manager with at least 5 years' experience in this type of project scope, with similar complexity and schedule requirements.

27. The acceptance of shop drawings containing deviations not specifically brought to the attention of FIT, or containing errors or omissions of any sort, shall not relieve Contractor of the responsibility for executing the Work in accordance with the Contract Documents and Contract Terms and Condition.

III. DEMOLITION NOTES

In accordance with, and in addition to, the requirements of the Contract Documents. It shall be Contractor's responsibility to perform the following:

1. Prior to commencement of selective removals and demolition work, inspect the areas in which the work will be performed.

2. Any asbestos contaminated material will be removed by FIT's certified asbestos abatement contractor prior to the work of this contract.

3. Provide temporary barricades and other forms of protection required to protect all FIT personnel, inclusive of its faculty, staff and students as well as the general public from injury due to selective removals and demolition work.

4. Remove and dispose of exposed bolts, supports, brackets, cleats, grounds, and other items, that are no longer required for the purpose for which they were originally installed.

5. Where existing work is required to be removed and replaced but found to be defective in any way, it shall be reported to the FIT Facilities Director and Architect before it is disturbed.

6. All existing work damaged or lost as a result of performing the required new work, shall be patched, repaired or replaced with new, and finished to match the existing work, or as the individual case requires at the Contractor's expense.

7. Perform cutting, drilling and removals in a manner which will prevent damage to construction which is to remain.

8. Promptly repair any and all damages to all property and finishes caused by the removals and demolition work; to FIT's satisfaction and at no extra cost to FIT.

9. Cut, patch, paint and finish existing walls, ceiling and/or floor disturbed to match existing.

10. Perform patching around items penetrating existing construction in a manner that will maintain the water and fire resistive capability of existing construction. Should either of these be compromised, it is the responsibility of the Contractor to repair prior to completion.

11. Remove debris, rubbish and other materials resulting from the removals and demolitions from the building immediately; transport and legally dispose of materials off-site. Disposal method shall be in accordance with city, state and federal statues regulations, and ordinances.

12. Work of this section shall conform to all requirements of the New York City Building Code and all applicable regulations and guidelines of all governmental authorities having jurisdiction, including, but not limited to, Safety, Health and Anti-Pollution regulations.

13. Any existing lead-based paint areas of the building where the contractor and its subcontractors are required to work shall be mitigated prior to beginning work. Such mitigation may include FIT directing the contractor to take necessary precautions and wear protective gear to work in the vicinity of the lead paint. The contractor will not be responsible for delays caused by the mitigation activities or any associated cost.

14. Work is to conform to OSHA requirements.

IV. ADDITIONAL CONTRACTOR'S RESPONSIBILITIES

In accordance with, and in addition to, the requirements of the Contract Documents:

1. Contractor shall coordinate all work with FIT Facilities Department and Director.

2. Contractor to provide daily crew manpower log/count to FIT.

3. Contractor shall perform work in a neat workmanlike manner in accordance with accepted industry standards.

4. FIT Facilities Department shall notify Contractor before commencing work which floors are accessible by Contractor.

5. Contractor shall mask all signs, window frames, door frames, etc. when painting around them.

6. Contractor shall use Benjamin Moore, Regal Paint, or approved equal.

7. Employee Identification and Building Access: All Managers and their crew must wear at all times company identification. All Managers and their crew must sign in and out, upon entering and leaving the facility, at the FIT front security desk.

8. After Bid opening, FIT will evaluate and review submissions and notify the lowest Bidder, who is deemed most responsive and responsible. Within five (5) business days of such written notification, such Bidder shall submit the following information. Failure to comply with these requirements in whole or part shall constitute grounds for rejection of the Bid. FIT reserves the right to determine whether a Bidder has substantially met these requirements and to ask for additional information. Documentation of the following:

    a. Health and safety training program and procedures for employees and on-site EHS Coordinator.

    b. Copies of current licenses and certifications applicable to the Work, including but not limited to licenses issued by the Fire Department of New York, Department of Buildings of the City of New York, must be provided to FIT Facilities.

9. Contractor shall complete the attached Outline for Preparing Work-Specific Environment, Health and Safety Plan ("EHS Plan") which will be reviewed and approved by FIT's EHS Compliance Director prior to commencement of work. Contractor shall include the costs of completing the EHS Plan in the Bid price. Proof of the 10 Hour OSHA Outreach Training Program for Construction certificate will be required.

10. Contractor shall provide as described in the FIT Safety EHS Plan, legible copies of SDS sheets and estimates of anticipated amounts of chemicals Contractor intends to store on site to the FIT's Director of EHS Compliance for review and approval at least ten (10) days before Contractor allows on-site storage.

11. Contractor shall ensure that legible copies of all SDS are available at the location of chemical storage and available for review at all times. Contractor shall take all necessary precautions necessary to prevent vapors, fumes, or dust from leaving the work area. This includes but is not limited to the construction of negatively ventilated containments as controls.

12. Contractor shall provide as described in the FIT Safety EHS Plan a written statement of the types of project waste disposed, including the amounts and the name of the waste disposal facility for each type of waste disposed. Contractor shall provide the statement with each Payment Application. Contractor shall provide a separate copy of the statement to FIT's Director of EHS Compliance.

13. Contractor may not store Hazardous Waste on site at any time. Contractor may not generate or accumulate Hazardous Waste on site without the written approval of FIT's Director of EHS Compliance. Contractor shall obtain FIT's

Director of EHS Compliance approval at least ten (10) days before the Contractor generates or accumulates Hazardous Waste on site beginning with demolition work.

14. Off-site shipments of Universal or Hazardous Waste. The Contractor may not allow the off-site removal of Universal or Hazardous Waste without the written approval of the FIT Director of EHS Compliance. Contractor will ensure that the FIT Director of EHS Compliance alone signs any shipping papers for the off-site removal of Universal or Hazardous Waste.

15. Contractor's personnel must report daily to the FIT Security area in the Lobby of Building "**C**" before entering FIT's site. All Contractor's personnel must obtain temporary FIT identification that shall be displayed at all times while on the FIT site. While on FIT property, all Contractor's personnel shall be subject to all FIT campus policies and procedures, including, but not limited to, prohibitions related to tobacco, drug, and alcohol use, and policies and procedures regarding appropriate and civil conduct. Contractor's personnel shall not fraternize with FIT students and employees beyond what is necessary to complete their work or any assigned Projects. FIT policies may be found at https://www.fitnyc.edu/policies/. FIT reserves the right, in its sole determination, to eject from the campus, any Contractor personnel violating such policies, in addition to any other rights and remedies.

V. PERMITS

Contractor shall be responsible for obtaining all required Permits and paying all costs and fees associated therewith. New York City Department of Buildings (DOB) Work Permit will be required for this project. Contractor will also be required to perform the following functions as it relates to this project:

A. Contractor shall submit to FIT and Engineer appropriate Workman's Compensation and New York State Disability insurance certificates for use in securing the required Work Permits to be posted at the site. The Contractor shall provide FIT's Facility Director with the appropriate insurance tracking numbers assigned to their firm by the NYC Department of Buildings.

B. The Contractor shall submit to FIT and Engineer a copy of all Licenses as issued by the NYC Department of Buildings.

C. Permits for the work shall be posted by the Contractor in a conspicuous location at the site at all times. No work shall begin until the necessary DOB work permits have been obtained by the Contractor.

D. The Contractor shall be responsible for obtaining any other governmental permits and approvals required to undertake the work, and shall pay any and all fees associated therewith**, including but not limited to fees to the MTA/DOT for setting up a crane, if**

applicable.

VI. PROJECT MANAGER

1. The Contractor shall provide the services of an experienced Project Manager, who shall be in continual responsible charge of the work and shall have a valid Certificate of Fitness by the New York City Department of Buildings.

2. The Project Manager shall be on site at all times, shall speak fluent English, shall maintain on the site a complete set of these specifications (including any addenda and/or change orders, as well as all project drawings and all applicable manufacturers' instruction sheets), and shall have full authorization to make all field changes as directed by FIT's Facility Director and Architect.

3. The Project Manager shall be required to maintain a daily log at the site indicating the following:

   -the date

   -the number of workers at the site on said date

   -the specific portions and locations of the Work completed on said date

4. The Project Manager (or another authorized representative of the Contractor) shall telephone FIT's Facility Director at least once daily throughout the construction period, to report on the day's activities and the work planned for the following day.

5. The name of the Project Manager shall be submitted to FIT's Facility Director prior to initiation of the project. This Manager shall remain in charge of the project for its entire length, at FIT's discretion, unless said Manager no longer remains in the employ of the Contractor. In such case, a capable and experienced replacement shall be immediately assigned subject to approval by FIT's Facilities Director.

6. No telephone service is available at the site for use by the Contractor; therefore, the Contractor shall equip the Project Manager with a cellular telephone at the site for the duration of the Project. The Contractor shall provide FIT and Architect with the appropriate contact numbers at the initiation of the Project.

7. A full time supervisor is required.

VII. SUBMISSIONS AND SUBSTITUTIONS

1. All submissions called for in the Contract Documents shall be submitted at least twenty (20) working days prior to proposed initiation of any related work.

2. FIT and FIT's Architect and Engineer will review and accept or take other appropriate action regarding Contractor submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. FIT's review of all shop drawings submitted by the Contractor shall be for concept only and does not remove the Contractor's responsibility for insuring that all specific details of the installation shall be performed in such a way so as to achieve satisfactory results. Acceptance by FIT, the Architect & Engineer of Contractor submittals does not relieve the Contractor from responsibility for errors which may exist in the submitted data.

3. Where the phrase "or approved equal" or "equal as approved by FIT" occurs in the Contract Documents, the Contractor may not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically approved by FIT and the Architect.

4. Any proposed substitute products or procedures are to be submitted to FIT's assigned Architect/Engineer for prior approval with any proposed price adjustments to the contract within fourteen (14) days of the signing of the agreement between FIT and the Contractor, so that FIT, the Architect and Engineer are permitted adequate time for review.

VIII. PROGRESS PAYMENTS

1. All submissions called for in the Contract Documents shall be submitted at least twenty (20) working days prior to proposed initiation of any related work.

2. Progress payments will be made to the Contractor based solely on actual work completed. Furthermore, payment will not be made for the purchase of materials, nor for their transfer onto the site, nor for any costs associated with mobilization.

3. Payment requests shall be submitted to FIT's Facilities Director on AIA Documents G702 and G703.

4. Payments will be authorized based upon FIT's field visits and review of work. All FIT's decisions regarding progress payments shall be final.

5. The values quoted on the bid form shall constitute the Schedule of Values for AIA Document G703. Additional breakdown of the bid form shall be provided on the Schedule of Values and will be used for progress payments.

6. No progress payments will be processed without submission by the Contractor of properly executed Affidavit of Payment and Release of Liens (AIA Documents G706 and G706A or equivalent forms as may be requested by FIT), up-to-date weekly written reports and timeline in bar chart form, and all

submittals, certificates, permits, etc. required pursuant to the terms of the contract.

7. A 10% retainage shall be deducted from all progress payments made by FIT.

8. Payment requests shall be submitted to FIT not more than once per month.

9. Contractor shall provide sufficient and appropriate documentation for all invoices to FIT including submittal of invoices for actual cost of materials, labor rates and certified payrolls. Filing of such payrolls shall comply with the Labor Law and is a condition precedent to payment. FIT reserves the right to request additional information at any time. Contractor required to submit Monthly Contractor's Compliance Form with each Payment Requisition.

10. Contractor required to submit a Certificate of Monthly Payment signed by each Sub- contractor with each Payment Requisition.

11. Contractor shall be required to submit a detailed Trade Payment Breakdown.

IX. SITE VISITS BY ARCHITECT/ENGINEER

1. Failure by Architect/Engineer to detect and/or notify the Contractor of any aspect of the Contractor's actions or materials that are not in conformance with the Contract Documents shall not remove the Contractor's responsibility to adhere to the Contract Documents in all instances, including but not limited to the Contractor's responsibility to expeditiously correct and/or replace all defective work.

2. Architect/Engineer will be the final judge as to whether the work is satisfactorily performed and shall have the authority to order that any work deemed unacceptable or not in conformance with the Contract Documents be redone by the Contractor at no cost to FIT.

3. Architect/Engineer shall have no responsibility for the presence, discovery, identification, handling, removal or disposal of, or exposure of persons to hazardous materials in any form at the Project site.

X. CHANGE ORDERS

1. FIT may order changes in the work of any quantity and without invalidating the Agreement so long as the Contract Sum and/or Contract Time of Completion are adjusted accordingly. All such changes in the work shall be authorized by written Change Order. All Change Orders shall be reviewed by Architect and Engineer and authorized by a representative of FIT.

2. No work shall be performed by the Contractor unless it is specifically included in the Contract Scope of Work or authorized in advance by a bulletin issued by the Architect which will serve as the backup paperwork for a change order. The contractor needs to submit a Change Order. All work to proceed prior to approval of change orders. Change Orders will be negotiated fairly in separate meetings. All written Change Orders are to be signed by all parties.

3. Any sums to be paid to Contractor as a result of any Change Order or any sums to be credited to FIT as a result of any Change Order shall be computed by one of the following methods:

   (1) As agreed upon between the parties to the contract in writing prior to commencement of the work required by the Change Order, or;

   (2) By Unit Prices detailed in the Contract Documents or subsequently agreed upon.

XI. GUARANTEES

1. All work on this project shall be guaranteed by the Contractor for a period of not less than one (1) year, or longer where covered by manufacturer warranty. Warranty to start on the day of the final signoff by FIT.

2. If within the guarantee period any of the work is found to be defective or not in conformance with the Contract Documents, the Contractor shall correct it promptly at his own expense after receipt of written notice from FIT.

XII. FINAL PAYMENT

1. Final payment (retainage) shall be released to the Contractor thirty (30) days after the project has been signed off by FIT and Architect/Engineer and the Contractor has satisfied all requirements of the Contract Documents.

2. In addition to any other requirements of the Contract Documents final payment shall not become due until the Contractor has delivered to FIT and Architect a fully executed 1-year guarantee for all work performed under this project, as well as a complete release of all liens arising out of this Contract, or receipts in full covering all labor, materials, equipment, applicable finance charges, and fines for which a lien could be filed. If such lien remains unsatisfied after payments are made, the Contractor shall refund to FIT all money that FIT may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

3. A Performance Bond and a Labor & Material Payment Bond, a copy of the

"Contractor's Affidavit of Payment of Debts and Claims (AIA Document G706)" and "Consent of Surety to Final Payment (AIA Document G707)" shall be submitted by the Contractor prior to the release of final payment.

4. One (1) set each of record drawings (measuring 24 inches by 36 inches) indicating the "As- Built" manner of installation of all work, shall be submitted to FIT and Engineer prior to the release of final payment.

5. Once the project has reached substantial completion, FIT and Architect will prepare a "Certificate of Substantial Completion". This certificate must be signed by all parties (Engineer, FIT and Contractor), to acknowledge the date the project has reached substantial completion, and confirm agreement on a final punch-list of work to be performed. The Contractor shall be responsible for completing all punch-list items prior to release of final payment.

XIII. SUPPLEMENTAL CONDITIONS

Project Schedule. Contractor shall complete all work as specified within the time period specified in the Contract Documents, inclusive of rain days, but excluding any shutdowns authorized by FIT.

XIV. PREVENTIVE MAINTENANCE SCHEDULE

Prior to final payment, the contractor shall provide a recommended maintenance schedule from the manufacturer for quarterly, semi-annual and yearly requirements, including part numbers where applicable, upon completion of the job.

BID ANALYSIS FORM FOLLOWS

ATTACHMENT C – BID ANALYSIS FORM
FASHION INSTITUTE OF TECHNOLOGY
SCIENCE DEPARTMENT RENOVATION
INVITATION FOR BID NUMBER C1762
NYS PREVAILING WAGE SCHEDULE PRC # 2026025093

Failure to complete and submit the Bid Analysis Form as required shall result in the rejection of the Bid.

BID BREAKDOWN

Line	Description	Total Labor Cost	Total Materials, Tools & Equipment	Line Total
1	DEMOLITION	$	$	$
2	RIGGING	$	$	$
3	FIRE STOPS	$	$	$
4	VALVES FOR HVAC	$	$	$
5	VIBRATION ISOLATION	$	$	$
6	DUCT SEALING/CLEANING	$	$	$
7	AIR BALANCING	$	$	$
8	HVAC SPECIALTIES	$	$	$
9	TESTING AND BALANCING	$	$	$
10	INSULATION FOR HVAC	$	$	$
11	COMISSIONING	$	$	$
12	HVAC AUTOMATIC TEMPERATURE CONTROLS	$	$	$
13	HVAC INTEGRATION ON BMS	$	$	$
14	PIPING FOR HVAC	$	$	$
15	WATER TREATMENT AND CLEANING	$	$	$
16	SHEET METAL DUCTWORK	$	$	$
17	EXHSUT FANS / GRAVITY VENTILATORS	$	$	$
18	AIR FILTERS	$	$	$
19	AIR HANDLING UNITS	$	$	$
20	VARIABLE FREQUENCY DRIVE	$	$	$
21	COILS	$	$	$
22	UNIT HEATERS	$	$	$
23	ELECTRICAL AND LIGHTING	$	$	$
24	FIRE ALARM	$	$	$
25	SPRINKLERS	$	$	$
26	CARPENTRY	$	$	$

27	WINDOWS AND GLASS	$	$	$
28	DOORS AND HARDWARE	$	$	$
29	PAINTING AND FINISHING	$	$	$
30	GENERAL REQUIREMENTS	$	$	$
31	GENERAL CONDITIONS	$	$	$

TOTAL BID PRICE (1-31) **$_____**

As stated in Section IV of the front-end documents: Subcontracting shall be permitted **not to exceed 50%** of the work of the project. Please provide the ratio of the contractors and subcontractors work that will be used on this project.

Contractor _____%, Subcontractor(s) _____%

For Bidding Purposes: the following sections pricing should cover the following items:

General Requirements: permits & licenses; project meetings; administrative overhead for submissions and shop drawings; progress photos; temporary facilities & controls; storage & protection of materials; project closeout; and project record documents.

General Conditions: supervision of work; all testing; coordination drawings; safety programs; insurance and performance & payment bonds.

The undersigned, having carefully examined all Contract Documents, including Notice to Bidders, Bid Terms and Conditions, Contract Terms and Conditions, General Requirements, General Conditions, Labor & Material Payment Bond, Performance Bond, Form of Bid, Non-Collusive Bidding Certification, Substitution Form Request, Contract, Affirmative Action Form, Change Order, Form, Contractor's Trade Payment Breakdown, Safety EHS Plan, Prevailing Wage Schedule, Specifications, and Drawings and having examined the existing conditions by on-site visit(s), hereby submits this Bid Analysis, covering all labor, materials, equipment, tools, machinery, licensing, insurance, taxes, and fees required to perform the specified work at the above-referenced site, in accordance with the Contract Documents. **No exclusions & no exceptions**.

Company Name and Address of Bidder:

_____

_____

_____

Signature of Bidder _____ Date_____

Printed Name and Title of Representative:_____

Telephone #:_____

Email Address: _____

EIN#:_____

IMPORTANT:
This bid analysis form is the **only** pricing format acceptable. Bidders **must** submit pricing using this form. **FIT will not accept bid responses on any other form.**

NOTE:
FIT will not sign any bidder generated contract, agreement or scope of work. FIT Bid and Terms and Conditions apply. Bidder requirement for FIT to sign any document will be grounds for rejection. Bidder inclusion of any conditions, clarifications, exceptions or changes which are not in compliance with FIT Bid and Terms and Conditions will be grounds for rejection.

SECTION IV.
GENERAL REQUIREMENTS

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01010 -- SUMMARY OF THE WORK

.01 - Work Under The Contract

The Work shall be as described in the Contract Documents.

.02 - Work by Others

Should any other contractor be engaged by the Owner to perform work on the Site or in areas adjoining or adjacent to the Site, the Contractor and such other contractor shall coordinate the work of the Contractor and such other contractor.

.03 - Items Not Included

The following items shown on the drawings are not included in the Work:

A. Items indicated "By Others".

B. Items indicated "N.I.C." (Not in Contract)

C. Existing construction not indicated or specified to be removed, replaced or altered.

.04 - Openings and Chases

A. The Contractor shall build openings, including but not limited to channels, chases and flues as required to complete the Work as set forth in the Contract and as directed by the Owner before any work is installed.

B. After the installation and completion of any work for which openings, including but not limited to, channels, chases and flues, have been provided for the Contractor, the Contractor shall build in, over, around and finish all such openings as required to complete the Work.

C. If a contractor fails to furnish drawings and information required in connection with such openings before the General Construction Contractor performs any Work affected thereby, said contractor who so fails to furnish such drawings and information shall bear the cost of all cutting and refinishing including that part of the General Construction Contractor’s Work affected.

D. The Contractor shall Furnish and Install all sleeves, inserts, hangers and supports required for the execution of the Work.

E. Specific instructions shall be obtained from the Owner or the Owner's Representative before cutting beams or other structural members, arches or lintels.

F. The Contractor shall not endanger the Work and shall not cut or alter the Work unless prior approval and instructions are received from the Owner or the Owner's Representative.

.05 - Surveys and Layout

A. If, for any reason, stakes, batter boards or monuments are disturbed, it shall be the responsibility of the Contractor to reestablish them.

B. The Owner or the Owner's Representative may order construction work suspended at any time when location of monuments, stakes, bench marks and other layout markings established by the Contractor are not adequate to permit checking the Work.

C. The Contractor shall Provide and shall maintain axis lines on each floor and shall establish and shall maintain grade marks 4' 0" above the finished floor on each floor level.

D. The Contractor shall Furnish such stakes and other required equipment, tools and materials, and all labor as may be required in laying out any part of the Work.

.06 - Scheduling

A. The Contractor shall deliver to the Owner schedules and forms in accordance with the Contract.

B. The Owner or the Owner's Representative may require the Contractor to modify schedules which the Contractor has submitted either before or after such schedules are approved so that:

1. The Work shall not be delayed.

2. Changes in the Work are reflected in the schedules of the Contractor.

.07 - Contractor Use of Premises

While performing the Work, the Contractor shall take every precaution against injuries to persons and damage to property.

01080 -- PERMITS AND COMPLIANCE

.01 - Permits and Licenses

The Contractor shall obtain, maintain and pay for all permits and licenses necessary for the execution of the Work and for the use of such Work when completed.

Prior to final payment the Contractor shall deliver to the Owner’s Representative all permits and certificates of approval issued by any agency having jurisdiction.

.02 - Compliance

The Contractor shall give all notices, pay all fees and comply with all laws, rules and regulations applicable to the Work.

.03 - Additional Compliance

The Contractor, Subcontractors, and the employees of the Contractor and Subcontractors, shall comply with all regulations governing conduct, access to the premises, operation of equipment and systems and conduct while in or near the premises and shall perform the Work in such a manner as not to unreasonably interrupt or interfere with the conduct of business of the Institution.

.04 - Royalties and Patents

It is the sole responsibility of the Contractor to determine what, if any, patents are applicable to the Project. The Contractor shall pay all royalties and/or license fees. The Contractor shall defend all suits or claims for infringement of any patent rights and save the Owner, Architect, Engineer, Environmental Consultant and Construction Manager harmless from loss, including attorney's fees, on account thereof.

01200 -- PROJECT MEETINGS

.01 - Project meetings shall be held to accomplish the following:

A. Coordinate the Work.

B. Establish a sound working procedure and relationship between all contractors, the Owner and the Owner's Representative.

C. Review requisitions, proposals and change orders.

D. Review the progress of the Work, review quality of work in place and review approval required by the Work and review delivery of materials.

E. Expedite the Work to completion within the scheduled time limit.

F. Review progress payments.

.02 - Initial Job Meeting (Orientation Meeting)

The Owner or the Owner's Representative shall call an initial job meeting which the Contractor shall attend. This meeting shall be called prior to the start of construction.

.03 - Job Progress Meetings

A. Job progress meetings shall be scheduled by the Owner or the Owner's Representative during the course of construction. The Contractor or the Contractor's duly authorized representative and such Subcontractors as required by the Contractor or the Owner or the Owner's Representative shall be present at all job progress meetings. The Contractors and Subcontractors shall answer questions on progress, workmanship, approvals required, delivery of material and other subjects concerning the Work. The purpose of such meetings is to coordinate the efforts of all

concerned so that the Work proceeds without delay to completion as required by the Contract.

B. The Owner or the Owner's Representative may require any schedule to be modified so that changes in the Work, delays or acceleration of any segment of the Work shall be reflected in such schedule. The Contractor shall cooperate with the Owner or the Owner's Representative in providing data for such changes in or modifications of schedules.

01300 -- SUBMITTALS

.01 - Schedules & Records

A. Within the time set forth in the Contract, the Contractor is required to complete and submit to the Owner or the Owner's Representative the following forms:

1. Submit construction progress schedule to the Owner or the Owner's Representative no later than thirty (30) calendar days after receipt by the Contractor of notice to proceed.

2. Submit names and addresses of all Subcontractors to the Owner or the Owner's Representative within thirty (30) calendar days of approval of the construction progress schedule.

3. Submit to the Owner or the Owner's Representative the date on which the Contractor proposes to award each subcontract a minimum of ten (10) days prior to such proposed award.

4. Submit Shop Drawings and material sample schedule to the Owner or the Owner's Representative no later than thirty (30) days after approval of the construction progress schedule. Such schedule shall include the date of all Shop Drawings, samples and materials shall be submitted and the date approval is required.

5. Submit to the Owner or the Owner's Representative on a form approved by the Owner, a schedule of anticipated monthly requisition amounts. Such schedule shall be submitted from time to time as directed by the Owner, the first such submission being required to be made by the Contractor within ten (10) days of receipt by the Contractor of a written order to proceed issued by the Owner. The amounts employed in preparing such schedules in no way shall be binding upon the Owner.

B. Sample forms shall be provided by the Owner or the Owner's Representative for the above mentioned schedules and records.

01311 – PROJECT ANALYSIS

.01 - Project Control and Progress Meetings

A. The Contractor shall attend all scheduling meetings as directed by the Owner or the Owner's Representative.

B. In addition to the Owner or the Owner's Representative and the Contractor's Superintendent and Scheduling Coordinator, such meetings shall also be attended by representatives of such subcontractors as the Contractor, the Owner or the Owner's Representative may deem advisable. The agenda for such meetings shall include the progress and current status of the Work, proposed solutions for problem areas and a review of schedules for future Work in order to meet the Contractor's objectives and his obligations under the Contract. Consideration shall be given to establishing actual start dates, actual completion dates, planned starts and finishes, quantities installed, man hours worked, as well as other data relevant to the performance of the Contract.

C. At least one week before each meeting described in subsection .01A of this Division 01311, the Contractor shall furnish progress data in the form required by the Owner or the Owner's Representative as follows:

1. The status of all activities as of date determined by the Owner or the Owner's Representative.

2. A list of actual start and completion dates for all activities.

3. Projected durations of completion of those activities in progress.

4. Relevant data of submittals in progress including equipment releases and equipment in fabrication.

5. All other information which in the discretion of the Owner or its Representative, may be required to complete the Project Schedule Update.

.02 – Payment

The Contractor's Payment Breakdown and Monthly Requisition as called for by Section 17.01 of the General Conditions of the Contract shall be the basis by which the Contractor is to be paid.

.03 - Time of Completion

It is the sole responsibility of the Contractor to complete the Work within the time of completion required by the Contract.

01340 -- SHOP DRAWINGS AND SAMPLES

.01 - Contractor Submittal

A. The Contractor shall submit the Shop Drawings and samples required by the Architect and the Contractor shall adhere to all submittal and scheduling requirements for Shop Drawings and samples. After examination of such Shop Drawings and samples by the Architect and the return of such items by the Architect to the Contractor, the Contractor shall make corrections indicated and shall furnish to the Architect the required number of corrected copies of Shop Drawings or samples.

B. Shop Drawings shall be accompanied by a letter of transmittal to the Owner or the Owner's Representative requesting approval and date approval is desired.

C. Each Shop Drawings and letter of transmittal shall be identified with the following information:

1. Project title

2. Contract name

3. Date of the drawing, including dates of any revisions

4. Name of Contractor, name of Subcontractor, material supplier and manufacturer, as applicable

5. Name of person or firm preparing Shop Drawings

6. Contract drawing numbers and specifications, section division and paragraph numbers used as references in preparing Shop Drawings, and titles of items to which the Shop Drawing refers.

D. Shop Drawings shall show the design, dimensions, connections and other details necessary to insure that the Shop Drawings accurately interpret the Contract Documents and shall also show adjoining Work in such Detail as required to provide proper connections with said adjoining Work. Where adjoining connected Work requires Shop Drawings, such Shop Drawings shall be submitted to the Owner or the Owner's Representative for approval at the same time so that connections can be checked.

E. The Contractor shall verify all field measurements. Measurements available prior to submittal of Shop Drawings shall be shown and so noted on the Shop Drawings. Measurements not available prior to submission of Shop Drawings shall be noted on the Shop Drawings as not available and such measurements shall be obtained prior to fabrication.

F. The Contractor shall submit manufacturer's drawings and specifications when necessary to fully explain apparatus or equipment required by the Work. These manufacturer's drawings and specifications shall be treated as Shop Drawings. Manufacturer's catalog numbers alone are not acceptable as sufficient information for compliance with this requirement.

G. Samples shall be accompanied by a letter of transmittal to the Owner or the Owner's Representative requesting approval, and date approval is desired.

H. Each sample shall be labeled with the following information:

1. Project title

2. Contract name

3. Date of submission

4. Name and quality of the material

5. Name of Contractor, name of Subcontractor, material supplier and manufacturer, as applicable

6. Contract drawing numbers and specification section, division and paragraph numbers used as reference in preparing samples.

I. Samples shall be of sufficient size and number to show the quality, type, color, finish and texture of the material required to be furnished by the Contractor pursuant to the Contract.

.02 - Contractor Review

The Contractor shall review, verify and determine all field measurements, field construction criteria, materials, catalog numbers and similar data, shall coordinate each Shop Drawing and sample with the requirements of the Contract and shall determine whether or not such Shop Drawings are in conformity with the provisions of the Contract before submitting the Shop Drawings to the Architect for approval.

.03 - Contractor Responsibility

The Architect's approval of Shop Drawings and samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract. The Contractor shall be responsible for the accuracy of the Shop Drawings and samples and for the conformity of Shop Drawings and samples with the Contract unless the Contractor has notified the Architect of the deviation in writing at the time of submission and has received from the Architect written approval of the specified deviations. The Architect's approval shall not relieve the Contractor of responsibility for errors or omissions in the Shop Drawings or samples.

.04 - Commencement of Work

No portion of the Work shall be commenced until required Shop Drawings or samples are approved by the Architect.

01380 -- PROGRESS PHOTOGRAPHS

.01 - Contractor Submission

A. The Contractor shall furnish to the Owner, progress photographs of the Work as follows: three (3) 8" x 10" glossy prints of each of the following views:

1. Two (2) different views of the area in which the building or buildings are to be located, taken before excavation starts.

2. Two (2) different views for each building when footings are in place and forms completed.

3. Four (4) different views for each building when foundations are completed.

4. Four (4) different views for each building when exterior wall is fifty per cent (50%) completed.

5. Four (4) different views for each building when the structure is ready for roofing.

6. Four (4) different exterior views in color for each building at completion.

7. Six (6) interior views in color for each building as directed upon completion.

B. A title identifying the view shown by each photograph and date taken shall appear on the back of each print.

01500 -- TEMPORARY FACILITIES AND CONTROLS

.01 - Requirements

The Contractor shall Provide the temporary facilities and controls as hereinafter specified and as required by law.

.02 - Temporary Lighting and Electric Service

The Contractor shall Provide and maintain all temporary lighting and power required in connection with the Contractor's operations from the commencement of the Work until the completion of each structure or for such other time as

directed by the Owner or the Owner's Representative. When the use of such temporary lighting and power is no longer required, all temporary wiring and equipment shall be completely removed by the Contractor. The Contractor shall make the necessary application to the lighting company and pay for all charges, costs and expenses incidental to the installation and maintenance of temporary lighting and power as required in connection with the Contractor's operations, and the Contractor shall pay for all power used. The minimum temporary lighting to be provided is at the rate of one-quarter watt per square foot and is to be maintained in each room and changed as required when interior walls are being erected. The required temporary lighting must be maintained for twenty-four (24) hours a day and seven (7) days a week at all stair levels and in all corridors below ground; in all other spaces temporary lighting is to be maintained only during working hours. All temporary wiring and equipment shall be in conformity with the National Electric Code. Three-phase temporary power circuits shall be installed as required to operate construction equipment of the various trades and to Install and test equipment such as pumps and elevators. The Contractor shall Install and maintain temporary or permanent service for the permanently installed building equipment such as sump pumps, boilers, boiler controls, fans, pumps, so that such equipment may be operated when required and so ordered by the Owner or the Owner's Representative for drainage or for temporary heat.

.03 - Material Hoists

A. General

1. Material hoists shall be operated by diesel, gasoline or steam engines and shall be complete with all equipment necessary for operation. Such hoists shall run from grade to roof, shall be installed immediately following the structural framing, centering or form work, and centering or form work unless otherwise approved by the Owner or the Owner's Representative. Electrically operated hoists shall not be used except as otherwise allowed by the Contract.

2. Material hoists shall meet any and all requirements of law, rule or regulation.

3. Hoist cars shall be of required size and design for the hoisting of all normal size building materials.

B. The Contractor shall:

1. Furnish, install, maintain and operate at the Contractor's expense, all hoisting equipment required for the Work.

2. Furnish all labor required for the Work.

.04 - Temporary Use of Permanent Elevator as Equipment Material Hoist

A. The Contractor shall:

1. Use the temporary hoists until a building is completed, or until the Contractor may, with the Owner's permission, use the equipment of one (1) elevator in a building for temporary service after the permanent elevator equipment and the permanent electric service have been installed.

2. If the Contractor elects to use such permanent elevator equipment, the Contractor shall:

a. Provide adequate protection for such equipment and shall operate such equipment within a capacity not to exceed that allowed by law, rule or regulation.

b. Provide for the maintenance of the elevator equipment as approved by the Owner or the Owner's Representative.

c. Leave such equipment in perfect condition.

B. The permanent elevator equipment shall be ready for use when required by the Work and shall permit any use approved by the Owner or the Owner's Representative.

.05- Temporary Enclosures

The Contractor shall:

A. Provide, install and maintain any temporary weather resistant enclosures for all openings in exterior walls and roof that are not enclosed.

B. After building is enclosed, maintain proper temperatures required by the Contract.

.06 - Temporary Fence Enclosures

The Contractor shall Provide, Install and maintain any temporary fence enclosures required by the Contract.

.07 - Maintenance of Permanent Roadways

The Contractor shall immediately remove dirt and debris which may collect on permanent roadways due to the Work.

.08 – Traffic Control

A. Routes to and from the location of the Work shall be as indicated in the Contract or as directed by the Owner or the Owner's Representative.

B. Parking areas for the use of those engaged in the Work shall be as indicated in the Contract or as directed by the Owner or the Owner's Representative.

.09 - Fire Prevention Control

The Contractor Shall:

A. Provide private unlisted telephone service reserved for fire calls at a location or locations approved by the Owner or the Owner's Representative. Such service shall be in addition to any other telephone service. The Contractor shall pay all costs thereof until completion and acceptance of the Work or as otherwise directed by the Owner or the Owner's Representative.

B. Comply with the safety provisions of the National Fire Protection Association's "National Fire Codes" pertaining to the Work and, particularly, in connection with any cutting or welding performed as part of the Work.

.10 - Pollution Control

The Contractor shall:

A. Comply with all laws, rules and regulations governing pollution control, including but not limited to those of the Department of Environmental Conservation of the State of New York.

B. Take all necessary precautions including, but not limited to digging and maintaining settling basins and dams; diverting streams, and taking all other actions that may be necessary to prevent silt, and waste of any kind from being deposited, silting and reduction of quality of streams below the construction area and downstream properties as a result of the Work.

C. Refrain from the disposal of volatile fluid wastes into storm or sanitary sewer systems, approved sewage disposal systems or any waterway.

D. Refrain from burning trash or waste materials.

.11 - Temporary Field Office

A. The Contractor may Provide a temporary office structure, for the Contractor's use during the course of the Work.

1. The Contractor must receive prior written approval from the Owner or the Owner's Representative for such temporary office structure in relation to location, type of structure, and included facilities.

2. All toilet and sink facilities in any such office structure shall be connected to an approved sewage disposal system.

3. The Contractor shall remove the temporary office structure from the Site and shall repair the Site and finish the area as directed by the Owner or the Owner's Representative.

B. The Contractor shall:

1. Provide a temporary office structure completely separate from any other office structures at a location approved by the Owner or the Owner's Representative until the Work is completed and is accepted.

2. Provide such office structure for the exclusive use of the Owner.

3. Bear all costs in relation to the furnishing, construction and removal of such office structure.

4. Repair and refinish the area as directed by the Owner or the Owner's Representative.

5. Construct such office structure and furnish such office structure as required by the Contract.

6. Maintain such office structure in a sanitary condition and in proper repair, properly heat the structure, furnish the fuel and furnish all utilities and pay all utility charges.

7. Install a telephone for the sole use of the Owner or the Owner's Representative and pay all service and local toll charges incurred as a result of the use of such telephone service.

C. With the prior written approval of the Owner or the Owner's Representative any other Contractor may erect a substantial office structure at the Site for the use of such Contractor in relation to the Work.

1. All toilet and sink facilities in any such office structure shall be connected to an approved sewage disposal system.

2. Such Contractor shall remove the temporary office structure from the Site and shall repair the Site and finish the area as directed by the Owner or the Owner's Representative.

D. When adequate space is available in a building, the Contractor may transfer such office to available space with the prior written permission of the Owner or the Owner's Representative.

E. Trailers providing comparable facilities may be accepted at the discretion of the Owner or the Owner's Representative.

.12 - Rubbish Removal

A. The Contractor shall:

1. Keep the Work free from rubbish at all times.

2. Clean all enclosed structures daily.

3. Remove rubbish from the Site at least once a week.

B. The Contractor shall conform with the following:

1. Burning of rubbish shall not be permitted.

2. All rubbish shall be lowered by way of chutes, taken down by hoists, or lowered in receptacles. Under no circumstances shall any rubbish be dropped or thrown from one (1) level to another inside or outside any building.

.13 - Discontinuance, Changes and Removal

The Contractor shall:

A. Discontinue all temporary services required by the Contract when so directed by the Owner or the Owner's Representative. The discontinuance of any such temporary service prior to the completion of the Work shall not render the Owner liable for any additional cost entailed thereby.

B. Remove and relocate such temporary facilities as directed by the Owner or the Owner's Representative without additional cost to the Owner, and shall restore the Site and the work to a condition satisfactory to the Owner.

.14 - Project Identification

A. No signs or advertisements shall be displayed on the site except as required by the Contract.

B. The Contractor shall Furnish, erect and maintain the Site, the exact location thereof to be designated by the Owner or the Owner's Representative, a construction sign, in the form provided by the Contract.

.15 - Moisture and Condensation Control

The Contractor shall provide for ventilation of all structures until Physical Completion and acceptance of the Work and shall control such ventilation to avoid excessive rates of drying of construction materials, including but not limited to concrete and to plaster, and to prevent condensation on sensitive surfaces.

.16 - Protective Services

The Contractor shall provide security services required by the Contract.

01600 -- MATERIAL AND EQUIPMENT

.01 - Storage and Protection

A. Materials stored on the Site shall be neatly piled and protected, and shall be stored in an orderly fashion in locations that shall not interfere with the progress of the Work or with the daily functioning of the Institution.

B. Should it become necessary during the course of the Work to move materials or equipment stored on the Site, the Contractor, at the direction of the Owner or the Owner's Representative, shall move such material or equipment.

01700 -- PROJECT CLOSE OUT

.01 - Final Cleanup

A. The Contractor shall leave the Work ready for use and occupancy without the need of further cleaning of any kind.

B. The Contractor shall remove all tools, appliances, projects signs, material and equipment from the premises as soon as possible upon completion of the Work.

C. The Work is to be turned over to the Owner in new condition, in proper repair and in perfect adjustment.

.02 - Required Close Out Documentation

A. Prior to final payment the Owner shall receive the following documents as required by the Contract:

1. The Contractor's general guarantee.

2. Specific guarantees, material, equipment and other items of work.

3. All certificates obtained in connection with the Work.

4. All final photographs of the Work.

B. The Owner shall also receive from the Contractor prior to final payment:

1. A complete listing of all Subcontractors, business addresses and items supplied by each such Subcontractor.

2. A listing of manufacturer's of major materials, equipment and systems installed in the Work.

3. A copy of all test data taken in connection with the Work.

4. Three (3) copies of all operation and maintenance manuals.

5. All keys, tools, screens, spare construction material, finishing material and equipment required to be furnish to the Owner as part of the Work.

.03 - Orientation Instruction

Prior to final payment appropriate maintenance personnel of the Owner shall be oriented and instructed by the Contractor in the operation of all systems and equipment as required by the Contract.

.04 - Project Close Out Inspections

A. When the Work has reached such a point of completion that the building or buildings, equipment or apparatus or any part thereof required by the Owner for occupancy or use can be so occupied and used for the purpose intended, the Owner or the Owner's Representative shall make a detailed inspection of the Work to insure that all requirements of the Contract have been met and that the Work is complete and is acceptable.

B. A copy of the report of the inspection shall be furnished to the Contractor as the inspection progresses so that the Contractor may proceed without delay with any part of the Work found to be incomplete or defective.

C. When the items appearing on the report of inspection have been completed or corrected, the Contractor shall so advise the Owner and the Owner's Representative. After receipt of the notification, the Owner or the Owner's Representative shall inform the Contractor of the date and time of final inspection. A copy of the report of the final inspection containing all

remaining contract exceptions, omissions and incompletions shall be furnished to the Contractor.

D. After receipt of notification of completion and all remaining contract exceptions, omissions and incompletions from the Contractor, the Owner and the Owner's Representative shall make an inspection to verify completion of the exception items appearing on the report of final inspection.

01720 -- PROJECT RECORD DOCUMENTS

.01 - Project Record Drawings

A. The purpose of the project drawings is to record the actual location of the Work in place including but not limited to underground lines, concealed piping within buildings, concealed valves and control equipment, and to record changes in the Work.

B. In addition to the sets of contract drawings that are required by the Contractor on the Site to perform the Work, the Contractor shall maintain, at the Site, one (1) copy of all drawings, specifications and addenda that are part of the Contract as awarded. Each of these documents should be clearly marked "Project Record Copy", maintained in a clean and neat condition available at all times for inspection by the Owner or the Owner's Representative, and shall not be used for any other purpose during the progress of the Work.

C. Project Record Requirements

1. The Contractor shall mark-up the "Project Record Copy" to show:

(a) Approved changes in the Work.

(b) Location of underground Work and concealed Work.

(c) Details not shown in the original Contract Documents.

(d) Any relocation of Work.

(e) All changed in dimensions.

(f) All access doors.

(g) Location of all plumbing, heating, ventilating, air conditioning or electrical assemblies.

2. Such information shall include, but shall not be limited to:

(a) Footing depth in relation to finished grade elevations.

(b) Any change in floor elevations.

(c) Any structural changes.

(d) Any substitutions.

(e) Elevations and locations of all underground utilities, services, or structures referenced to permanent above-ground structures or monuments.

(f) Designation of all utilities as to the size and use of such utilities.

(g) All invert elevations of manholes.

(h) The location of all utilities, services and appurtenances concealed in building structures that have been installed different from that required by the Contract.

(i) Any approved change order.

D. The Contractor shall keep the Project Record Documents up-to-date from day to day as the Work progresses. Appropriate documents are to be updated promptly and accurately; no Work is to be permanently concealed until all required information has been recorded.

E. The project record drawings are to be submitted by the Contractor to the Owner or the Owner's Representative when all the Work is completed and is approved by the Owner and the Owner's Representative before the Contractor may request final payment.

01740 -- WARRANTIES, GUARANTEES, AND BONDS

See the Contract Documents for details.

SECTION V.
GENERAL CONDITIONS

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ARTICLE 1 -- DEFINITIONS

Section 1.01 - The following terms as used in the Contract Documents shall be defined as follows:

Beneficial Occupancy - The use, occupancy or operation by the Owner of the Work, or any part thereof, as evidenced by a notification of Beneficial Occupancy executed by the Owner.

Construction Completion - Acceptance by the Owner of the Work as evidenced by a Notification of Construction Completion executed by the Architect.

Construction Manager - A person, persons, firm, partnership or corporation, regularly engaged in the management of construction projects, and so designated by the Owner.

Consultant - A person, persons, firm, partnership or corporation providing Architectural, Engineering or other professional services, and so designated by the Owner.

Contract - The agreement between the Owner and the Contractor consisting of the Contract Documents including all amendments and supplements thereto.

Contract Documents - The Contract, Notice to Bidders, Bid Checklist, Bid Terms and Conditions, Contractor Reference Sheet, Contract Terms and Conditions, Bid Analysis Form, Affirmative Action Form, Change Order Form, Contractors Trade Payment Breakdown, Safety EHS Plan, Prevailing Wage Schedule, Information for Bidders, Form of Bid, General Conditions, General Requirements, Bonds, Drawings, Specifications, Addenda, Change Orders and any supplementary data together with all provisions of law deemed to be inserted in the Contract or incorporated by reference.

Contractor - A person, persons, firm, partnership or corporation with whom the Contract is entered into by the Owner to perform the Work.

Extra Work - Any work in addition to the Work initially required to be performed by the Contractor pursuant to the Contract.

Furnish - To deliver to the site ready for installation.

Install - To unload at the delivery point at the Site and perform every operation necessary to establish secure mounting and correct operation at the proper location.

Owner – The Fashion Institute of Technology and/or its auxiliary corporations, as applicable.

Owner's Representative - A person, persons, firm, partnership or corporation so designated by the Owner.

Project - Work at the Site(s) carried out pursuant to one or more sets of Contract Documents.

Provide - To Furnish and Install complete in place and ready for operation and use.

Shop Drawings - Diagrams, fabrication drawings, illustration, schedules, test data, performance charts, cuts brochures and other data which are submitted by the Contractor to the Architect and illustrate any portion of the Work. These drawings and data are reviewed and acted upon by the architect.

Site - The area within the Contract limit, as indicated by the Contract.

Subcontract - An agreement between the Contractor and Subcontractor for work on the Site.

Subcontractor - A person, persons, firm, partnership or corporation under contract with the Contractor, or under contract with any subcontractor, to provide labor and material at the Site.

Substantial Completion - Stage of construction at which the Architect determines there is a minimal amount of the Work to be completed, or Work to be corrected.

Work - The performance of all obligations imposed upon the Contractor by the Contract.

ARTICLE 2 -- CONTRACT DOCUMENTS

Section 2.01 - Captions

The table of contents, titles, captions, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect the interpretation of the provisions to which they refer.

Section 2.02 - Conflicting Conditions

Should any provision in any of the Contract Documents be in conflict or inconsistent with any of the General Conditions or Supplements thereto, the General Conditions or Supplements thereto shall govern.

Section 2.03 - Notice and Service Thereof

Any notice to the Contractor from the Owner relative to any part of the Contract shall be in writing and service considered complete when said notice is mailed to the Contractor at the last address given by the Contractor, or when delivered in person to said Contractor or the Contractor's authorized representative.

Section 2.04 - Nomenclature

Materials, equipment or other Work described in words which have a generally accepted technical or trade meaning shall be interpreted as having said meaning in connection with the Contract.

Section 2.05 - Invalid Provisions

If any term or provision of the Contract Documents or the application thereof to any person, firm or corporation or circumstance shall, to any extent, be determined to be invalid or unenforceable, the remainder of the Contract Documents, or the application of such terms or provisions to persons, firms or corporations or circumstances other than those to which it is held invalid or unenforceable, shall not be affected thereby and each term or provision of the Contract Documents shall be valid and be enforced to the fullest extent permitted by law.

ARTICLE 3 -- INTERPRETATION OF CONTRACT DOCUMENTS

Section 3.01 – Owner/Architect

A. The Owner's representative/Architect shall give all orders and directions contemplated under the Contract relative to the execution of the Work. The Architect shall determine the amount, quality, acceptability of the Work and shall decide all questions which may arise in relation to said Work. The Owner's estimates and decisions shall be final except as otherwise expressly provided. In the event that any question arises between the Owner and Contractor concerning the Contract, the decision of the Owner shall be a condition precedent to the right of the Contractor to receive any money or payment under the Contract.

B. Any differences or conflicts concerning performance which may arise between the Contractor and other contractors performing Work for the Owner shall be adjusted and determined by the Owner's representative.

C. The Owner may act through a representative designated by the Owner.

Section 3.02 - Meaning and Intent of Contract Documents

The meaning and intent of all Contract Documents shall be as interpreted by the Architect.

Section 3.03 - Order of Preference

A. Figured dimensions shall take precedence over scaled dimensions. Larger scale drawings shall take precedence over smaller scale drawings. Latest addenda shall take precedence over previous addenda and earlier dated drawings and specifications.

B. Should a conflict occur in or between or among any parts of the Contract Documents that are entitled to equal preference, the better quality or greater quantity of material, of the more specific compared to the general, shall govern, unless the Architect/Owner's representative directs otherwise.

C. Drawings and specifications are complementary. Anything shown on the drawings and not mentioned in the specifications, or mentioned in the specifications and not shown on the drawings, shall have the same effect as if shown or mentioned in both.

ARTICLE 4 -- MATERIALS AND LABOR

Section 4.01 - Contractor's Obligations

A. The Contractor shall, in a good workmanlike manner, perform all the Work required by the Contract Documents within the time specified in the Contract.

B. The Contractor shall Furnish, erect, maintain, and remove such construction plant and such temporary Work as may be required for the performance of its work. The Contractor shall be responsible for the safety, efficiency and adequacy of the Contractor's plant, appliances and methods, and for damage which may result from failure or improper construction, maintenance or operation of said plant, appliances and methods. The Contractor shall comply with all terms of the Contract, and shall, carry on and complete the entire Work to the satisfaction of the Owner.

C. Any labor, materials or means whose employment or utilization during the course of this Contract may tend to or in any way cause or result in strike, work stoppages, delays, suspension of Work or similar troubles by workmen employed by the Contractor, its subcontractors or material suppliers, or by any of the trades working in or about the buildings and premises where Work is being performed under this Contract, or by other contractors, their subcontractors or material suppliers pursuant to other contracts shall not be allowed. Any violation by the Contractor of this requirement may in the sole judgment of the Owner be considered as proper and sufficient cause for declaring the Contractor to be in default, and for the Owner to take action against the Contractor as set forth in the General Conditions Article entitled "Termination" or such other action as the Owner may deem proper.

Section 4.02 - Contractor's Title to Materials

A. No materials or supplies for the Work shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by any other party. The Contractor warrants that the Contractor has full, good and clear title to all materials and supplies used by the Contractor in the Work, or resold to the Owner pursuant to the Contract free from all liens, claims or encumbrances.

B. All materials, equipment and articles which become the property of the Owner shall be new unless specifically stated otherwise.

Section 4.03 - "Or Equal" Clause

A. Whenever a material, article or piece of equipment is identified on the plans or in the specifications by reference to manufacturers' or vendors' names, trade names, catalogue number or make, said identification is intended to establish a standard. Any material, article or equipment of other manufacturers and vendors which performs satisfactorily the duties imposed by the general design may be considered equally acceptable provided that, in the opinion of the Architect/Engineer, the material, article or equipment so proposed is of equal quality, substance and function and the Contractor shall not Provide, Furnish or Install any said proposed material, article or equipment without the prior written approval of the Architect/Engineer. The burden of proof and all costs related thereto concerning the "or equal" nature of the substitute item, whether approved or disapproved, shall be borne by the Contractor.

B. Where the Architect/Engineer, pursuant to the provisions of this Section, approves a product proposed by the Contractor and said proposed product requires a revision of the Work covered by this Contract, or the Work covered by other contracts, all changes to the Work of all contracts, revision or redesign, and all new drawings and details required therefore shall be provided by the Contractor at the cost of the Contractor and shall be subject to the approval of the Consultant.

C. No substitution will be permitted which may result in a delay to the Project.

Section 4.04 - Quality, Quantity and Labeling

A. The Contractor shall Furnish materials and equipment of the quality and quantity specified in the Contract.

B. When materials are specified to conform to any standard, the materials delivered to the Site shall bear manufacturer's labels stating that the materials meet said standards.

C. The above requirements shall not restrict or affect the Owner's right to test materials as provided in the Contract.

D. The Contractor shall develop and implement quality control plans to assure itself and the Owner that all Work performed by the Contractor and its Subcontractors complies fully with all Contract requirements, and shall submit the plans to the Owner as required by the Contract. See Submittals Section of the General Requirements. The Contractor's quality control plans shall be independent of any testing or inspection performed by or on behalf of the Owner.

ARTICLE 5 -- CONTRACTOR

Section 5.01 - Supervision by Contractor

A. The Contractor shall provide full-time competent supervision for the duration of the Contract; during the course of on-site work the Contractor shall provide a full-time on-site superintendent who shall have full authority to act for the Contractor at all times. The Superintendent shall be able to read, write and speak English fluently, as well as communicate with the workers.

B. If at any time the supervisory staff is not satisfactory to the Owner, the Contractor shall, if directed by the Owner, immediately replace such supervisory staff with other staff satisfactory to the Owner.

C. The Contractor shall remove from the Work any employee of the Contractor or of any Subcontractor when so directed by the Owner.

Section 5.02 - Representations of Contractor

The Contractor represents and warrants:

A. That it is financially solvent and is experienced in and competent to perform the Work, and has the staff, equipment, subcontractors and suppliers available to complete the Work within the time specified for the Contract price.

B. That it is familiar with all Federal, State or other laws, ordinances, orders, rules and regulations that may in any way affect the Work.

C. That any temporary and permanent Work required by the Contract can be satisfactorily constructed, and that said construction will not injure any person or damage any property.

D. That it has carefully examined the Contract and the Site of the Work and that, from the Contractor's own investigations and through the bid process and requirements is satisfied as to the nature and materials likely to be encountered, the character of equipment and other facilities needed

for the performance of the Work, the general and local conditions and all other materials or items which may affect the Work.

E. That it is satisfied that the Work can be performed and completed as required in the Contract, and warrants that it has not been influenced by any oral statement or promise of the Owner or the Consultant.

SECTION 5.03 – COPIES OF CONTRACT DOCUMENTS FOR CONTRACTORS

A. The Owner shall furnish to the Contractor, without charge, up to five (5) copies of Contract Documents.

B. Any sets in excess of the number mentioned above may be furnished to the Contractor at the cost of reproduction and mailing or delivery.

SECTION 5.04 - MEETINGS

The Contractor shall attend all meetings as directed by the Owner or the Owner's Representative.

SECTION 5.05 – RELATED WORK

To ascertain the relationship of its work to all Work required by the Contract Documents, the Contractor shall examine the Contract Documents for Work of its Contract and any related work of other contracts.

SECTION 5.06 – ERRORS OR DISCREPANCIES

The Contractor shall examine the Contract thoroughly before commencing the Work and report in writing any errors or discrepancies to the Owner or the Owner's Representative within five (5) days of discovery.

ARTICLE 6 -- SITE CONDITIONS

SECTION 6.01 – SUBSURFACE OR SITE CONDITIONS FOUND DIFFERENT

A. The Contractor acknowledges that the Contract amount set forth in its bid includes such provisions which the Contractor deems proper for all Site

conditions the Contractor could reasonably anticipate encountering as indicated in the Contract or from the Contractor's inspection and examination of the Site prior to submission of bids.

SECTION 6.02 – VERIFYING DIMENSIONS AND CONDITIONS

A. The Contractor shall take all measurements and verify all dimensions and conditions at the Site before proceeding with the Work. If said dimensions or conditions are found to be in conflict with the Contract, the Contractor immediately shall refer said conflict to the Architect in writing. The Contractor shall comply with any revised Contract Documents.

B. During the progress of Work, the Contractor shall verify all field measurements prior to fabrication of building components or equipment and proceed with the fabrication to meet field conditions.

C. The Contractor shall consult all Contract Documents to determine exact location of all Work and verify spatial relationships of all Work. Any question concerning said location or spatial relationships may be submitted in a manner approved by the Architect.

D. Special locations for equipment, pipelines, ductwork and other such items of Work, where not dimensioned on plans, shall be determined in consultation with other affected contractors.

E. The Contractor shall be responsible for the proper fitting of the Work in place.

SECTION 6.03 - SURVEYS

Unless otherwise expressly provided in the Contract, the Owner shall furnish the Contractor all surveys of the property necessary for the Work, but the Contractor shall lay out the Work.

ARTICLE 7 -- INSPECTION AND ACCEPTANCE

SECTION 7.01 – ACCESS TO THE WORK

The Owner, the Owner's Representative, and the architect shall at all times have access to the Work and the Contractor shall provide proper facilities for said access.

SECTION 7.02 – NOTICE FOR TESTING

If the Contract Documents, the Owner's instructions, laws, rules, ordinances or regulations require that any Work be inspected or tested, the Contractor shall give the Architect and/or Owner's representative a minimum of three (3) work days written notice of readiness of the Work for inspection or testing and the date fixed for said inspections or testing.

SECTION 7.03 – REEXAMINATION OF WORK

Reexamination of any part of the Work may be ordered by the Owner, and if so ordered, the Work must be uncovered by the Contractor. If said Work is found to be in accordance with the Contract, the Owner shall pay the cost of reexamination. If said Work is not found to be in accordance with the Contract, the Contractor shall pay the cost of reexamination and replacement.

SECTION 7.04 – INSPECTION OF WORK

All Work, all materials whether or not incorporated in the Work, all processes of manufacture and all methods of construction shall be, at all times and places, subject to the inspection of the Owner or the Owner's Representative or the architect, and the Architect shall be the final judge of the quality and suitability of the Work, materials, processes of manufacture and methods of construction for the purposes for which said Work, materials, processes of manufacture and methods of construction are used. Any Work not approved by the Architect shall be reconstructed, made good, replaced or corrected immediately by the Contractor including all Work of other contractors destroyed or damaged by said removal or replacement. Rejected material shall be removed immediately from the Site. Acceptance of material and workmanship by the Owner shall not relieve the Contractor from the Contractor's obligation to replace all Work which is not in compliance with the Contract.

SECTION 7.05 – DEFECTIVE OR DAMAGED WORK

If, in the opinion of the Owner, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the Work damaged or not performed in accordance with the Contract, the compensation to be paid to the Contractor shall be reduced by an amount which, in the judgment of the Owner, shall be deemed to be equitable.

SECTION 7.06 - TESTING

All materials and equipment used in the Work shall be subject to inspection and testing in accordance with accepted standards to establish conformance with specifications and suitability for uses intended, unless otherwise specified in the Contract. If any Work shall be covered or concealed without the approval or consent of the Architect, said Work shall, if required by the Architect, be uncovered for examination. Any inspection by the Architect or by a testing laboratory on behalf of the Owner does not relieve the Contractor of the responsibility to maintain quality control of materials, equipment and installation to conform to the requirements of the Contract. If any test results are below specified minimums, the Architect may order additional testing. The cost of said additional testing, any additional professional services required, and any other expenses incurred by the Owner as a result of said additional testing shall be at the Contractor's expense. The Owner may deduct such costs from moneys due the Contractor.

SECTION 7.07 - ACCEPTANCE

No previous inspection shall relieve the Contractor of the obligation to perform the Work in accordance with the Contract. No payment, either partial or full, by the Owner to the Contractor shall excuse any failure by the Contractor to comply fully with the Contract Documents. The Contractor shall remedy all defects and deficiencies, paying the cost of any damage to other Work resulting therefrom.

ARTICLE 8 -- CHANGES IN THE WORK

SECTION 8.01 - CHANGES

A. Without invalidating the Contract, the Owner/Architect may order Extra Work or make changes by altering, adding to, or deducting from the Work, the Contract consideration being adjusted accordingly. No claims for Extra Work shall be allowed unless such Extra Work is ordered in writing by the Owner/Architect. No changes in the Work shall be made unless such Work is ordered in writing by the Owner/Architect or Owner’s Representative. If the time for completion is affected by this change, the revised time for completion shall be included in the change order. The Owner may order the Contractor to perform the Extra Work and proceed under the Dispute Article.

B. The amount by which the Contract consideration is to be increased or decreased by any change order may be determined by the Owner by one or more of the following methods:

1. By applying the applicable unit price or prices contained in the Contract.

2. By estimating the fair and reasonable cost of the Extra Work:

   a. Labor, including all wages, required wage supplements and insurance required by law, paid to employees below the rank of superintendent directly employed at the Site. Wages are the prevailing rate of wages defined in the Contract Documents and supplemental updates.

   b. Premiums or taxes paid by the Contractor for worker's compensation insurance, unemployment insurance, FICA tax and other payroll taxes as required by law, net of actual and anticipated refunds and rebates.

   c. Materials

   d. Equipment, excluding hand tools, which in the judgment of the Owner, would have been or will be employed in the Work. It is the duty of the Contractor to utilize either rented or self-owned equipment that is of a nature and size appropriate for the Work to be performed. The Owner reserves the right to determine reasonable and appropriate equipment sizing, and at the Owner's discretion, to adjust the costs allowed to reflect a smaller or less elaborate piece of equipment more suitable for performance of the Extra Work.

3. By determining the actual cost of the Extra Work in the same manner as in Article 8, Section 8.01, Subsection B. 2. except that the actual costs of the Contractor shall be used in lieu of estimated costs.

C. The Owner shall have the option of determining by which method the Contractor shall proceed with said Extra Work. Wages are the prevailing rate of wages defined in the Contract Documents and supplemental updates. The Contractor shall submit a signed and notarized Labor Rate Worksheet(s) to the Owner to be used to determine hourly rates for various classifications of workers. The Contractor agrees to provide documentation verifying costs and calculations at the Owner's request.

D. Regardless of the method used by the Owner in determining the value of a change order, the Contractor shall, within the time-frame given by the Owner, submit to the Owner or Owner's Representative a detailed breakdown of the Contractor's estimate of the value of the omitted or Extra Work.

E. Unless otherwise specifically provided for in a change order, the compensation specified therein for Extra Work includes full payment for the Extra Work covered thereby, and the Contractor waives all rights to any other compensation for said Extra Work, damage or expense.

F. The Contractor shall furnish satisfactory bills, payrolls and vouchers covering all items of cost and when requested by the Owner shall give the Owner access to all accounts and records relating thereto, including records of subcontractors and material suppliers.

G. Increased bonding costs for the Work which may result from Owner issued Changes in the Work will be addressed by the Owner at the completion of the Project Work upon submission of satisfactory proof of Contractor's increased cost.

H. Increased contractual liability insurance premium costs which may result from changes in the Work will be addressed by the Owner at the completion of the Work upon submission of satisfactory proof of Contractor's increased cost.

SECTION 8.02 – OVERHEAD AND PROFIT ALLOWANCE

A. See Example A for changes in the Work performed directly by the Contractor, whether a base cost is arrived at by estimated cost or actual cost method; add to base cost a sum equal to twenty percent. See Exceptions - Paragraphs "D" and "E".

Example A:

Contractor base cost	$1,000
20% overhead and profit	200
Total	$1,200

B. See Example B for changes in the Work performed by a Subcontractor under contract with the Contractor, where estimated or actual cost is Ten Thousand Dollars ($10,000.00) or less; add to the base cost a sum equal to twenty percent of cost, for the benefit of the Subcontractor. For the benefit of the Contractor; add an additional sum equal to ten percent of the Subcontractor's base cost.

Example B:

Subcontractor base cost	$1,000
20% Subcontractor overhead and profit	200
Subcontractor Total	$1,200
10% Contractor overhead and profit on base cost	100
Total	$1,300

C. See Example C for changes in the Work performed by a Subcontractor, under contract with the Contractor, which exceeds a base cost of Ten Thousand Dollars ($10,000) in estimated or actual cost; add to the base cost a sum equal to twenty percent of cost for the benefit of the Subcontractor. For the benefit of the Contractor; add an additional sum equal to ten percent of the first Ten Thousand Dollars ($10,000) of the Subcontractor's base cost, plus five percent of the next Ninety Thousand Dollars ($90,000) of the Subcontractor's base cost, plus three percent of any sum in excess of One Hundred Thousand Dollars ($100,000) of the Subcontractor's base cost.

Example C:

Subcontractor base cost	$200,000
20% Subcontractor overhead and profit	40,000
Subcontractor Total	$240,000
10% Contractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Total	$248,500

D. See Example D for overhead and profit on major equipment such as: switchgear, transformers, air handling units, boilers, etc. For extra equipment purchases by the Contractor or Subcontractors which exceeds a base cost of Ten Thousand dollars ($10,000) in estimated or actual cost; add to the base cost for the benefit of the Contractor a sum equal to ten percent of the first Ten Thousand dollars ($10,000) of the vendor's base cost plus five percent of the next Ninety Thousand dollars ($90,000) of the vendor's base cost, plus three percent of any sum in excess of One Hundred Thousand dollars ($100,000) of the vendor's base cost. If the equipment is supplied by the Subcontractor, the Contractor is entitled to a maximum of ten (10) percent of the first Ten Thousand dollars ($10,000) of the base cost.

Example D:

Vendor base cost	$200,000
10% Contractor or Subcontractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Contractor or Subcontractor Total	$208,500
10% Contractor overhead and profit on first $10,000 base cost when equipment is supplied by the Subcontractor, no other mark-up allowed	1,000
Total	$209,500

E. See Example E for overhead and profit on a material only Change Order. For increased material purchases by the Contractor or Subcontractors which exceed a base cost of Ten Thousand dollars ($10,000) in estimated or actual costs; add to the base cost for the benefit of the Contractor a sum equal to ten percent of the first Ten Thousand dollars ($10,000) of the supplier's cost plus five percent of the next Ninety Thousand dollars ($90,000) of the supplier's cost, plus three percent of any sum in excess of One Hundred Thousand dollars ($100,000) of the supplier's cost. If the material is supplied by the Subcontractor, the Contractor is entitled to a maximum of ten (10) percent of the first Ten Thousand dollars ($10,000) of the base cost.

Example E:

Material cost (net difference between original contract and revised)	$200,000
10% Contractor or Subcontractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Contractor or Subcontractor Total	$208,500
10% Contractor overhead and profit on first $10,000 base cost when material is supplied by the Subcontractor, no other mark-up allowed	1,000
Total	$209,500

F. Other than the overhead and profit described in General Conditions Section 7.02A, no further overhead and profit will be allowed for changes to the Work performed by a Subcontractor under Subcontract with the Contactor or for major equipment or material supplier determined to be an affiliate of or controlled by the Contractor. An affiliate is considered any firm or entity in which the Contractor or any individual listed on the Contractor's NYS Vendor Responsibility Questionnaire either owns 5% or more of the shares of, or is one of the five largest shareholders, a director, officer, member, partner or proprietor of said Subcontractor, major equipment or material supplier; a controlled firm is any firm or entity which, in the opinion of the Owner, is controlled by the Contractor or any individual listed on the Contractor's NYS Vendor Responsibility Questionnaire.

1. The Owner, in its sole and exclusive discretion, will determine if a firm or entity is an affiliate of or controlled by the Contractor.

G. No overhead and profit shall be paid for changes in the Work performed by a Subcontractor not under Subcontract with the Contractor. No overhead and profit shall be paid on the premium portion of overtime pay. Where the changes in the Work involve both an increase and a reduction in similar or related Work, the overhead and profit allowance shall be applied only to the cost of the increase that exceeds the cost of the reduction.

SECTION 8.02A – DEDUCT CHANGE ORDER

The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a decrease in the Contract amount shall be as determined by the Owner. The credit shall include the overhead and profit allocable to the deleted or changed Work unless the Owner, in its sole and exclusive discretion, determines otherwise.

SECTION 8.03 – FORM OF CHANGE ORDERS

All Change Orders shall be processed, executed and approved on AIA document G701, which is included herein and made part of the Contract Documents. No alteration to this form shall be acceptable to the Owner and no payment for Extra Work shall be due the Contractor unless it executes a Change Order on said form.

ARTICLE 9 -- TIME OF COMPLETION

SECTION 9.01 – TIME OF COMPLETION

A. The Work shall be commenced at the time stated in the Owner's written notice to proceed, and shall be completed no later than the time of completion specified in the Contract Documents. Notwithstanding anything to the contrary, a schedule submitted by the Contractor showing a time of completion earlier than that specified in the Contract shall not entitle the Contractor to any additional compensation in the event the earlier time of completion is not realized.

B. It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the time for completion of the Work, as specified in the Contract Documents, is an essential and material condition of the Contract.

C. The Contractor agrees that the Work shall be prosecuted regularly, diligently and uninterruptedly at such rate of progress as shall insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for completion of the Work described herein is a reasonable time for completion of the same.

D. If the Contractor shall neglect, fail or refuse to complete the Work within the time specified, or any proper extension thereof granted by the Owner, the Contractor agrees to pay to the Owner for loss of beneficial use of the structure an amount specified in the Contract, not as a penalty, but as liquidated damages, for each and every calendar day that the Contractor is in default. Default shall include abandonment of the Work by the Contractor.

E. Said amount of liquidated damages is agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages which the Owner would sustain for loss of beneficial use of the structure in the event of delay in completion, and said amount is agreed to be the amount of damages sustained by the Owner and said amount may be retained from time to time by the Owner.

F. It is further agreed that time is of the essence for each and every portion of the Work. In any instance in which additional time is allowed for the completion of any Work, the new time of completion established by said extension shall be of the essence. The Contractor shall not be charged with liquidated damages or any excess cost if the Owner determines that the Contractor is without fault and that the delay in completion of the Work is due:

1. to an unforeseeable cause beyond the control and without the fault of, or negligence of the Contractor, and approved by the Owner, including, but not limited to, acts of God or of public enemy, acts of the Owner, fires, epidemics, quarantine, restrictions, strikes, freight embargoes and unusually severe weather; and

2. to any delays of Subcontractors or suppliers occasioned by any of the causes specified in Subsections 1. of this paragraph.

The Contractor shall, within ten (10) days from the beginning of any such delay, notify the Owner, in writing, of the causes of the delay.

G. The time for completion can be extended only by Change Order approved by the Owner and may be extended for:

1. all of the Work, or

2. only that portion of the Work altered by the Change Order.

H. The foregoing liquidated damages are intended to compensate the Owner only for the loss of beneficial use of the structure. In addition, the Contractor shall be liable to the Owner for whatever actual damages (other than actual loss of beneficial use) the Owner may incur as a result of any actions or inactions of the Contractor or its Subcontractors including, without limitation, interest expense and carrying costs, liabilities to other Contractors working on the project or other third parties, job extension costs and other losses incurred by the Owner. The provisions of this paragraph are for the exclusive use of the Owner, and shall not accrue to other contractors or third parties.

ARTICLE 10 -- TERMINATION OR SUSPENSION

SECTION 10.01 – TERMINATION FOR CAUSE

In the event that any provision of the Contract is violated by the Contractor or by any Subcontractor, the Owner may serve written notice upon the Contractor and upon the Contractor's surety, if any, of the Owner's intention to terminate the Contract; such notice shall contain the reasons for the intention to terminate the Contract upon a date specified by the Owner. If the violation or delay shall not cease or arrangements satisfactory to the Owner shall not be made, the Contract shall terminate upon the date so specified by the Owner. In the event of any such termination, the Owner may take over the Work and prosecute same to completion by Contract or otherwise for the account and at the expense of the Contractor, and the Contractor and Contractor's surety shall be liable to the Owner for all costs occasioned the Owner thereby. In the event of such termination the Owner may take possession of and may utilize such materials, appliances and plant as may be on the Site and necessary or useful in completing the Work.

SECTION 10.02 – TERMINATION FOR CONVENIENCE OF OWNER

The Owner, at any time, may terminate the Contract in whole or in part. Any such termination shall be effected by delivering to the Contractor a notice of termination specifying the extent to which performance of Work under the Contract is terminated and the date upon which the termination becomes effective. Upon receipt of the notice of termination, the Contractor shall act promptly to minimize the expenses resulting from the termination. The Owner shall pay the Contractor for Work of the Contract performed by the Contractor and accepted by the Owner for the period extending from the date of the last approved Application for Payment up to the effective date of the termination, including retainage. In no event shall the Contractor be entitled to compensation in excess of the total consideration of the Contract. . In the event of such termination the Owner may take over the Work and prosecute the Contract to completion and may take possession of and may utilize such materials, appliances, and equipment as may be on the Site and necessary or useful in completing the Work.

SECTION 10.03 – OWNER’S RIGHT TO DO WORK

The Owner may, after notice to the Contractor, without terminating the Contract and without prejudice to any other right or remedy the Owner may have, perform or have performed by others all of the Work or any part thereof and may deduct the cost thereof from any moneys due or to become due the Contractor.

SECTION 10.04 – SUSPENSION OF WORK

A. The Owner may order the Contractor in writing to suspend, delay or interrupt performance of all or any part of the Work for a reasonable period of time as the Owner may determine. The order shall contain the reason or reasons for issuance which may include but shall not be limited to the following: latent field conditions, substantial program revisions, acquisition of rights of way or real property, financial crisis, labor disputes, civil unrest or acts of God.

B. Upon receipt of a suspension order, the Contractor shall, as soon as practicable, cease performance of the Work as ordered and take immediate affirmative measures to protect such Work from loss or damage.

C. The Contractor specifically agrees that such suspension, interruption or delay of the performance of the Work pursuant to this Article shall not increase the cost of performance of the Work of this Contract.

D. Time for completion of the Work may be extended to such time as the Owner determines shall compensate for the time lost by the suspension, interruption or delay, such determination to be set forth in writing.

ARTICLE 11 -- DISPUTES

SECTION 11.01 – CLAIMS FOR EXTRA WORK

A. If the Contractor claims that any Work which the Contractor has been ordered to perform will be Extra Work, or that any action or omission of the Owner is contrary to the terms and provisions of the Contract and will require the Contractor to perform Extra Work the Contractor shall:

1. Promptly comply with said order.

2. File with the Owner and the architect within fifteen (15) working days after being ordered to perform the Work claimed by the Contractor to be Extra Work or within fifteen (15) working days after commencing performance of the Work, whichever date shall be earlier, or within fifteen (15) working days after the said action or omission on the part of the Owner occurred, a written notice of the basis of the Contractor's claim, including estimated cost, and request for a determination thereof.

3. Proceed diligently, pending and subsequent to the determination of the Owner with respect to any said disputed matter, with the performance of the Work in accordance with all instructions of the Owner.

B. No claim for Extra Work shall be allowed unless the same was done pursuant to a written order of the Owner. The Contractor's failure to comply with any or all parts of this Article shall be deemed to be:

1. a conclusive and binding determination on the part of the Contractor that said order, Work, action or omission does not involve Extra Work and is not contrary to the terms and provisions of the Contract,

2. a waiver by the Contractor of all claims for additional compensation or damages as a result of said order, Work, action or omission.

C. The value of claims for Extra Work, if allowed, shall be determined by the methods described in the Contract.

SECTION 11.02 – CLAIMS FOR DELAY

No claims for increased costs, charges, expenses or damages of any kind shall be made by the Contractor against the Owner for any delays or hindrances from any cause whatsoever; provided that the Owner, in the Owner's discretion, may compensate the Contractor for any said delays by extending the time for completion of the Work as specified in the Contract.

SECTION 11.03 – FINALITY OF DECISIONS

A. Any decision or determination of the Architect, Owner or the Owner's Representative shall be final, binding and conclusive on the Contractor unless the Contractor shall, within ten (10) working days after said decision, make and deliver to the Owner a verified written statement of the Contractor's contention that said decision is contrary to a provision of the Contract. The Owner shall determine the validity of the Contractor's contention. Pending the decision of the Owner, the Contractor shall proceed in accordance with the original decision.

B. Wherever it is required in the Contract that an application must be made to the Owner or a determination made by the Owner, the decision of the Owner on said application or the determination of the Owner under the Contract shall be final, conclusive and binding upon the Contractor unless the Contractor, within ten (10) working days after receiving notice of the Owner's decision or determination, files a written statement with the Owner that the Contractor reserves the Contractor's rights in connection with the matters covered by said decision or determination.

ARTICLE 12 -- SUBCONTRACTS

SECTION 12.01 – SUBCONTRACTING

A. The Contractor may utilize the services of Subcontractors subject to the bid terms and conditions.

B. The Contractor shall submit to the Owner, in writing, the name of each proposed Subcontractor as required by the Contract or earlier when requested. The Owner reserves the right to disapprove any proposed Subcontractor. Such disapproval shall not result in additional cost to the Owner.

C. The Contractor shall be fully responsible for the Work, acts and omissions of Subcontractors, and of persons either directly or indirectly employed by Subcontractors.

D. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind Subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the work of Subcontractors.

E. The Contractor's use of Subcontractors shall not diminish the Contractor's obligation to complete the Work in accordance with the Contract Documents. The Contractor shall control and coordinate the work of Subcontractors.

F. Nothing contained in the Contract or any subcontract shall create any contractual relationship between Subcontractors and the Owner.

ARTICLE 13 -- CONTRACT COORDINATION AND COOPERATION

SECTION 13.01 – COOPERATION WITH OTHER CONTRACTORS

A. During the progress of the Work, other contractors may be engaged in performing work. The Contractor shall coordinate the Contractor's Work with the work of said other contractors in such a manner as the Owner may direct.

B. If the Owner shall determine that the Contractor is failing to coordinate the Work with the work of other contractors as the Owner has directed:

1. the Owner shall have the right to withhold any payments due under the Contract until the Owner's directions are complied with by the Contractor; and

2. the Contractor shall assume the defense and pay on behalf of the Owner any and all claims or judgments or damages and from any costs or damages to which the Owner may be subjected or which the Owner may suffer or incur by reason of the Contractor's failure to promptly comply with the Owner's directions.

C. If the Contractor notifies the Owner, in writing, that another contractor on the Site is failing to coordinate the work of said contractor with the Work, the Owner shall investigate the charge. If the Owner finds it to be true, the Owner shall promptly issue such directions to the other contractor with respect thereto as the situation may require. The Owner shall not be liable for any damages suffered by the Contractor by reason of the other contractor's failure to promptly comply with the directions so issued by the Owner, or by reason of another contractor's default in performance.

D. Should the Contractor sustain any damage through any act or omission of any other contractor having a contract with the Owner or through any act or omission of any Subcontractor of said other contractor, the Contractor shall have no claim against the Owner for said damage.

E. Should any other contractor having or which shall have a contract with the Owner sustain damage through any act or omission of the Contractor or through any act or omission of a Subcontractor, the Contractor shall reimburse said other contractor for all said damages and shall indemnify and hold the Owner harmless from all said claims.

F. The Owner cannot guarantee the responsibility, efficiency, unimpeded operations or performance of any Contractor. The Contractor acknowledges these conditions and shall bear the risk of all delays including, but not limited to, delays caused by the presence or operations of other contractors and delays attendant upon any construction schedule approved by the Owner and the Owner shall not incur any liability by reason of any delay.

SECTION 13.02 – SEPARATE CONTRACTS

A. The Owner may award other contracts, work under which may proceed simultaneously with the execution of the Work. The Contractor shall coordinate the Contractor's operations with those of other contractors as directed by the Owner. Cooperation shall be required in the arrangements for access, the storage of material and in the detailed execution of the Work.

B. The Contractor shall keep informed of the progress and workmanship of other contractors and any Subcontractors and shall notify the Owner in writing immediately of lack of progress or defective workmanship on the part of other contractors or subcontractors, where said delay or defective workmanship may interfere with the Contractor's operations.

C. Failure of a Contractor to keep so informed and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by the Contractor of said progress and workmanship as being satisfactory for proper coordination with the Work.

D. Where the Contractor shall perform Work in close proximity to work of other contractors or subcontractors, or where there is evidence that Work of the Contractor may interfere with work of other contractors or subcontractors, the Contractor shall assist in arranging space conditions to make satisfactory adjustment for the performance of said work and the Work. If the Contractor performs work in a manner which causes interference with the work of other contractors or subcontractors, the Contractor shall make changes necessary to correct the condition.

SECTION 13.03 – COORDINATED COMPOSITE DRAWINGS

The Contractor shall prepare coordinated composite scale reproducible drawings and sections, on reproducible paper, clearly showing how the Work of the Contractor is to be performed in relation to work of other contractors or subcontractors.

ARTICLE 14 -- PROTECTION OF RIGHTS, PERSONS AND PROPERTY

SECTION 14.01 – ACCIDENT PREVENTION

The Contractor shall, at all times, take every precaution against injuries to persons or damage to property and for the safety of persons on or about the Site or engaged in the performance of the Work.

SECTION 14.02 – SAFETY PROGRAMS

The Contractor shall be responsible for the initiation, maintenance and supervision of safety precautions and programs in connection with the Work.

SECTION 14.03 – PROTECTION OF WORK AND PROPERTY

A. The Contractor shall, at all times, guard the Owner's property from injury or loss in connection with the Work. The Contractor shall, at all times, guard and protect the Contractor's Work, and adjacent property. The Contractor shall replace or make good any said loss or injury unless said loss or injury is caused directly by the Owner.

B. The Contractor shall have full responsibility to protect and maintain all materials and supplies on and off site in proper condition and forthwith repair, replace and make good any damage thereto until construction completion. The Contractor shall maintain an inventory of all materials and supplies for the Project that are delivered to the Site or approved for off-site storage facilities.

C. The Contractor shall report any loss, theft, burglary, vandalism or damage of materials or installed work to the Owner by phone and fax as soon as it is discovered. If vandalism, theft, or burglary are suspected as the cause of the loss, the Contractor shall notify site security personnel and the municipal police. The Contractor shall also protect the place of the loss until released from protection by the Owner or the Owner's Representative. The Contractor shall insure that no potential evidence relating to the loss is removed from the place of the loss.

SECTION 14.04 – ADJOINING PROPERTY

The Contractor shall protect all adjoining property and shall repair or replace any said property damaged or destroyed during the progress of the Work.

SECTION 14.05 – RISKS ASSUMED BY THE CONTRACTOR

A. The Contractor solely assumes the following distinct and several risks whether said risks arise from acts or omissions, whether supervisory or otherwise, of the Owner, of any Subcontractor, of third persons or from any other cause, including unforeseen obstacles and difficulties which may be encountered in the execution of the Work, whether said risks are within or beyond the control of the Contractor and whether said risks involve any legal duty, primary or otherwise, imposed upon the Owner, excepting only risks which arise from faulty designs as shown by the plans and specifications or from the negligence of the Owner or the Owner's members, officers, representatives or employees that caused the loss, damage or injuries hereinafter set forth:

1. The risk of loss or damage, includes direct or indirect damage or loss, of whatever nature to the Work or to any plant, equipment, tools, materials or property furnished, used, installed or received by the Owner, the Construction Manager, the Contractor or any Subcontractor, material or workmen performing services or furnishing materials for the Work. The Contractor shall bear said risk of loss or damage until construction completion or until completion or removal of said plant, equipment, tools, materials or property from the Site and the vicinity thereof, whichever event occurs last. In the event of said loss or damage, the Contractor immediately shall repair, replace or make good any said loss or damage.

2. The risk of claims, just or unjust, by third persons against the Contractor or the Owner and the Construction Manager on account of wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising or alleged to arise out of or as a result of or in connection with the performance by the Contractor of the Work, whether actually caused by or resulting from the performance of the Work, or out of or in connection with the Contractor's operations or presence at or in the vicinity of the Site. The Contractor shall bear the risk for all deaths, injuries, damages or losses sustained or alleged to have been sustained prior to the construction completion of the Work. The Contractor shall bear the risk for all deaths, injuries, damages or losses sustained or alleged to have been sustained resulting from the Contractor's negligence or alleged negligence which is discovered, appears or is manifested after acceptance by the Owner.

3. The Contractor assumes entire responsibility and liability for any and all damage or injury of any kind or nature whatsoever, including death resulting therefrom, to all persons, whether employees of the Contractor or otherwise, and to all property, caused by, resulting from, arising out of or occurring in connection with the execution of the Work. If any person shall make said claim for any damage or injury, including death resulting therefrom, or any alleged breach of any statutory duty or obligation on the part of the Owner, the Owner's Representative, Construction Manager, servants and employees, the Contractor shall assume the defense and pay on behalf of the Owner, the Owner's Representative, the Construction Manager, servants and employees, any and all loss, expense, damage or injury that the Owner, the Owner's Representative, Construction Manager, servants and employees, may sustain as the result of any claim, provided however, the Contractor shall not be obligated to indemnify the Owner, the Owner's Representative, Construction Manager, servants and employees for their own negligence, if any. The Contractor agrees to assume, and pay on behalf of the Owner and the Owner's Representative, Construction Manager, servants and employees, the defense of any action at law or equity which may be brought against the Owner and the Owner's Representative, Construction Manager, servants and employees. The assumption of defense and liability by the Contractor includes, but is not limited to the amount of any legal fees associated with defending, all costs of investigation, expert evaluation and any other costs including any judgment or interest or penalty that may be entered against the Owner and the Owner's Representative, Construction Manager, servants and employees, in any said action.

4. The Contractor is advised that the Work required under this Contract may impose certain obligations and requirements mandated by the U.S. Department of Labor Occupational Safety and Health Administration regulations, Title 29 CFR Part 1926.62 Lead Exposure in Construction, relative to the potential exposure to lead by its employees. The Contractor assumes entire responsibility and liability for complying fully in all respects with these regulations.

B. The Contractor's obligations under this Article shall not be deemed waived, limited or discharged by the enumeration or procurement of any insurance for liability for damages. The Contractor shall notify its insurance carrier within twenty four (24) hours after receiving a notice of loss or damage or claim from the Owner.

The Contractor shall make a claim on its insurer specifically under the provisions of the contractual liability coverages and any other coverages afforded the Owner including those of being an additional insured where applicable.

C. Neither Final Acceptance of the Work nor making any payment shall release the Contractor from the Contractor's obligations under this Article. The enumeration elsewhere in the Contract of particular risks assumed by the Contractor or of particular claims for which the Contractor is responsible shall not be deemed to limit the effect of the provisions of this Article or to imply that the Contractor assumes or is responsible for only risks or claims of the type enumerated; and neither the enumeration in this Article nor the enumeration elsewhere in the Contract of particular risks assumed by the Contractor of particular claims for which the Contractor is responsible shall be deemed to limit the risks which the Contractor would assume or the claims for which the Contractor would be responsible in the absence of said enumerations.

Upon the conclusion of any action, proceeding or lawsuit, should a final binding determination of responsibility be made which allocates responsibility to the Owner, or the Owner's members, officers, employees or representatives, the Owner agrees that the obligation to indemnify and hold harmless shall not be applicable to the portion of any uninsured money judgment for which the Owner is responsible, and the Owner agrees to pay the Contractor the percentage of uninsured defense costs which the Contractor incurred based upon an apportionment of the Owner's allocated responsibility.

The Contractor agrees that any claim or costs of the Owner and/or Construction Manager arising from obligations in this Article and/or Article 15 shall be set off or deducted from payments due the Contractor.

ARTICLE 15--INSURANCE AND CONTRACT SECURITY

SECTION 15.01 – INSURANCE PROVIDED BY CONTRACTOR

A. The Contractor shall procure and maintain all of the insurance required under this Article until all Work, including punch list items, is complete.

The Contractor shall provide insurance as follows:

1. Workers' Compensation and Employers Liability Insurance

    a. Statutory Workers' Compensation (including occupational disease)

b. Employers Liability (with a minimum limit of $1,000,000) New York Statutory Endorsement

2. Commercial General Liability (CGL) with a combined single limit for Bodily Injury, Personal Injury and Property Damage of at least $2,000,000 per occurrence & aggregate. The limit may be provided through a combination of primary and umbrella/excess liability policies.

Coverage shall provide and encompass the following:

a. Written on an occurrence form;

b. Endorsement naming the following as additional insureds: The Fashion Institute of Technology, its auxiliary corporations, the State University of New York, the New York City Department of Education and the City and State of New York, the Construction Manager (if applicable) and other entities specified.

c. Policy or policies must be endorsed to be primary as respects the coverage afforded the Additional Insureds and such policy shall be primary to any other insurance maintained by the Owner. Any other insurance maintained by the Owner shall be excess of and shall not contribute with the Contractor's or Subcontractor's insurance, regardless of the "other insurance" clause contained in the Owner's own policy of insurance.

3. Commercial Automobile Liability and Property Damage Insurance covering all owned, leased, hired and non-owned vehicles used in connection with the Work with a combined single limit for Bodily Injury and Property Damage of at least $1,000,000 per occurrence. The limit may be provided through a combination of primary and umbrella/excess liability policies.

4. Umbrella/excess liability insurance with limits of:

$5,000,000 per occurrence
$5,000,000 general aggregate

B. Before commencement of Work, the Contractor shall submit to the Owner for approval two (2) Certificates of Insurance, indicating the Project. Certificates shall provide thirty (30) days' written notice prior to the cancellation, non- renewal, or material modification of any policy. Upon request, the Contractor shall furnish the Owner and the Construction Manager with certified copies of each policy. In addition, where applicable, the Contractor shall provide copies of Certificates of Insurance to the Construction Manager.

Certificates shall be forwarded to Owner in care of: Purchasing

Sammy Li
Purchasing Deputy Director
FIT Purchasing
333 Seventh Avenue, 15th Floor
New York, NY 10001

Certificate(s) of Insurance, when submitted to the Owner, constitutes a warranty by the Contractor that the insurance coverage described is in effect for the policy term shown.

Should the Contractor engage a Subcontractor, the same conditions as are applicable to the Contractor under these insurance requirements shall apply to each Subcontractor of every tier. Proof thereof shall be supplied to the Owner at the address listed above.

C. All insurance required to be procured and maintained must be procured from insurance companies licensed to do business in the State of New York and rated at least B+ by A.M. Best and Company, or meet such other requirements as are acceptable to the Owner.

D. Should the Contractor fail to provide or maintain any insurance required by this Contract, the Owner may, after providing written notice to the Contractor, purchase insurance complying with the requirements of this Article and charge back such purchase to the Contractor.

E. At any time that the coverage provisions and limits on the policies required herein do not meet the provisions and limits set forth above, the Contractor shall immediately cease Work on the Project. The Contractor shall not resume Work on the Project until authorized to do so by the Owner. Any delay or time lost as a result of the Contractor not having insurance required by this Article shall not give rise to a delay claim or any other claim against the Owner or the Client.

F. Notwithstanding any other provision in this Article, the Owner may require the Contractor to provide, at the expense of the Owner, any other form or limit of insurance necessary to secure the interests of the Owner.

G. The Contractor shall secure, pay for, and maintain Property Insurance necessary for protection against the loss of owned, borrowed or rented capital equipment and tools, including any tools owned by employees, and any tools or equipment, staging towers, and forms owned, borrowed or rented by the Contractor. The requirement to secure and maintain such insurance is solely for the benefit of the Contractor. Failure of the Contractor to secure such insurance or to maintain adequate levels of coverage shall not render the Additional Insureds or their

agents and employees responsible for any losses; and the Additional Insureds, their agents and employees shall have no such liability.

H. Neither the procurement nor the maintenance of any type of insurance by the Owner, the Contractor or the Construction Manager shall in any way be construed or deemed to limit, discharge, waive or release the Contractor from any of the obligations or risks accepted by the Contractor or to be a limitation on the nature or extent of said obligations and risks.

SECTION 15.01A – OTHER INSURANCE PROVIDED BY CONTRACTOR

Railroad Protective Liability insurance: If any Work of the Contract is to be performed on or within fifty (50) feet of a railroad property or railroad right of way or will require entrance upon railroad property or right of way or will require assignment of a railroad employee, the Contractor shall provide and maintain a Railroad Protective Liability policy with the policy limits required by the owner(s) of the railroad, including the MTA. For purposes of this paragraph, a subway is a railroad. The policy form shall be ISO-RIMA or an equivalent form approved by the owner(s) of the railroad. The railroad owner(s) shall be the named insured on the policy and the definition of "physical damage to property" shall mean direct and accidental loss of or damage to all property of any named insured and all property in any named insured's care, custody, or control. If the Contractor shall provide a Railroad Protective Liability insurance policy, the Contractor and any Subcontractor performing on or within fifty (50) feet of railroad property or railroad right of way or entering railroad property or right of way or requiring assignment of a railroad employee shall have their CGL insurance policy endorsed to delete the exclusion of coverage for Work within fifty (50) feet of railroad property.

SECTION 15.02 – GENERAL CONFORMANCE

The Contractor and Subcontractors shall not violate, or be permitted to violate, any term or condition of their insurance policies, and shall at all times satisfy the safety requirements of the Owner and of the insurance companies issuing such policies.

SECTION 15.03 – CONTRACT SECURITY

The Contractor shall furnish a surety bond in an amount at least equal to one hundred (100%) of the Contract price as security for the faithful performance of the Contract and also labor and material bond in the form set forth in the Contract in an amount at least equal to one hundred (100%) of the Contract price for the payment of all persons performing labor or providing materials in connection with the Work. The surety on said bond shall be a surety company authorized to do business in the State of New York and shall be rated at least B+ by A.M. Best and Company, or meet such other requirements as are acceptable to the Owner.

SECTION 15.04 – ADDITIONAL OR SUBSTITUTE BOND

If at any time the Owner shall become dissatisfied with any surety or sureties upon the performance bond, or the labor and material payment bond, or if for any other reason said bonds shall cease to be adequate security to the Owner, the Contractor shall, within five (5) days after notice from the Owner to do so, substitute an acceptable bond or bonds in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on said bond or bonds shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond or bonds to the Owner.

SECTION 15.05 – FAILURE TO COMPLY WITH PROVISIONS OF ARTICLE 15

The Contract may, at the sole option of the Owner, be declared void and of no effect if the Contractor fails to comply with the provisions of Article 15.

ARTICLE 16 -- USE OR OCCUPANCY PRIOR TO ACCEPTANCE BY OWNER

SECTION 16.01 – OCCUPANCY PRIOR TO ACCEPTANCE

NOT APPLICABLE

ARTICLE 17 -- PAYMENT

SECTION 17.01 – PROVISION FOR PAYMENT

A. The Owner may make a partial payment to the Contractor on the basis of an approved estimate of the Work performed during each preceding business month. The Owner shall retain ten percent (10%) of the amount of each said estimate.

The Contractor shall submit a detailed Contract Payment Breakdown prior to the Contractor's first application for payment. The model contract payment breakdown included in the Contract Documents shall establish the minimum level of detail required for the Contractor's payment breakdown. It is understood and the Contractor acknowledges that this model is included as an administrative tool for

the purpose of illustrating a format and minimum level of detail required for the Contract Payment Breakdown and shall not be considered as delineating the Contractor's Scope of Work. The Owner may request further and more detailed Contract Payment Breakdown. Further, the Owner reserves the right to accept only those cost distributions which, in the Owner's opinion, are reasonable, equitably balanced and correspond to the estimated quantities in the Contract Documents.

No payment shall be made by the Owner until the Contract Payment Breakdown is approved by the Owner.

Each monthly partial payment requisition must include Affirmative Action Form AAP 7.0, Contractor's Compliance Report, properly executed, as a condition precedent to requisition payment by the Owner.

B. In preparing estimates for partial payment, material delivered to the Site and properly stored and secured at the Site, and Material approved to be stored off-site under such conditions as the Owner shall prescribe may be taken into consideration. All costs related to the storage of materials are the sole responsibility of the Contractor.

The Owner will provide an Agreement for Materials Stored Off-Site and specific forms which the Contractor must complete and submit with any request for approval of partial payment for such material. Required information includes but is not limited to: a general description of the material; a detailed list of the materials; a pre-approved storage area; segregation and identification of the material; insurance covering full value against all risks of loss or damage, with non-cancellation provision; immediate replacement agreement in event of loss or damage; agreement to pay the expense of all inspections of the material; ownership provisions; delivery guarantee; project completion statement; bill of sale, releases, and inventory.

C. Any partial payment made shall not be construed as a waiver of the right of the Owner to require the fulfillment of all the terms of the Contract.

D. After the Owner has determined Substantial Completion of the Work, the Contractor shall submit to the Owner, for the Owner's approval, a detailed estimate of the value of the known remaining items of Work as set forth by the Owner and a schedule of completion for said items of Work. The Owner shall review that estimate and make the final determination.

The Owner, when all the Work is substantially complete, shall pay to the Contractor the balance due the Contractor pursuant to the Contract, less:

1. two (2) times the value of any remaining items of Work to be completed or corrected; and

2. an amount necessary to satisfy any and all claims, liens or judgments against the Contractor.

As the remaining items of Work are completed and accepted by the Owner, the

Owner shall pay the appropriate amount pursuant to the duly completed and submitted monthly requisitions.

The list of remaining Work items may be expanded to include additional items of corrective or completion Work until final acceptance as certified by the Owner's execution of "Notification of Construction Completion". Appropriate payments may be withheld to cover the value of these items pursuant to this Section.

E. All Monthly Requisitions submitted by the Contractor shall be on AIA documents G702 and G703. The Contractor shall furnish such affidavits, vouchers and receipts as to delivery and payment for materials as required by the Owner to substantiate each and every payment requested. The Contractor and its Subcontractors will submit with all applications for payment copies of the certified payrolls and certification of payment of wage supplements in a form satisfactory to the Owner. The submission of Contractor and Subcontractor certified payrolls is required at least monthly. No progress payments will be processed without submission by the Contractor of properly executed Affidavit of Payment and Release of Liens (AIA Documents G706 and G706A)."

Section 17.02 - Acceptance of the First Payment Pursuant to Section 17.01 D. of the Contract Constitutes Release

The acceptance by the Contractor of the first payment pursuant to Section 17.01 D. shall be and shall operate as a release to the Owner of all claims by and all liability to the Contractor for all things in connection with the Work and for every act and neglect of the Owner and others relating to or arising out of the Work. No payment, final or otherwise, shall operate to release the Contractor or the Contractor's sureties from any obligations under this Contract or the performance or labor and material payment bonds.

SECTION 17.03 – RELEASE AND CONSENT OF SURETY

Notwithstanding any other provision of the Contract Documents to the contrary, the first payment pursuant to Section 17.01 D. shall not become due until the Contractor submits to the Owner a General Release and a Consent of Surety to said payment pursuant to Section 17.01 D., both in form and content acceptable to the Owner.

SECTION 17.04 - LIENS

Upon the Owner's receipt of a lien, a sum which shall be one and one-half (1 1/2) times the amount stated to be due in the notice of lien shall be deducted from the current payment due the Contractor. This sum shall be withheld until the lien is discharged.

SECTION 17.05 – WITHHOLDING OF PAYMENTS

A. The Owner may withhold from the Contractor any part of any payment as may, in the judgment of the Owner, be necessary:

1. to assure payment of just claims of any persons supplying labor or materials for the Work;

2. to protect the Owner from loss due to defective Work not remedied; or

3. to protect the Owner, Construction Manager or Consultant from loss due to failure to defend, loss due to injury to persons or damage to the Work or property of other contractors, Subcontractors or others caused by the act or neglect of the Contractor or Subcontractors.

4. to assure payment of fines and penalties which may be imposed on the Contractor pursuant to the provisions of this Contract.

B. The Owner shall have the right to apply any such amounts so withheld, in such manner as the Owner may deem proper to satisfy said claims, fines and penalties or to secure said protection. Said application of the money shall be deemed payments for the account of the Contractor.

C. The provisions of this Article 17 are solely for the benefit of the Owner, and any action or non-action hereunder by the Owner shall not give rise to any liability on the part of the Owner.

SECTION 17.06 – OWNER'S RIGHT TO AUDIT AND INSPECTION OF RECORDS

The Contractor shall maintain and keep, for a period of at least six (6) years after the date of final payment, all records and other data relating to the Work, including records of Subcontractors and material suppliers. The Owner or the Owner's Representative shall have the right to inspect and audit all records and other data of the Contractor, Subcontractors and material suppliers relating to the Work.

SECTION 17.07 – FALSE STATEMENTS/INFORMATION

A. False statements, information or data submitted on or with applications for payment may result in one or more of the following actions:

1. Termination of the Contract for cause;
2. Disapproval of future bids or contracts and sub-contracts;
3. Withholding of final payment on the Contract; and
4. Civil and/or criminal prosecution.

B. These provisions are solely for the benefit of the Owner, and any action or non-action hereunder by the Owner shall not give rise to any liability on the part of the Owner.

ARTICLE 18 -- TAX EXEMPTION

SECTION 18.01 – TAX EXEMPTION

A. The Owner is exempt from payment of Federal, State, local taxes and sales and compensating use taxes of the State of New York and of cities and counties on all materials and supplies incorporated into the completed Work. These taxes are not to be included in bids. This exception does not apply to tools, machinery, equipment or other property leased by or to the Contractor or a Subcontractor, or to supplies and materials which, even though they are consumed, are not incorporated into the completed Work, and the Contractor and Subcontractors shall be responsible for and pay any and all applicable taxes, including sales and compensating use taxes, on said leased tools, machinery, equipment or other property and upon all said unincorporated supplies and materials.

B. The Contractor and Subcontractors shall obtain any and all necessary certificates or other documentation from the appropriate governmental agency or agencies, and use said certificates or other documentation as required by law, rule or regulation.

ARTICLE 19 -- GUARANTEE

SECTION 19.01 - GUARANTEE

The Contractor shall in all respects guarantee the Work to the Owner and be responsible for all material, equipment and workmanship of the Work. The Contractor shall forthwith repair, replace or remedy in a manner approved by the Owner, any said material, equipment, workmanship, or other part of the Work found by the Owner to be defective or otherwise faulty and not acceptable to the Owner, which defect or fault appears during the minimum period of one (1) year, or such longer period as may be prescribed by the Contract, from the date of Construction Completion or any part thereof, by the Owner. The Contractor shall also pay for any damage to the Work resulting from said defect or fault.

ARTICLE 20 -- STANDARD PROVISIONS

SECTION 20.01 – PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in the Contract shall be deemed to be inserted therein and the Contract shall read and shall be enforced as though so included therein.

SECTION 20.02 – COMPLIANCE WITH LAWS, RULES AND REGULATIONS

The Contractor shall comply fully with all applicable laws, rules and regulations.

SECTION 20.03 – LAW GOVERNING THE CONTRACT

The Contract shall be governed by the laws of the state of New York.

SECTION 20.04 - ASSIGNMENT

The Contractor shall not assign the Contract in whole or in part without prior written consent of the Owner. If the Contractor assigns all or part of any moneys due or to become due under the Contract, the instrument of assignment shall contain a clause substantially to the effect that the Contractor and assignee agree that the assignee's right in and to any moneys due or to become due to the Contractor shall be subject to all prior claims for services rendered or materials supplied in connection with the performance of the Work.

SECTION 20.05 – NO THIRD PARTY RIGHTS

Nothing in the Contract shall create or shall give to third parties any claim or right of action against the Owner, the Fashion Institute of Technology, the State University of New York, Board of Education of the City of New York, the City or State of New York and the Construction Manager beyond such as may legally exist irrespective of the Contract.

SECTION 20.06 – CONTRACT DEEMED EXECUTORY

The Contractor agrees that the Contract shall be deemed executory to the extent of moneys available and that no liability shall be incurred by the Owner beyond the moneys available therefore.

SECTION 20.07 – ANTI-RIOT PROVISIONS

A. The Contractor agrees that no part of the Contract funds shall be used to make payments, give assistance, or supply services, in any form, to any individual convicted in any Federal, State or local court of competent jurisdiction for inciting, promoting, or carrying on a riot or engaging in any group activity resulting in material damage to property or injury to persons found to be in violation of Federal, State or local laws designed to protect persons or property.

B. The Contractor and each Subcontractor shall notify their employees of all rules and

regulations adopted pursuant to Article 129-A of the Education Law of the State of New York. Notices containing the text of the aforementioned rules and regulations shall be posted by the Contractor at the Site.

SECTION 20.08 – DOMESTIC STEEL

The Contractor agrees, that if the value of this contract exceeds $100,000 all structural steel, reinforcing steel and other major steel items to be incorporated in the Work of this Contract shall be produced and made in whole or substantial part in the United States, its territories or possessions.

SECTION 20.09 – PROTECTION OF LIVES AND HEALTH

A. Each Contractor and Subcontractor shall comply with all applicable provisions of the laws of the State of New York, the United States of America and with all applicable rules and regulations adopted or promulgated by agencies or municipalities of the State of New York or the United States of America. The Contractor's and Subcontractor's attention is specifically called to the applicable rules and regulations, codes and bulletins of the New York State Department of Labor and to the standards imposed under the Federal Occupational Safety and Health Act of 1970, as amended.

B. The Contractor shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment of Work under the Contract, and shall immediately notify the Owner in writing of any injury which results in hospitalization or death. The Contractor shall provide to the Owner a copy of Form C-2, Employers Report of Injury/Illness within twenty- four (24) hours of any job related injury on the Owner's job site. Further, a copy of the OSHA Log of Injury and Illness shall also be provided to the Owner for any reporting period in which a job related injury or illness is recorded. The Contractor shall also provide a list of witnesses to the Owner. The list shall include at least the full name, home address, occupation and telephone number of each person who saw or has knowledge of the incident which caused the injury or illness.

C. The Contractor alone shall be responsible for the safety, efficiency and adequacy of the Contractor's Work, plant, appliances and methods, and for any damage which may result from the failure or the improper construction, maintenance or operation of such Work, plant, appliances and methods.

D. If, in the performance of the Work, a harmful hazard is created for which appliances or methods of elimination have been approved by regulatory authorities, the Contractor shall install, maintain and operate said appliances or methods.

E. The Owner may impose a payment penalty on the Contractor for any act of non-compliance with this section. The payment penalty shall not exceed one twentieth

(1/20) of the Contract price or a maximum of One Thousand Dollars ($1,000.00) for each time the Contractor fails to perform or to provide the information, reports or forms required in this section. This payment penalty is not exclusive, the Owner may avail itself of any other contractual remedy available.

F. The Owner, Owner's Representative, or Architect may inspect the Site at any time without notice to the Contractor. If the Owner or its representatives find that the Contractor is not complying with Section 20.10 A or any other provision of Section 20.10, the Owner may send written notice to the Contractor to correct any deficiency. Upon re-inspection, if the Owner finds the deficiencies have not been corrected, or in instances where a safety violation (s) must be corrected before Work continues and the Contractor is given three (3) hours to make correction (s) and they are not made, the Owner may let a separate contract to correct any deficiencies and back charge the cost of the separate contract to the Contractor at a premium rate. The Contractor cannot pass these additional charges on to the Owner. No action taken under this section shall be deemed as a basis for any delay claim or any other claim against the Owner by the Contractor.

G. The Contractor shall preserve and safeguard the scene of an accident involving a ladder, scaffold, mobile machinery, equipment, safety railing or uncovered floor opening or any other incident where the injured person required emergency medical treatment. The Contractor shall "tape off" the area, and not allow any material object or property to be altered, changed, moved or removed from the accident site. In addition to "taping off" the accident site, the Contractor shall telephone and send a facsimile or email to Owner immediately, and post a person at the accident site to protect it. Safeguarding and protecting the accident site shall only be abandoned by the Contractor upon release by the Owner or the Owner's Representative. Failure of the Contractor to comply with the provisions of this paragraph shall be deemed a breach of this Contract. In addition to any other contractual remedies available, the Owner may satisfy the breach by imposing the penalties set out in paragraph 20.10 E or void the entire Contract and retain any or all amounts due the Contractor under this Contract.

SECTION 20.10 – PROHIBITED INTERESTS / ETHICAL CONDUCT

A. No officer, employee, architect, attorney, engineer, inspector or consultant of or for the Owner authorized on behalf of the Owner to exercise any legislative, executive, administrative, supervisory or other similar functions in connection with the Contract or the Work, shall become personally interested, directly or indirectly, in the Contract, material supply contract, subcontract, insurance contract, or any other contract pertaining to the Work.

B. The Owner strongly discourages the Contractor from offering or giving anything of value to employees of the Owner under circumstances which may constitute, or even suggest, impropriety. Contractor, or its agents, shall not directly or indirectly offer or give any gift whether in the form of money, service, loan, travel, lodging, meals, refreshments, entertainment, discount, forbearance or promise, or in any other form, to an employee or any representatives of the Owner.

C. To promote a working relationship with the Owner based on ethical business practices, the Contractor shall:

- furnish all goods, materials and services to the Owner as contractually required and specified,
- submit complete and accurate reports to the Owner and its representatives as required,
- not seek, solicit, demand or accept any information, verbal or written, from the Owner or its representatives that provides an unfair advantage over a competitor,
- not engage in any activity or course of conduct that restricts open and fair competition on Owner-related projects and transactions,
- not engage in any course of conduct with Owner employees or its representatives that constitutes a conflict of interest, in fact or in appearance, and
- not offer or give any unlawful gifts or gratuities, or engage in bribery or other criminal activity.

D. The Owner encourages the Contractor to advance and support ethical business conduct and practices among its directors, officers and employees, through the adoption of corporate ethics awareness training programs and written codes of conduct.

E. Although the Contractor may employ relatives of Owner's employees, the Owner must be made aware of such circumstances as soon as possible, in writing, to ensure a conflict of interest situation does not arise. The Owner reserves the right to request that the Contractor modify the work assignment of a relative of an Owner's

employee or representative where a conflict of interest, or the appearance thereof, is deemed to exist.

F. The Contractor may hire former employees of the Owner. However, as a general rule, former employees of the Owner may neither appear nor practice before the Owner, nor receive compensation for services rendered on a matter before the Owner, for a period of *two (2) years* following their separation from service with the Owner. In addition, former employees of the Owner are subject to a *"lifetime bar"* from appearing before the Owner or receiving compensation for services regarding any transaction in which they personally participated or which was under their active consideration during their tenure with the Owner.

G. The Contractor agrees to notify Stephen Tuttle, Esq., the Owner's attorney, at (212) 217-4030 of any activity by an employee of the Owner that is inconsistent with the contents of this Section.

H. Any violation of these provisions shall justify termination of this Contract and may result in Owner's rejection of the Contractor's bids or proposals for future contracts.

SECTION 20.11 – STATE AND FEDERAL LABOR LAW PROVISIONS

A. Although the Work of this Contract is not public work, the Owner intends that all applicable provisions of the Labor Law of the State of New York shall be carried out in the performance of the Work.

B. The Contractor specifically agrees to comply with Labor Law, Sections 220 and 220-d as amended, that:

1. no laborer, workman or mechanic, in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or any part of the Work contemplated by the Contract shall be permitted or required to work more than eight (8) hours in any one (1) calendar day and more than five (5) days in any one week, except in the extraordinary emergencies set forth in the Labor Law;

2. the wages paid for a legal day's work shall be not less than the prevailing rate of wages as defined by law;

3. the minimum hourly rate of wage to be paid and supplement provided shall be not less than that stated in the Contract and as shall be designated by the Industrial Commissioner of the State of New York; and

4. the Contractor and every Subcontractor shall post in a prominent and accessible place on the Site, a legible statement of all minimum wage rates and supplements to be paid or provided for the various classes of laborers and mechanics to be engaged in the Work and all deductions, if any,

required by law to be made from unpaid wages actually earned by the laborers and mechanics so engaged.

C. The minimum wage rates, if any, herein specified for apprentices shall apply only to persons working with the tools of the trade which such persons are learning under the direct supervision of journeyman mechanics. Except as otherwise required by law, the number of apprentices in each trade or occupation employed by the Contractor or any Subcontractor shall not exceed the number permitted by the applicable standards of the New York State Department of Labor, or, in the absence of such standards, the number permitted under the usual practice prevailing between the unions and the employers' association of the respective trades or occupations.

D. All employees of the Contractor and each Subcontractor shall be paid in accordance with the provisions of the Labor Law. Certified payroll copies shall be provided to the Owner as specified in these General Conditions and otherwise upon request.

E. The Contractor agrees that, in case of underpayment of wages to any worker engaged in the Work by the Contractor or any Subcontractor, the Owner shall withhold from the Contractor out of payments due an amount sufficient to pay such worker the difference between the wages required to be paid under the Contract and the wages actually paid such worker for the total number of hours worked, and that the Owner may disburse such amount so withheld by the Owner for and on account of the Contractor to the employee to whom such amount is due. The Contractor further agrees that the amount to be withheld pursuant to this paragraph may be in addition to the percentages to be retained by the Owner pursuant to other provisions of the Contract.

F. Pursuant to subdivision 3 of section 220 and section 220-d of the Labor Law the Contract shall be forfeited and no sum paid for any Work done thereunder upon a Contractor's or Subcontractor's second conviction for willfully paying or providing less than:

1. the stipulated wage scale or supplement as established by the fiscal officer, or
2. less than the stipulated minimum hourly wage scale as designated by the Industrial Commissioner.

G. Pursuant Labor Law, Section 220-e, the Contractor specifically agrees:

1. That in the hiring of employees for the performance of Work under the Contract or any subcontract hereunder, or for the manufacture, sale or distribution of materials, equipment or supplies hereunder, but limited to operation performed within the territorial limits of the State of New York, no Contractor, Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the Work to which the employment relates;

2. That no Contractor, Subcontractor, nor any person on behalf of such Contractor or Subcontractor shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under the Contract on account of race, creed, color, disability, sex or national origin;

3. That there may be deducted from the amount payable to the Contractor, by the Owner under the Contract, a penalty of fifty dollars ($50.00) for each person for each calendar day during which such person was discriminated against or intimidated in violation of the terms of the Contract; and

4. That the Contract may be canceled or terminated by the Owner and all moneys due or to become due hereunder may be forfeited for a second or any subsequent violation of the terms or conditions of this section of the Contract, or when one final determination involves the falsification of payroll records or the kickback of wages and/or supplements.

H. The Contractor specifically agrees:

1. That the Contractor shall certify its payrolls and keep these certified records on site and available, and provide copies to the Owner upon request.

2. That the Contractor shall provide each worker with a written notice informing the worker of the prevailing wage requirements for the job. The notice shall contain a simple statement or declaration for the worker's

SECTION 20.12 - NONDISCRIMINATION

During the performance of the Work, the Contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, religion/creed, color, sex, sexual orientation, gender, gender identity/expression, national origin, age, disability, marital status, or any other protected category.

B. If directed to do so by the Commissioner of Human Rights, the Contractor will send to each labor union or representative of workers with which the Contractor has or is bound by a collective bargaining or other agreement or understanding, a notice, to be provided by the State Commissioner of Human Rights, advising such labor union or representative of the Contractor's agreement under clauses A through G (hereinafter called "non-discrimination clauses"). If the Contractor was directed to do so by the Owner as part of the bid or negotiation of this Contract, the Contractor shall request such labor union or representative to furnish a written statement that such labor union or representative will not discriminate because of race, creed, color, sex, national origin, age, disability or marital status, and that such labor union or representative will cooperate, within the limits of its legal and contractual authority, in the implementation of the policy and provisions of these nondiscrimination clauses and that it consents and agrees that recruitment, employment and the terms and conditions of employment under this Contract shall be in accordance with the purposes and provisions of these nondiscrimination clauses. If such labor union or representative fails or refuses to comply with such a request that it furnish such a statement, the Contractor shall promptly notify the State Commissioner of Human Rights of such failure or refusal.

C. If directed to do so by the Commissioner of Human Rights, the Contractor shall post and keep posted in conspicuous places, available to employees and applicants for employment, notices to be provided by the State Commissioner of Human Rights setting forth the substance of the provisions of clauses A and B and such provisions of the State's laws against discrimination as the State Commissioner of Human Rights shall determine.

D. The Contractor shall state, in all solicitations or advertisement for employees placed by or on behalf of the Contractor, that all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, sex, national origin, age, disability or marital status.

E. The Contractor shall comply with the provisions of Section 290-299 of the Executive Law and with the Civil Rights Law, will furnish all information and reports deemed necessary by the State Commissioner of Human Rights under these nondiscriminatory clauses and such sections of the Executive Law, and will permit access to the Contractor's books, records and accounts by the State Commissioner for the purposes of investigation to ascertain compliance with these nondiscrimination clauses and such sections of the Executive Law and Civil Rights Law.

F. This Contract may be forthwith canceled, terminated or suspended, in whole or in part, by the Owner upon the basis of a finding made by the State Commissioner of Human Rights that the Contractor has not complied with these nondiscrimination clauses, and the Contractor may be declared ineligible for future contracts made by or on behalf of the State or a public authority or agency of the State, until the Contractor satisfies the State Commissioner of Human Rights that the Contractor has established and is carrying out a program in conformity with the provisions of these nondiscrimination clauses. Such finding shall be made by the State Commissioner of Human Rights after conciliation efforts by the Commissioner have failed to achieve compliance with these nondiscrimination clauses and after a verified complaint has been filed with the Commissioner, notice thereof has been given to the Contractor and an opportunity has been afforded the Contractor to be heard publicly in accordance with the Executive Law. Such sanctions may be imposed and remedies invoked independently of or in addition to sanctions and remedies otherwise provided by law.

G. The Contractor shall include the provisions of clauses A through F above in every subcontractor purchase order in such a manner that such provisions will be binding upon each Subcontractor or vendor as to operation to be performed within the State of New York. The Contractor shall take such action in enforcing such provisions of such Subcontract or purchase order as the State Commissioner of Human Rights or the Owner may direct, including sanctions or remedies for noncompliance. If the Contractor becomes involved in or is threatened with litigation with a Subcontractor or vendor as a result of such direction by the State Commissioner of Human Rights or the Owner, the Contractor shall promptly so notify the Attorney General, requesting the Attorney General to intervene and to protect the interests of the State of New York.

SECTION 20.13 – LIMITATION ON ACTIONS

No action or proceeding shall lie in favor of or shall be maintained by the Contractor against the Owner unless such action shall be commenced within six (6) months after receipt by the Owner of the Contractor's final requisition or, if the Contract is terminated by the Owner, unless such action is commenced within six (6) months after the date of such termination.

SECTION 20.14 – WAIVER OF REMEDIES

Inasmuch as the Contractor can be compensated adequately by money damages for any breach of the Contract which may be committed by the Owner, the Contractor agrees that no default, act or omission of the Owner shall constitute a material breach of Contract entitling the Contractor to cancel or rescind the same or to suspend or abandon performance thereof; and the Contractor hereby waives any and all rights and remedies to which the Contractor might otherwise be or become entitled to because of any wrongful act or omission of the Owner saving only the Contractor's right to money damages.

SECTION 20.15 – WAIVER OF CERTAIN CAUSES OF ACTION

No action or proceeding shall lie or shall be maintained by the Contractor, nor anyone claiming under or through the Contractor, against the Owner upon any claim arising out of or based upon the Contract, relating to the giving of notices or information.

SECTION 20.16 – CONTRACTOR RELATIONSHIP

The relationship created by the Contract between the Owner and the Contractor is one of an independent contractor and it is no way to be construed as creating an agency relationship between the Owner and the Contractor nor is it to be construed as, in any way or under any circumstances, creating or appointing the Contractor as an agent of the Owner for any purpose whatsoever.

SECTION 20.17 – FAILURE TO COMPLY WITH THIS ARTICLE

The Contract shall be void and of no effect unless the Contractor complies with the provisions of this Article 20.

SECTION 20.18 – YEAR 2000 WARRANTY

SECTION DELETED

SECTION 20.19 – FALSE RECORDS/KICKBACKS

The Contractor agrees that this Contract may be canceled or terminated for cause by the Owner and all moneys due or to become due hereunder may be forfeited upon the Owner's determination that the Contractor has submitted false records to the Owner and/or that the Contractor has participated in the kickback of wages. Said determination by the Owner must first allow the Contractor an opportunity to show why its Contract should not be canceled or terminated for cause for said actions.

ARTICLE 21- COOPERATION WITH INVESTIGATIONS

The Contractor agrees to cooperate fully and faithfully with any investigation, audit or inquiry conducted by the Owner or any other duly authorized representative of the Owner ("Representative").

The Contractor shall grant the Owner or the Representative the right to examine all books, records, files, accounts, computer records, documents and correspondence, including electronically-stored information, in the possession or control of the Contractor, its subsidiaries and affiliated companies and any other company directly or indirectly controlled by the Contractor, relating to the Contract. These shall include, but not be limited to: Subcontracts; bid files; payroll and personnel records; cancelled checks; correspondence; memoranda; reports; audits; vendor qualification records; original estimate files; change order/amendment estimate files; detailed worksheets; Subcontractor, consultant and supplier proposals for both successful and unsuccessful bids; back-charge logs; any records detailing cash, trade, or volume discounts earned; insurance proceeds, rebates or dividends received; payroll and personnel records; tax returns, and the supporting documentation for the aforesaid books and records.

At the Owner's or the Representative's request, said materials shall be provided in a computer readable format, where available. At the request of the Owner or the Representative, the Contractor shall execute such documents, if any, as are necessary to give the Owner or the Representative access to Contract-related books, documents or records which are, in whole or part, under control of the Contractor but not currently in the Contractor's physical possession. The Contractor shall not enter into any agreement with a Subcontractor, consultant or supplier, in connection with the Contract, that does not contain a right to audit clause in favor of the Owner. The Contractor shall assist the Owner or the Representative in obtaining access to past and present Subcontractor, consultant and supplier amendment/change order files (including detailed documentation covering negotiated settlements), accounts, computer records, documents, correspondence, and any other books and records in the possession of Subcontractors, consultants and suppliers pertaining to the Contract, and, if appropriate, enforce the right-to-audit provisions of such agreements.

The Contractor shall assist the Owner or the Representative in obtaining access to, interviews with, and information from all former and current persons employed and/or retained by the Contractor, for purposes of the Contract.

The Contractor shall require each Subcontractor to include in all agreements that the

Subcontractor may hereinafter enter into with any and all Subcontractors, consultants and suppliers, in connection with the Contract, a right-to-audit clause in favor of the Owner conferring rights and powers of the type outlined in this section. The Contractor shall not enter into any Subcontract with a Subcontractor in connection with the Contract that does not contain such a provision.

The Contractor shall not make any payments to a Subcontractor, consultant or supplier from whom the Contractor has failed to obtain and supply to the Owner or the Representative complete, accurate and truthful information in compliance with a request from the Owner or the Representative to the Contractor.

Any violation of the provisions of this Article shall justify termination of this Contract and may result in the Owner's rejection of the Contractor's bids or proposals for future contracts.

SECTION VI.
LABOR & MATERIAL PAYMENT BOND

LABOR & MATERIAL PAYMENT BOND

KNOW ALL BY THESE PRESENTS:

That_____
(Here insert the name and address or legal title of the Contractor)

_____

as Principal, hereinafter called Principal, and _____

_____
(Here insert the legal title of Surety)

_____
(Address)

as Surety, hereinafter called Surety, are held and firmly bound unto The Fashion Institute of Technology, as applicable, as Obligee, hereinafter called Owner, for the use and benefit of the claimants as hereinbelow defined, in the amount of _____

_____and /100 Dollars ($_____)

WHEREAS, Principal has by written agreement dated _____

entered into a Contract with Owner for _____

_____

in accordance with the Contract Documents and any changes thereto, which are made a part hereof, and are hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise such obligation shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct Contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full

before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

   a. Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two (2) of the following: 1) the Principal, 2) the Owner, or 3) the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner, or Surety, at any place where an office is regularly maintained by said Principal, Owner, or Surety for the transaction of business, or served in any manner in which legal process may be served in the State in which the aforesaid project is located, save that such service need not be made by a public officer.

   b. After the expiration of one (1) year following the date on which Principal ceased work of said Contract, however, if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

   c. Other than in a State court of competent jurisdiction in and for the county or other political subdivision of the State in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.

4. The penal sum of this Bond is in addition to any other Bond furnished by the Contractor and in no way shall be impaired or affected by any other Bond.

5. The amount of this Bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of Mechanics' Liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this Bond.

Signed this_____day of_____20__.

IN THE PRESENCE OF:

_____	_____
(Principal)	(Surety)
_____	_____
(Signature)	(Signature)
_____	_____
(Print Name and Title)	(Print Name and Title)
_____	_____
(Address)	(Address)
_____	_____
(City, State, Zip)	(City, State, Zip)

Telephone (____)_____

Fax No. _____

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

STATE OF_____) ss:

COUNTY OF_____)

On the_____day of_____in the year 20__, before me personally came_____to me known, who, being by me duly sworn, did depose and say that (s)he resides at_____, that (s)he is the _____ of_____, the corporation described in and which executed the above instrument; and that (s)he signed her/his name thereto by order of the Board of Directors of said corporation.

_____

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

STATE OF_____)ss:

COUNTY OF_____)

On the_____ day of_____ in the year 20__, before me personally came

_____, to me known and known to me to be a member of the firm_____, described in and who executed the foregoing instrument, and (s)he duly acknowledged to me that (s)he executed the same for and in behalf of said firm for the uses and purpose mentioned therein.

_____
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

STATE OF_____) ss:

COUNTY OF_____)

On the_____day of_____in the year 20__, before me personally came _____, to me known and known to me to be the person described in and who executed the foregoing instrument and (s)he duly acknowledged that (s)he executed the same.

_____
Notary Public

ACKNOWLEDGEMENT OF SURETY

STATE OF NEW YORK)

COUNTY OF_____) ss:

On the_____day of_____in the year 20__, before me personally came _____ to me known, who, being by me duly sworn, did depose and say that (s)he resides at _____ _____, that (s)he is the _____of_____, the corporation described in and which executed the above instrument; and that (s)he signed her/his name thereto by order of the Board of Directors of said corporation.

_____
Notary Public

SECTION VII.
PERFORMANCE BOND

PERFORMANCE BOND

KNOW ALL BY THESE PRESENTS:

That_____
(Here insert the name and address or legal title of the Contractor)

_____

as Principal, hereinafter called Principal, and _____

_____
(Here insert the legal title of Surety)

_____
(Address)

as Surety, hereinafter called Surety, are held and firmly bound unto The Fashion Institute of Technology, as applicable, as Obligee, hereinafter called Owner, in the amount of _____ _____and _____ /100 Dollars ($_____) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement dated _____

entered into a Contract with Owner for _____

_____

in accordance with the Contract Documents and any changes thereto, which are made a part hereof, and are hereinafter referred to as the Contract.

1. If the Contractor performs the Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Subparagraph 2.1.

2. If there is no Owner default, the Surety's obligation under this Bond shall arise after:

2.1 The Owner has notified the Contractor, the Surety at its address described in Paragraph 8. below that the Owner is considering declaring a Contractor in default.

2.2 The Owner has declared a Contractor in default and formally terminated the Contractor's right to complete the Contract.

2.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Contract or to a Contractor selected to perform the Contract in accordance with the terms of the Contract with the Owner.

3. When the Owner has satisfied the conditions of Paragraph 2 herein., the Surety shall, at the Owner's option, promptly and at the Surety's expense take on the following actions:

3.1 Arrange for the Contractor, with consent of the Owner, to perform and complete the Contract; or

3.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

3.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the Owner and the Contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified Surety equivalent to the bonds issued on the Contract, and pay to the Owner the amount of damages as described in Paragraph 5. in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor default.

4. If the Surety does not proceed with reasonable promptness, the Surety shall be deemed to be in default on this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

5. After the Owner has terminated the Contractor's right to complete the Contract, and if the Surety elects to act under Subparagraph 3.1, 3.2, or 3.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

5.1 The responsibilities of the Contractor for correction of defective work and completion of the Contract;

5.2 Additional legal, design, professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 3.; and

5.3 Liquidated Damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the Contractor. 3

6. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators or successors.

7. The Surety hereby waives notice of any change, including changes of time, to the Contract

or to related subcontracts, purchase orders, and other obligations.

8. Notice of the Surety and the Contractor shall be mailed or delivered to the address shown on the signature page. Notice to the Owner shall be mailed or delivered to the address shown in the preamble.

9. Definitions:

9.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Contract.

9.2 Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

9.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

9.4 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

The penal sum of this Bond is in addition to any other Bond furnished by the Contractor and in no way shall be impaired or affected by any other Bond.

Any suit under this Bond must be instituted before the expiration of two (2) years from the date on which Final Payment is made under this Contract.

Signed this_____day of_____20__.

IN THE PRESENCE OF:

_____	_____
(Principal)	(Surety)
_____	_____
(Signature)	(Signature)
_____	_____
(Print Name and Title)	(Print Name and Title)

_____ (Address)

_____ (City, State, Zip)

_____ (Address)

_____ (City, State, Zip)

Telephone (____)_____

Fax No. _____

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

STATE OF_____) ss:

COUNTY OF_____)

On the_____ day of_____ in the year 20__, before me personally came

_____ to me known, who, being by me duly sworn, did depose and say that (s)he resides at_____, that (s)he is the_____of _____, the corporation described in and which executed the above instrument; and that (s)he signed her/his name thereto by order of the Board of Directors of said corporation.

_____
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

STATE OF_____)ss:

COUNTY OF_____)

On the_____ day of_____ in the year 20__, before me personally came

_____, to me known and known to me to be a member of the firm _____, described in and who executed the foregoing instrument, and (s)he duly acknowledged to me that (s)he executed the same for and in behalf of said firm for the uses and purpose mentioned therein.

_____
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

STATE OF_____) ss:

COUNTY OF_____)

On the _____ day of _____ in the year 20_, before me personally

came_____, to me known and known to me to be the person described in and who executed the foregoing instrument and (s)he duly acknowledged that (s)he executed the same.

_____

Notary Public

ACKNOWLEDGEMENT OF SURETY

STATE OF NEW YORK)

COUNTY OF_____) ss:

On the _____ day of_____ in the year 20_, before me personally came

_____ to me known, who, being by me duly sworn, did depose and say that (s)he resides at _____

_____, that (s)he is the_____ of_____, the corporation described in and which executed the above instrument; and that (s)he signed her/his name thereto by order of the Board of Directors of said corporation.

_____

Notary Public

SECTION VIII.
FORM OF BID

FORM OF BID

(Contract for Total of All Materials and Labor)

The Fashion Institute of Technology
(Owner)

For:

The Fashion Institute of Technology is requesting Bids for the Work described in Section II. Bid Terms and Conditions, II. Summary of Scope of Work and as shown and described on the drawings and specifications provided with this document at the Fashion Institute of Technology's "_____" located on 27th street campus. To be known from this point forward as the "_____"

Pursuant to and in compliance with the Owner's advertisement for bids dated_____, 201 and the Contract Documents relating hereto, the undersigned hereby offers to provide all plant, labor, materials, supplies, equipment, and other facilities and things necessary or proper for or incidental to, the General Contracting and Electrical Work as required by, and in strict accordance with, the applicable provisions of the Contract Documents, as defined in the General Conditions, including changes thereto, and all of the addenda issued by the Owner and sent to the undersigned by facsimile transmission or delivered to the bidder prior to the date of opening of bids, whether received by the undersigned or not, for the total sum of

_____Dollars

($_____).

The Bid may be withdrawn at any time prior to the scheduled time for the opening of bids or any authorized postponement thereof.

If written notice of the acceptance of the Bid is sent to the undersigned by certified or registered mail or by facsimile transmission or delivered to the undersigned within ninety (90) days after the date of opening of the bids, or any time thereafter before the Bid is withdrawn, the undersigned shall, within eight (8) days after the date of such mailing, facsimile transmission, or delivery of such notice, execute and deliver a Contract in the Form of Contract included in the Contract Documents.

The undersigned hereby designates as the undersigned's office to which such notice of acceptance may be mailed, transmitted, or delivered as _____
_____
_____

SECTION IX.

NON-COLLUSIVE BIDDING CERTIFICATION

Non-collusive Bidding Certification

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and, in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief:

1. The prices in the bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

2. Unless otherwise required by law, the prices which have been quoted in the bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and

3. No attempt has been made or will be made by the bidder to induce any other person, partnership, or corporation to submit or not to submit a bid for the purpose of restricting competition.

Firm Name _____

Address _____

_____

By_____
(Signature and Title)

Dated: _____

Telephone (____)_____Fax No. (____)_____

_____
(Taxpayer ID or Social Security Number)

ACKNOWLEDGEMENT OF BIDDER, IF A CORPORATION

STATE OF NEW YORK)
COUNTY OF_____) ss:

On the_____day of_____, 20_, before me personally came _____

to me known, who, being by me duly sworn, did depose and say that (s)he resides at _____

_____, that (s)he is the_____of _____

_____, the corporation described in and which executed the above instrument;

and that (s)he signed her/his name thereto by order of the Board of Directors of said corporation.

_____
Notary Public

ACKNOWLEDGEMENT OF BIDDER, IF A PARTNERSHIP

STATE OF NEW YORK)
COUNTY OF_____) ss:

On the_____day of_____, 20__, before me personally came _____ to me known and known to me to be a member of the firm _____ _____, described in and who executed the foregoing instrument, and (s)he duly acknowledged to me that (s)he executed the same for and in behalf of said firm for the uses and purposes mentioned therein.

_____
Notary Public

ACKNOWLEDGEMENT OF BIDDER, IF AN INDIVIDUAL

STATE OF NEW YORK)
COUNTY OF_____) ss:

On the_____day of_____, 20__, before me personally came _____ to me known and known to me to be the person described in and who executed the foregoing instrument, and (s)he duly acknowledged that (s)he executed the same.

_____
Notary Public

SECTION X:

SUBSTITUTION FORM REQUEST

FASHION INSTITUTE OF TECHNOLOGY

SUBSTITUTION REQUEST FORM

1.1 CONDITIONS OF SUBSTITUTIONS

A. Substitution indicated on this Form is a proposed substitute to requirements indicated in the Contract Documents. Substitution listed has not been included in an Addendum. Submit one Form for each proposed substitution.
B. For each proposed Substitution, state difference in price or "No Change" where Substitution is offered.
C. Attach complete technical data, specifications, and description of substitutions.
D. Architect reserves the right to accept or reject any or all proposed substitutions.

1.2 SUBSTITUTION REQUEST

The following information is hereby submitted for a substitution to the specified item.

Specification Section and Title: _____

Paragraph_____ Page_____ Specified Item _____

Proposed Substitution: _____

Manufacturer:_____ Address:_____ Phone: _____

Trade Name:_____ Model No: _____

Price Difference:_____ or No Change _____

The Undersigned certifies:

A. Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
B. Same warranty will be furnished for proposed substitution as for specified product.
C. Same maintenance service and source of replacement parts, as applicable is available.
D. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
E. Proposed substitution does not affect dimensions and functional clearances.
F. Payment will be made for changes to the building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____ FAX: _____

ARCHITECT'S REVIEW AND ACTION

□ Substitution Approved – Make submittals in accordance with General Requirements
□ Substitution Approved As Noted – Make submittals in accordance with General Requirements.
□ Substitution Rejected – Use specified materials.
□ Substitution Request Received Too Late. Use specified materials.

Signed by: _____

Supporting Data Attached: □ Drawings □ Product Data □ Samples □ Tests
□ Reports □ Other_____

SECTION XI.
CONTRACT

TO BE SIGNED ONLY UPON AWARD

CONTRACT

This Agreement made as of the_____day of_____20____, by and between the _____, hereinafter referred to as the "**OWNER**" and _____hereinafter referred to as the "Contractor", for Work at _____

_____

WITNESSETH: That the **OWNER** and the Contractor for the consideration named agree as follows:

1. The Contractor shall Provide and shall perform all Work of every kind or nature whatsoever required and all other things necessary to complete in a proper and workmanlike manner the _____

_____

_____in strict accordance with the Contract Documents as defined in the General Conditions (and of which a listing of specifications and drawings are attached hereto) and in strict accordance with such changes as are ordered and approved pursuant to the Contract, and shall perform all other obligations imposed on such Contractor by the Contract.

2. The Contractor agrees to perform all Work and labor required, necessary, proper for, or incidental to the Work, and to Furnish all supplies and materials required, necessary, proper for, or incidental to the Work for the total sum of_____ _____and 00/100 Dollars ($_____ _____.00), which sum shall be deemed to be in full consideration for the performance by the Contractor of all the duties and obligations of such Contractor under the Contract.

3. The Contractor shall commence Work on the Contract at a time to be specified in a written notice to proceed issued by the OWNER and complete the project no later than_____.

IN WITNESS WHEREOF, the parties hereto have executed this Contract the day and year first above written.

Fashion Institute of Technology

_____

Sherry Brabham, VP of Finance

_____

(Name of Contractor)

By_____

(Signature)

_____

(Print Name and Title)

ACKNOWLEDGEMENT OF CONTRACTOR, IF A CORPORATION

STATE OF_____)
COUNTY OF_____) ss:

On the_____day of_____in the year 20____, before me personally came _____ to me known, who, being by me duly sworn, did depose and say that (s)he resides at_____, that (s)he is the_____of_____, the corporation described in and which executed the above instrument; and that (s)he signed her/his name thereto by order of the Board of Directors of said corporation.

_____
Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR, IF A PARTNERSHIP

STATE OF_____)
COUNTY OF_____) ss:

On the_____day of_____in the year 20__, before me personally came _____to me known and known to me to be a member of the firm_____, described in and who executed the foregoing instrument, and (s)he duly acknowledged to me that (s)he executed the same for and in behalf of said firm for the uses and purpose mentioned therein.

_____
Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR, IF AN INDIVIDUAL

STATE OF_____)
COUNTY OF_____) ss:

On the_____day of_____in the year 20__, before me personally came_____, to me known and known to me to be the person described in and who executed the foregoing instrument and (s)he duly acknowledged that (s)he executed the same.

_____
Notary Public

SECTION XII.
AFFIRMATIVE ACTION FORM

MONTHLY CONTRACTOR'S COMPLIANCE REPORT FORM AAP 7.0

INSTRUCTION SHEET

ALL PAYMENT REQUISITION, CONTRACTOR AND PROJECT INFORMATION ON THE TOP PORTION OF THE FORM MUST BE COMOPLETELY FILLED OUT. PLEASE NOTE:

False statements, information or data submitted on or with application for payment may result in one or more of the following actions: Termination of Contract for cause; Disapproval of future bids, or contracts or subcontracts; Withholding of final payments on the contract; and Civil and/or criminal prosecution.

PART B- PAYMENTS TO SUBCONTRACTORS AND SUPPLIERS

1) ALL FIRMS THAT YOU ARE UTILIZING ON THE JOB MUST BE LISTED EACH TIME **REGARDLESS** IF THEY ARE SCHEDULED TO RECEIVE PAYMENTS OUT OF THE PROCEEDS OF THE REQUISITION FOR PAYMENT.

2) All relevant information for each subcontractor and/or supplier must be filled in. This includes firm's complete name, address, phone number and Federal ID #. In addition, if the firm is a **NYS CERTIFIED MBEIWBE**, please indicate as such in the appropriate box.

   AS A REMINDER, ONLY THOSE FIRMS THAT HAVE NYS CERTIFICATION BY THE EMPIRE STATE DEVELOPMENT CORPORATION CAN BE COUNTED TOWARDS THE MBE/WBE GOAL ACHIEVEMENT FOR THE PROJECT.

3) The percentage of the job or purchases completed must be filled in and in addition, please indicate the number of change orders issued on any subcontract agreement or the number of purchase orders issued to date if purchasing supplies.

4) A description of the work being performed by a subcontractor or the type of supplies being purchased must be filled in.

DEFINITIONS

INTENDED PAYMENT: This is the amount of money that you intend to pay to each firm with the money that you will receive from the accompanying requisition. **This is not** the amount that you intend to pay over the life of the contract.

AMOUNT PAID TO DATE: This is the amount of money that has **ACTUALLY** been paid to date from previous requisitions submitted. It does not include the amount that you intend to pay from this requisition. THIS AMOUNT WILL BE VERIFIED BY OUR OFFICE PRIOR TO CLOSE OUT OF THE JOB BY THE RECEIPT OF COPIES OF CANCELED CHECKS OR PAID INVOICES.

CURRENT VALUE OF SUBCONTRACT: This is the total value to date of any subcontract agreement that has been issued to the firm by your company. It should be inclusive of any change orders issued to the original contract. **NOTE:** THIS LINE IS FOR SUBCONTRACTOR INFORMATION ONLY. IF THE FIRM LISTED IS A SUPPLIER THAT YOU ARE PURCHASING SUPPLIES OR MATERIAL FROM, LEAVE BLANK AND GO TO THE NEXT LINE.

TOTAL VALUE OF ALL PURCHASE ORDERS: This is the total amount of **all** purchase orders that will be issued to the firm for the entire job. The number of purchase orders issued to date should be reflected in the area indicated to the left. **NOTE:** THIS LINE IS FOR SUPPLIER INFORMATION ONLY. IF THE FIRM IS A SUBCONTRACTOR, LEAVE THIS AREA BLANK. A SUBCONTRACTOR AGREEMENT SHOULD BE ISSUED WHICH WOIULD BE REFLECTED ON THE PREVIOUS LINE.

The current form that you should be utilizing is form: AAP 7.0 Revised 1/9/08. This form must be included with each payment requisition submitted or the payment will not be processed.

If the form is not filled out according to the above instructions, your next payment requisition may be held until corrections are made. In addition, each report submitted must have an original signature and date.

MONTHLY CONTRACTOR'S COMPLIANCE REPORT

Payment Requisition Date _____
Payment Requisition Amount $._____
FIT Contract Number _____

CONTRACTOR INFORMATION

Name_____ Federal ID No. _____

Address_____

Contact Person_____ Telephone Number _____

PROJECT INFORMATION

Institution_____ City and Zip Code _____

Work Description _____

Part B – Payments to Subcontractors and Suppliers: Provide name, address and telephone number of **ALL** subcontractors to which you have awarded a subcontract or suppliers to which you have issued a purchase order. Place **X** in check box to indicate whether they are a New York State certified MBE or WBE or Other. In addition, for each firm listed below you must also include: the firms federal identification number; amount of intended payment to be made from proceeds of the accompanying requisition; percent complete, amount paid to date; the number of change orders or purchase orders; current value of subcontract (including change orders) or cumulative value of purchase orders; and a brief description of the work or service. All subcontractors or suppliers with whom you have an agreement should be listed below, even if they are not scheduled to receive a payment out of the proceeds of the attached requisition for payment. For further details, see Instruction Sheet

Firm_____ ☐ MBE ☐ WBE ☐ Other Fed. ID# _____

Address_____ Phone#_____ Intended Payment$._____

Address _____ Percent Complete_____ Amount Paid to Date$_____

No. of Change Orders._____ Current Value of Subcontract $_____

No. of Purchase Orders Issued _____ Total Value of Purchase Orders $ _____

Work Description _____

Firm_____ ☐ MBE ☐ WBE ☐ Other Fed. ID# _____

Address_____ Phone #_____ Intended Payment$._____

Address _____ Percent Complete_____ Amount Paid to Date$_____

No. of Change Orders._____ Current Value of Subcontract $_____

No. of Purchase Orders Issued _____ Total Value of Purchase Orders $ _____

Work Description _____

False statements, information or data submitted on or with application for payment may result in one or more of the following actions: Termination of Contract for cause; Disapproval of future bids, or contracts or subcontracts; Withholding of final payments on the contract; and Civil and/or criminal prosecution.

_____ _____
Name of Principalor Officer (Type or Print) Title of Principal or Officer {Type or Print)

_____ _____
Signature of Principal or Officer Date

SECTION XIII.
CHANGE ORDER FORM

CHANGE ORDER

TO:

Contractor:_____ Contract No. _____

Street: _____ Contract Date: _____

City, State, Zip:_____ Original Contract Amount: $ _____

Phone No. _____ Total Approved Change Orders: _____

Current Contract Amount: $_____

You are hereby directed to perform all labor and to provide all materials necessary to carry out the Work described below:

Full consideration for this change order shall be on **INCREASE/DECREASE** of the original contract amount by:

_____Dollars.

Labor = _____

Materials = _____

INCREASE/DECREASE of the original schedule by days. In accepting and executing this change order, the Contractor, its heirs, executors, administrators, successors, and assigns hereby release and forever discharge the Owner, its successors, and assigns from any and all actions, causes of action, claims and demands whatsoever in law or in equity which the Contractor ever had, now has, or may have against the Owner in any way arising out of this change.

Recommended by:
CONSTRUCTION MANAGER OR ARCHITECT

Name: _____

_____

By: _____ Date: _____

Approved by:

Name:_____

By: _____ Date:_____

Accepted by:
CONTRACTOR

Name:_____

By: _____ Date: _____

OWNER

Name:_____

By: _____ Date: _____

SECTION XIV.
CONTRACTOR'S
TRADE PAYMENT BREAKDOWN

TRADE PAYMENT BREAKDOWN

PROJECT: _____ **CONTRACT # C**

CONTRACTOR: _____

			CONTRACT AMOUNT			
ITEM no.	**DESCRIPTION**	**UNIT MEAS.**	**QUANTITY**	**LABOR**	**MATERIAL**	**TOTAL**
1	Mobilization	LS				
2	Bonds	LS				
3	Insurance	LS				
4	Safety Program	MTLY				
5	Supervision	MTLY				
6	Permits/Licenses	LS				
7	CPM Schedules	LS				
8	Samples - Submittals	LS				
9	Data Submittals	LS				
10	Field Coordination	MTLY				
11	Coordinate with HVAC, Electrical	MTLY				
12	Coordinate with Plumbing/Fire Prevention	MTLY				
13	Coordinate with Kitchen Equipment Contractor	MTLY				
14	Temporary Electric	LS				
15	Temporary Light	LS				
16	Temporary Facilities	MTLY				
17	Fire Prevention	LS				
18	Temporary Field Office	MTLY				
19	Material Hoisting	LS				
20	Hoisting Operations	LS				
21	Storage	LS				
22	Warranties, Etc.	LS				

EXHIBIT A: SAFETY EHS PLAN

EXHIBIT A. SAFTEY EHS PLAN

FASHION INSTITUTE OF TECHNOLOGY

OUTLINE FOR PREPARING WORK-SPECIFIC ENVIROMENT, HEALTH AND SAFETY (EHS) PLAN

Before commencing work on site at FIT, Contractor shall prepare a work-specific EHS Plan and submit the EHS Plan to both the Facilities Management and EHS Departments for review and approval. Such approval shall be given in a timely manner.

I) A work-specific EHS Plan is required in the following instances:

A) When proposed work will:

1) use regulated hazardous chemicals;

2) have the potential to generate fumes, vapors or dusts;

3) involve cutting torches or other spark-generating equipment ("hot" work);

4) generate any waste;

5) involve high-energy systems or

6) require any type of air monitoring.

B) When work involves the removal of less than 25 liner feet, or 10 square feet, of asbestos-containing material (that is greater than 1% asbestos). For work involving more than these amounts of asbestos, Contractor must consult with the EHS Department for additional guidelines.

C) When work involves the use of tools and equipment in areas where FIT employees or students are present.

D) When work involves construction, other than minor repairs or alterations to on-campus facilities.

E) When work involves dangerous environments, such as confined spaces, hazardous energy, use scaffolds greater than 10 feet high, or vehicle-mounted articulated booms.

II) Use the outline below to develop the work-specific EHS Plan. Contractor shall amend the work-specific EHS Plan as needed to accommodate work on-campus as it proceeds.

DESCRIPTION OF CONTENTS OF WORK-SPECIFIC EHS PLAN

III) GENERAL INFORMATION – PROJECT PLANNING

A) List primary information about Contractor's firm and that of sub-

contractors, if any, Project Name, FIT Bid Number and Contractor's safety-related performance measurements on Table 1.

B) Describe the scope of work and list a breakdown of its specific tasks.

C) Provide a project schedule that, at a minimum, shows the anticipated start date of the work, the duration of each phase of the work, the anticipated date of completion of each phase, and the project completion date.

D) List name of Contractor's on-site EHS Coordinator and the names of all OSHA- competent persons needed to carry out the scope of work on Table 2. The EHS Coordinator shall serve as the primary contact with FIT's Director of EHS Compliance during all work.

IV) WORK-SPECIFIC HAZARD ANALYSIS/RISK ASSESSMENT

A) Describe each task associated with the work of the project.

B) List the potential hazards, if any, associated with each task.

C) Provide copies of Contractor's EH&S program applicable to scope of work.

D) List the types of protective work practices or personal protective equipment (PPE) Contractor will employ to carry-out each task.

E) Describe the types of exposure assessments that are needed to address potential hazardous exposures related to the work of the project. These include:

1) Work practices and engineering controls Contractor will use to prevent exposure of Contractor's employees to hazardous chemicals or hazardous energy;

2) Work practices and engineering controls Contractor will use to prevent exposure of FIT students and staff to any detectable chemical exposure;

3) Contractor's use of respiratory protection and other protective equipment (PPE) and

4) Qualitative or quantitative monitoring protocols, personal and area monitoring equipment, and contaminant action levels.

F) Attach copies of certified documentation of "Hazard Assessment and Equipment Selection" required by 29 CFR 1910.132 (d)(2) that complies with 1910 Subpart I Appendix B for all tasks in the work-specific EHS Plan.

G) Attach a copy of Contractor's written Hazard Communication Program that OSHA requires for the work-specific EHS Plan.

V) WORK-SPECIFIC ENVIRONMENTAL, HEALTH AND SAFETY ELEMENTS

A) To address health and safety issues, the work-specific EHS Plan shall:

1) Describe criteria for upgrading or downgrading personal protective equipment (PPE) or modifying work practices to control hazardous exposures during the work;

2) Describe criteria Contractor will use to set up exclusion zones, including physical barriers and decontamination zones, as needed to prevent spread of debris and restrict access of unauthorized persons to work areas;

3) List equipment Contractor will use for routine and emergency on-site communication;

4) Describe utility clearance and marking procedures to prevent damage to buried utilities, or to lines, piping, or cables located inside of walls and ceilings, if applicable;

5) Describe decontamination and cleaning procedures for Contractor's employees and equipment to prevent the spread of debris. This includes procedures during work, at the end of each work day, and at the completion of the project before FIT's final inspection of the work area;

6) Identify measures to manage dangerous environments, such as confined spaces, scaffold work greater than 10 feet, or articulated booms;

7) List "Hot Work" procedures involved in the work of the project. This may include, but not be limited to, work such as welding, burning, open flames, tar melting or other type of melting pots, grinding that throws sparks. (See Appendix 1 - "Daily Safety Management Work Permit");

8) Identify the need for air monitoring or special testing to carry out the work. Include a listing of monitoring equipment or special tests and the Action Levels that Contractor will apply to project work;

9) Describe safety procedures for excavations more than four 4 feet deep and sloping or shoring procedures where excavations will exceed 5 feet deep;

10) Describe fire protection and explosive hazard review;

11) List the name and address of Contractor's on-contract Confined Space rescue team;

12) Describe spill control procedures for chemical products Contractor will have on-campus during work. Include a listing of spill control or containment supplies that Contractor will have on-hand in case of a spill;

13) Describe the need for site coordination with FIT employees, other contractors on-site and other adjacent work groups. This includes identification of hazardous energy Lock Out and Tag Out

requirements to make to work area safe and

14) Provide a listing of other safety equipment that Contractor will have on site during the work of the project.

B) To address oil, chemical and waste management issues, the work-specific EHS Plan shall:

1) Provide estimates of the types and amounts of waste (both hazardous and non-hazardous) that Contractor anticipates the work will generate. As applicable, provide a copy of a waste analysis plan that lists the types of analysis required, the USEPA SW-846 method number and the method detection limits;

2) Provide facility name, USEPA ID number, and a contact name for each facility that will transport and dispose of each of the waste streams identified above. Provide this information for any facility that will dispose of residuals from the treatment of project waste, as applicable;

3) On a copy of a drawing that will be provided by FIT, identify location where Contractor proposes to accumulate waste during work, to set-up exclusion zones and to provide employee decontamination areas;

4) Provide a statement that describes the methods that Contractor will use to minimize the amount of waste generated from the work of the project;

5) Provide a tabular listing, along with copies of Safety Data Sheets (SDS), for any chemical products that Contractor intends to store or use on-site during the work. The listing shall include the product name, manufacturer's name, type, amounts, intended storage location on FIT site, the specific use of the chemical and identification of any NYCDEP/USEPA regulated hazardous substances that Contractor intends to store or use on-site during the work. In all cases, Contractor must submit the listing before chemical products are delivered to the FIT campus;

6) On a copy of a drawing that will be provided by FIT, identify location where Contractor proposes to store chemical products on-site during work;

7) Identify the need, if any, to amend existing FIT emergency contingency planning documents. Such documents include, but are not limited to: Spill Prevention Control and Countermeasure Plan, Spill Prevention Report, Right-to-Know Survey and

8) List permits and Certificates of Fitness (NYCDEP, NYSDEC, USEPA, FDNY) needed to carry-out the scope of work and have copies on-site of permits and Certificates to carry-out project work.

VI) ON-SITE DOCUMENTATION

A) Contractor shall record initial and daily safety-related procedures on Table 3. These shall include:

1) Before start of the work, FIT's Project Manager will conduct a FIT Hazard Communication briefing for Contractor's employees;

2) Before start of the work, FIT's Project Manager and Contractor's on-site EHS Coordinator shall conduct a briefing for FIT employees in areas adjacent to work areas about proposed work;

3) Review of FIT Emergency Evacuation Procedures;

4) Listing of initial and ongoing project status meetings on-site with FIT Project Manager to address EHS concerns safety and health and

5) Scheduled and unscheduled employee safety briefings, toolbox talks.

B) Contractor shall provide a summary of the on-site EHS Coordinator's EHS-related training and experience relevant to the work of the project.

C) Contractor's employees shall sign-in daily with FIT Security in the A-Building Lobby.

D) For each work shift necessary to complete the project, Contractor's on-site EHS Coordinator shall open and fill out the "Daily Safety Management Work Permit" (See Appendix 1) at the start of each work shift and close the Permit at the end of each work shift.

VII) EMERGENCY RESPONSE PLANNING

Contractor shall review the summary of the Emergency Response Contact Names listed on Table 4 and provide the information as follows:

A) On a site map that will be provided by FIT, identify the primary and secondary routes for the evacuation of Contractor's employees, including the "rally point" where Contractor's employees will assemble and carry-out an accountability check in case of an evacuation;

B) List emergency response contacts with titles and telephone numbers. Contractor shall immediately call FIT Security and the FIT Project Manager in the event of a spill of oil, chemicals, waste water, or hazardous materials;

C) Identify the name, address and route to nearest hospital or Contractor's wellness center and

D) Provide a listing of emergency equipment for first aid, personal protection, spill response, fire protection and rescue.

TABLE 1

Project Name: _____ Bid Number: _____

CONTACTOR ORGANIZATION CHART AND SAFETY DATA

COMPANY	:	Name: Address: Phone:
President	:	Name: Phone:
Vice President – Operations		Name: Phone:
Director of Environmental, Health, and Safety	:	Name: Phone:
Contractor EHS Program Development	:	Name: Phone:
OSHA Total Case Recordable Rate (TCRR)	:	
Days Away from work, or Restricted work or job Transfer (DART)	:	
Experience Modification Rate (EMR)	:	

Listing of On-site Subcontractors for project work, as applicable -

COMPANY NAME	ADDRESS	PHONE NUMBER	TASKS

TABLE 2

ON-SITE SUPERVISORY PERSONNEL

TITLE	:	**NAME(S) AND ON-SITE PHONE NUMBER**
On-site EHS Coordinator	:	
Contractor Project Managers	:	
FIT's Project Manager(s)	:	
Contractor's Competent Persons		List all that Apply – Indicate not applicable areas for department /project work as "NA" For subcontractor employees, place subcontractor firm name in parenthesis after the employee's name
• Confined Spaces	:	
• Excavations	:	
• Industrial Hygiene	:	
• Electrical--Lock Out/Tag Out	:	
• PPE, Respiratory Protection	:	
• Hazard Communication (Required for each department and project. Identify responsible employee for each subcontractor)	:	
• Fall Protection	:	
• Scaffolds	:	
• Cranes & Derricks	:	
• Blasting & Use of Explosives	:	

TABLE 2 (Cont'd)

ON-SITE SUPERVISORY PERSONNEL	Page 2 of 2
• Asbestos (Attach copies of Company license, supervisor and handler certificates for all employee that will perform work)	:
• Lead	
• Silica	
• Hot Work (Complete and submit permits daily - see Appendix 1)	
• FDNY Certificate of Fitness-Torch Operations	
• FDNY Certificate of Fitness-Fire Guard	
• FDNY Certificate of Fitness-Fire proofing	
• FDNY Certificate of Fitness-Powder Activated Tools	
• FDNY Certificate of Fitness-Air Compressors_____	
• FDNY Certificate of Fitness-Use of LPG and Use in Tar Kettles	
• FDNY REFRIGERATING SYSTEM OPERATING ENGINEER	
• FDNY Certificate of Fitness-Other_____	
• FDNY Certificate of Fitness-Other_____	
•	
•	

TABLE 3

LISTING OF REQUIRED EMPLOYEE/SUPERVISORY BRIEFINGS

DATE	TOPIC	Comments	TYPE (Monthly Supervisor/Bi-weekly Employee/Supervisor	Comments
	FIT Haz Com Briefing	At start of Work		
	Briefing for FIT Employees in work area(s)	FIT briefing for all FIT Department Supervisors in areas where work may potentially affect FIT employees or students at start of work. Record name of FIT employee(s) briefed	Complete Daily Safety Management Work Permit (See Appendix 1)	
	Review of FIT Emergency Evacuation Procedures	At start of Work		

TABLE 4

EMERGENCY CONTACT NAMES & TELEPHONE NUMBERS

TITLE	CONTACT NAME	EMERGENCY PHONE NUMBERS
Contractor: MAIN OFFICE		
Contractor President:		
On-site EHS Coordinator		
FIT Facilities Management	**Executive Director:** Allen King	Phone: 212-217-4424
FIT Environmental, Health and Safety Department	**Director:** Paul DeBiase paul_debiase@fitnyc.edu **Coordinator:** TBD	Phone: 212-217-3752 Phone: 212-217-3754
Contractor Project Manager(s)		
FIT Public Safety	Central Control	212-217-7777, or Use Red Phone
Occupational Safety And Health Administration, – Area Director	Provide Zip Code for the location of Accident	800-321-6742
Location of nearest hospital and/or contractor's wellness center		
Rally Point and Accountability Check Location	In case of Building Evacuation Alarm	

Note: Call FIT Central Control at 212-217-7777 in case or any emergency such as fire, chemical spills, injury requiring medical treatment, or exposure of contractor or FIT personnel to fumes, vapors, or dusts.

EXHIBIT B: PREVAILING WAGE SCHEDULE

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Fashion Institute of Technolog

Sam Li, Director of Procurement Serv.
227 W 27th St
New York NY 10001

Schedule Year 2026 through 2027
Date Requested 08/24/2026
PRC# 2026025093

Location 227 W 27th St
Project ID# C1762
Project Type Renovation of FIT Science Department on the Third Floor of the Dubinsky Building.

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Rate Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2026 through June 2027. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Contractor Registry

Effective December 30, 2024 all contractors and subcontractors submitting bids or performing construction work on public work projects, or private projects covered by Article 8 of the Labor Law, are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. To register, contractors and subcontractors must submit an application through NYSDOL's Contractor Registry portal which is available through the agency's Management System for Protecting Worker Rights (MPWR) https://mpwr-public.labor.ny.gov/en/login.

For additional information, please visit online.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission: a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion online.

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website

www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemperaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment.Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed $100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds $25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of $50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Fashion Institute of Technolog

Sam Li, Director of Procurement Serv.
227 W 27th St
New York NY 10001

Schedule Year 2026 through 2027
Date Requested 08/24/2026
PRC# 2026025093

Location 227 W 27th St
Project ID# C1762
Project Type Renovation of FIT Science Department on the Third Floor of the Dubinsky Building.

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information
All information must be supplied

Federal Employer Identification Number: _____

Name: _____

Address: _____

_____

City: _____ State: _____ Zip: _____

Amount of Contract: $_____

Approximate Starting Date: ____/____/____

Approximate Completion Date: ____/____/____

Contract Type:
[ ] (01) General Construction
[ ] (02) Heating/Ventilation
[ ] (03) Electrical
[ ] (04) Plumbing
[ ] (05) Other : _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to $1,500 for a first offense and up to $5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, https://dol.ny.gov/public-work-and-prevailing-wage
If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov .

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website *www.labor.ny.gov* or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

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1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

NEW YORK STATE OF OPPORTUNITY. Department of Labor

Required Notice under Article 25-B of the Labor Law

Attention All Employees, Contractors and Subcontractors: You are Covered by the Construction Industry Fair Play Act

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor**, you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

• **Civil Penalty**	First offense: Up to $2,500 per employee Subsequent offense(s): Up to $5,000 per employee
• **Criminal Penalty**	First offense: Misdemeanor - up to 30 days in jail, up to a $25,000 fine and debarment from performing public work for up to one year. Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a $50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)

WE ARE YOUR DOL

NEW YORK STATE Department of Labor

New York State Department of Labor
Bureau of Public Work

Attention Employees

THIS IS A:

PUBLIC WORK PROJECT

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at: https://dol.ny.gov/bureau-public-work

If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is $250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training “prior to the performing any work on the project.”

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.)*
- Training roster, attendance record of other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is $3 million in Bronx, Kings, New York, Queens and, Richmond counties; $1.5 million in Nassau, Suffolk and Westchester counties; and $500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirement s on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.
Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.
Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.
Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

*Contractor Registry (LL 220-I):
Labor Law Section 220-i requires that contractors obtain a Contractor Registry certificate of registration prior to bidding on or commencing work on a public or private project subject to prevailing wage requirements. Subcontractors also are prohibited from commencing work on covered employment unless they have received a Contractor Registry certificate. Contractors are required to submit their Certificate of Registration with their bid materials. A public database is available online to confirm registration at data.ny.gov to confirm registration validity. For additional information on how to register and the requirements, visit https://dol.ny.gov/public-work-contractor-and-subcontractorregistry-
landing.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three (3) years from the projects date of completion. Additionally, as per Article 6 of the Labor Law, contractors and subcontractors are required to establish, maintain, and preserve for not less that six (6) years, contemporaneous, true, and accurate payroll records.

At a minimum, payrolls must show the following information for each person employed on a public work project: Name; Address, Last 4 Digits of Social Security number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

Payroll records and transcripts are required to be kept on site during all the time that work under that contract is being performed.

NOTE: *For more detailed information regarding Article 9 prevailing wage contracts, please refer to "General Provisions of Laws Covering Workers on Article 9 Public Work Building Service Contracts".*

If you have any questions concerning the attached schedule or would like additional information, please write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12240

OR

Contact the nearest BUREAU of PUBLIC WORK District Office

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518

Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. The specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. Please Note: Updates to the Wage Schedule shall be made on a quarterly basis.

All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Shift Work

If the timeline of the contract requires shift work be performed to meet deadlines, the BPWE will enforce the shift work rate as the required rate on the project whether or not shift work is specifically addressed in the contract.

Paid Prenatal Leave

Every employer shall be required to provide to its employees twenty hours of paid prenatal personal leave during any fifty-two week calendar period. Paid prenatal personal leave shall mean leave taken for the health care services received by an employee during their pregnancy or related to such pregnancy, including physical examinations, medical procedures, monitoring and testing, and discussions with a healthcare provider related to the pregnancy. Paid prenatal personal leave may be taken in hourly increments. Benefits for paid prenatal personal leave shall be paid in hourly installments. Employees shall receive compensation at the employee's regular rate of pay, or the applicable minimum wage established by the labor law, whichever is greater, for the use of Paid Prenatal leave.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4

Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12226

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

New York County General Construction

Asbestos Worker — 08/01/2026

JOB DESCRIPTION Asbestos Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2026	01/01/2027
		Additional
Asbestos Worker	$ 48.50	2.66**
Removal & Abatement ONLY*		

NOTE: * For Mechanical Systems that are NOT to be SCRAPPED.

**To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

Asbestos Worker	$ 18.02
Removal & Abatement Only	

OVERTIME PAY
See (B, B2, *E, J) on OVERTIME PAGE
*Hours worked on Saturdays are paid at time and one half only if forty hours have been worked during the week.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 28) on HOLIDAY PAGE

REGISTERED APPRENTICES
Apprentice Removal & Abatement Only:

1000 hour terms at the following percentage of Journeyworker's wages per hour.

1st	2nd	3rd	4th
78%	80%	83%	89%

SUPPLEMENTAL BENEFITS Per Hour:

All Terms: $ 18.02

4-12a - Removal Only

Boilermaker — 08/01/2026

JOB DESCRIPTION Boilermaker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2026	01/01/2027
Boilermaker	$ 70.38	$ 71.88
Repairs & Renovations	70.38	71.88

Repairs & Renovation: Includes Repairing, Renovating, and Replacement of parts to an existing unit(s).

SUPPLEMENTAL BENEFITS
Per Hour:

Boilermaker	33.5% of Hourly
Repair & Renovations	Wage Paid
	+ $26.85

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

OVERTIME PAY
See (*B, O, **U) on OVERTIME PAGE
Note:* Includes 9th & 10th hours, double for 11th or more.
** Labor Day ONLY, if worked.

Repairs & Renovation see (B,E,Q) on OT Page

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 12, 15, 25, 26, 29) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1/2) Year Terms at the following percentage of Boilermaker's wage per hour:

1st	2nd	3rd	4th	5th	6th	7th
65%	70%	75%	80%	85%	90%	95%

SUPPLEMENTAL BENEFITS:

33.5% of Hourly Wage Paid Plus Amount Below:

1st	2nd	3rd	4th	5th	6th	7th
$20.36	$21.28	$22.22	$23.12	$24.07	$25.00	$25.93

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Broadband — 08/01/2026

JOB DESCRIPTION Broadband **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

PARTIAL COUNTIES
Orange: Entire County except Village of Greenwood Lake, Village of Highland Falls, Town of Tuxedo, and Town of Patterson

WAGES
NOTE: Applies to all public work and covered private projects, including those receiving ConnectAll funding subject to New York State Labor Law §224-E, solicited on or after July 1,2025. For all other projects solicited prior to July 1,2025 please see LINEMAN ELECTRICIAN(1)-TELEDATA

Per Hour:	07/01/2026	08/04/2026
Field Tech Install/Repair*	$ 55.59	$ 57.26

For outside work (excluding installation on building construction/alteration/renovation projects), stopping at first point of attachment (demarcation), installing/maintaining/repairing broadband internet service.

"Broadband", "Broadband Service", or "Broadband Internet" means mass-market retail service by wire or radio that provides the capability to transmit data to and receive data from all or substantially all internet endpoints, including any capabilities that are incidental to and enable the operation of the communications service, but excluding dial-up internet access service.

*NOTE: EXCLUDES work within ten(10) feet of High Voltage (600 Volts and over) transmussion lines. Please see LINEMAN rates.
*NOTE: Does not include the operation of equipment. Please see OPERATING ENGINEER rates.
*NOTE: Does not include groundmen/flagger/flagmen. Please see LABORER/LABORER-HEAVY/HIGHWAY rates.

SUPPLEMENTAL BENEFITS
Per Hour:
$ 23.54

OVERTIME PAY
See (B, K, *R) on OVERTIME PAGE
*Two and one half times the hourly rate after the 8th hour

HOLIDAY
Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

4-CWA-Dist1

Carpenter — 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2026

Piledriver	$ 62.59
	+ 10.16*
Dockbuilder	$ 62.59
	+ 10.16*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 47.48

OVERTIME PAY
See (B, E2, O) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.
Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour
(1)year terms:

1st	2nd	3rd	4th
$ 28.98	$ 34.58	$ 42.96	$ 51.35
+ 5.66*	+ 5.66*	+ 5.66*	+ 5.66*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

All Terms: $ 34.03

8-1556 Db

Carpenter — 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2026

Carpet/Resilient	
Floor Coverer	$ 60.05
	+ 8.39*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS
Per hour:

$ 42.24

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE.

Paid for 1st & 2nd yr.

Apprentices See (5,6,11,13,16,18,19,25)
Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wage per hour - (1) year terms:

1st	2nd	3rd	4th
$ 26.54	$ 29.60	$ 34.05	$ 42.40
+ 2.00*	+ 2.54*	+ 3.00*	+ 3.94*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 16.91	$ 18.13	$ 21.67	$ 22.98

8-2287

Carpenter **08/01/2026**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour: 07/01/2026

Marine Construction:

Marine Diver $ 77.46
+ 10.16*

Marine Tender $ 57.00
+ 10.16*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker $ 47.48

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 13, 16, 18, 19, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms.

1st year $ 28.98
+ 5.66*
2nd year 34.58
+ 5.66*
3rd year 42.96
+ 5.66*
4th year 51.35
+ 5.66*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits
Per Hour:

All terms $ 34.03

8-1456MC

Carpenter **08/01/2026**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2026

Building
Millwright $ 62.03
+ 13.12*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Millwright $ 46.66

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18,19) on HOLIDAY PAGE.

Overtime: See (5,6,8,11,13,15,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$ 33.04	$ 38.89	$ 44.74	$ 56.44
+ 7.08*	+ 8.25*	+ 9.42*	+ 11.76*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$ 31.81	$ 34.34	$ 37.52	$ 41.94

8-740.1

Carpenter **08/01/2026**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per Hour:
07/01/2026

Timberman $ 57.59
+ 10.42*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per Hour:
$ 46.79

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Overtime: See (5, 6, 11, 13, 25) on HOLIDAY PAGE
Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.
Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour:
One (1) year terms:

1st	2nd	3rd	4th
$ 26.96	$ 32.07	$ 39.72	$ 47.38
+ 5.71*	+ 5.71*	+ 5.71*	+ 5.71*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:
All terms $ 33.78

8-1556 Tm

Carpenter 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Westchester

PARTIAL COUNTIES
Orange: South of but including the following, Waterloo Mills, Slate Hill, New Hampton, Goshen, Blooming Grove, Mountainville, east to the Hudson River.
Putnam: South of but including the following, Cold Spring, TompkinsCorner, Mahopac, Croton Falls, east to Connecticut border.
Suffolk: West of Port Jefferson and Patchogue Road to Route 112 to the Atlantic Ocean.

WAGES

Per hour:	07/01/2026	10/18/2026
Core Drilling:		
Driller	$ 48.78 + 3.85*	Additional + $2.63
Driller Helper	$ 38.15 + 3.85*	

Note: Hazardous Waste Pay Differential:
For Level C, an additional 15% above wage rate per hour
For Level B, an additional 15% above wage rate per hour
For Level A, an additional 15% above wage rate per hour
Note: Additional $3.00 per hour to be paid when required to work on water

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Driller and Helper $ 32.37

OVERTIME PAY
See (B, G, P) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 13, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 25) on HOLIDAY PAGE

8-1536-CoreDriller

Carpenter 08/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, New York, Putnam, Queens, Richmond

PARTIAL COUNTIES
Nassau: The portion of the county that lies west of Seaford Creek and south of the Southern State Parkway.

WAGES

Per hour:	07/01/2026
Show Exhibit	$ 57.75 + 10.00**
Bldg. Carpenter*	$ 60.05 + 8.39**

* Not applicable in Putnam County
**This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour worked:

Show Exhibit	$ 46.94
Bldg. Carpenter	42.24

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE

Overtime: See (5,6,11,13,16,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour: Show Exhibit

(1) year terms:

1st.	2nd.	3rd.	4th.
$ 23.10	$ 28.88	$ 37.54	$ 46.20
+ 5.00*	+ 5.00*	+ 5.00*	+ 5.00*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:
All terms $ 32.50

Wages per hour: Bldg. Carpenter
(1) year terms:

1st	2nd	3rd	4th
$ 25.20	$ 28.20	$ 32.45	$ 40.33
+ 2.14*	+ 2.59*	+ 3.09*	+ 4.09*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 17.86	$ 18.91	$ 22.01	$ 23.01

8-EXHIB

Carpenter - Heavy&Highway **08/01/2026**

JOB DESCRIPTION Carpenter - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

PARTIAL COUNTIES
Nassau: That portion of the county that lies West of Seaford Creek and South of the Southern State Parkway.

WAGES
Per hour:

	07/01/2026
Heavy & Highway	
Carpenter	$ 62.59
	+ 10.16*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour worked:

Heavy & Highway	
Carpenter	$ 47.48

OVERTIME PAY
See (B, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 13, 25) on HOLIDAY PAGE

For 1st & 2nd year Apprentices
Paid: See (5,6,11,13,25)

REGISTERED APPRENTICES
Wage per hour:
One (1) year terms:

	1st	2nd	3rd	4th
Heavy & Highway	$ 28.98 + 5.66*	$ 34.58 + 5.66*	$ 42.96 + 5.66*	$ 51.35 + 5.66*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits:
Per Hour:

All terms
$ 34.03

8-NYC H/H

Electrician — 08/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour: 07/01/2026

Tree Trimmer	$ 35.24
Ground Person	20.69

Applies to line clearance, tree work, and right-of-way preparation on all new or existing overhead, electrical, telephone, and CATV lines.

SUPPLEMENTAL BENEFITS
Per hour:

Tree Trimmer	$ 13.20
Ground Person	7.75

OVERTIME PAY
See (B, *H, Q) on OVERTIME PAGE
*Worked performed on Sundays & Holidays outside of 7.00am - 4.00pm shall be paid at double time, in addition to the holiday pay if applicable.

HOLIDAY
Paid: See (5, 6, 10, 11, 15, 16, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 11, 15, 16, 26) on HOLIDAY PAGE
(An additional floating holiday after four years service)

9-3T

Electrician — 08/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2026	04/14/2027
Electrician	$ 34.50	$ 34.50
Telephone	34.50	34.50

Maintenance and Jobbing-Electrical and teledata work of limited duration and scope, consisting of repairs and/or replacement of electrical and teledata equipment.

- Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.

SUPPLEMENTAL BENEFITS
Journeyworker:

	$ 30.55	$ 31.22
	32.73*	33.40*

* Applies to overtime hours

OVERTIME PAY
See (B, H) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

9-3m

Electrician — 08/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond, Westchester

WAGES

Per hour:	07/01/2026	03/12/2027
Service Technician	$ 39.45	$ 40.45

Service and Maintenance on Alarm and Security Systems.

Maintenance, repair and /or replacement of defective (or damaged) equipment on, but not limited to, Burglar - Fire - Security - CCTV - Card Access - Life Safety Systems and associated devices. (Whether by service contract of T&M by customer request.)

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker:	$ 23.33	$ 24.11

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE

9-3H

Electrician — 08/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per Hour:	07/01/2026	04/14/2027
Electrician, Audio/Sound and Temporary Light/ Power	$ 64.00	$ 64.00
Solar-Photovoltaic Systems		
Group 1 All tasks not listed in Group 2	64.00	64.00
Group 2	34.50	34.50

D.C portion and associated mechanical equipment related to solar systems,
(excluding battery storage and its associated equipment) including work related to
Weather Stations and Data Acquisitions/Monitoring Systems on solar photovoltaic systems.

Mounting of PV modules.
Mounting of DC optimizers to back of modules if the installation calls for this equipment.
Mounting of microinverters to back of modules and install trunk cabling on racking if called for.

Module to module connection of PV modules to adjacent modules. If racking manufacturer provides integrated inter-row cable management, install string jumper to complete the string in full in same sub-array.
If racking manufacturer does not provide integrated inter-row cable management, run conduit between rows, bond it and run string jumper to complete string in full in same sub-array.
Installation of weather stations and other weather station relevant sensors as specified.
Installation of data acquisition system (DAS) for PV system monitoring.

SHIFT WORK
Evening (Swing Shift):

Electrician Audio/Sound and Temporary Light/ Power	$ 75.10	$ 75.10

Night (Graveyard Shift):

Electrician Audio/Sound and Temporary Light	$ 84.12	$ 84.12

SUPPLEMENTAL BENEFITS
Per Hour:

Electrician	$ 74.25 78.30*	$ 76.71 80.76*
Swing Shift:	$ 83.59 88.33*	$ 86.32 91.06*
Graveyard Shift:	$ 91.49 96.81*	$ 94.47 99.78*
Temporary Light/Power:	$ 32.38 35.78*	$ 33.88 37.28*
Group 1:	$ 74.25 78.30*	$ 76.71 80.76*
Group 2:	$ 30.55 32.73*	$ 31.22 33.40*

* Applies when premium (OT) wages are paid.

Temporary Light and Power benefit rate applies for three or less workers.

Reduce benefit rate by 6.2% for any employee who has accumulated wages of $184,500 for the same employer.

OVERTIME PAY
See (A, H) on OVERTIME PAGE
See (B) for Temporary Light and Power

HOLIDAY
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages Per Hour:

	07/01/2026	04/14/2027
First Year:	$19.25	$19.25
Second Year:	21.25	21.25
Third Year:	23.25	23.25
Fourth Year:	26.25	26.25

Supplemental Benefits per hour:

	Regular	Overtime	Regular	Overtime
First year:	$ 19.84	$ 21.11	$ 20.93	$ 22.21
Second year:	20.89	22.30	21.99	23.40
Third year:	21.93	23.48	23.05	24.59

Fourth year:	23.51	25.25	24.64	26.38

9-3

Electrician - Highway and Street Lighting, Traffic Signals and Controls — 08/01/2026

JOB DESCRIPTION Electrician - Highway and Street Lighting, Traffic Signals and Controls **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2026	04/21/2027
Electro Pole Electrician	$ 64.00	$ 64.00
Electro Pole Foundation Installer	$ 49.66	$ 49.66
Electro Pole Maintainer	$ 43.61	$ 43.61

SUPPLEMENTAL BENEFITS
Per Hour:

Electro Pole Electrician	$ 76.43 80.09*	$ 78.89 82.55*
Electro Pole Foundation Installer	$ 56.99 60.13*	$ 58.99 62.12*
Electro Pole Maintainer	$ 51.66 54.42*	$ 53.60 56.53*

*Applies when premium wages are paid.

Note: Reduce benefit rate by 6.2% for any employee who has accumulated wages in $184,500 for the same employer.

OVERTIME PAY
See (A, B, E4, F, K) on OVERTIME PAGE
B - Applies to Electro Pole Foundation Installer
E4 - Applies to Electro Pole Maintainer

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

9-3J

Elevator Constructor — 08/01/2026

JOB DESCRIPTION Elevator Constructor **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

PARTIAL COUNTIES
Rockland: Entire County except for the Township of Stony Point
Westchester: Entire County except for the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES
Per hour:

	07/01/2026	03/17/2027
Elevator Constructor	$ 86.43	$ 89.76
Modernization & Service/Repair	$ 68.06	$ 70.72

SUPPLEMENTAL BENEFITS
Per Hour:

Elevator Constructor	$ 48.96	$ 50.27

Modernization & Service/Repairs	$ 47.73	$ 49.00

OVERTIME PAY
Constructor See (D, M, T) on OVERTIME PAGE.

Modern/Service See (B, E5, P) on OVERTIME PAGE.

HOLIDAY
Paid: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES PER HOUR:

6 MONTH TERMS:

1st Term*	2nd & 3rd Term*	4th & 5th Term	6th & 7th Term	8th & 9th Term
50%	50%	55%	65%	75%

* Note: 1st, 2nd, 3rd Terms are based on average of the Constructor, the Modernization and the Service/Repair wage.
Terms 4 thru 9 Based on the Journeyworker's wage of classification they are working in.

SUPPLEMENTAL BENEFITS:

	07/01/2026	03/17/2027
Elevator Constructor		
1st Term	$0.00	$ 0.00
2nd & 3rd Term	37.66	38.42
4th & 5th Term	38.80	39.62
6th & 7th Term	40.60	41.50
8th & 9th Term	42.39	43.39
Modernization & Service/Repair		
1st Term	$0.00	$ 0.00
2nd & 3rd Term	37.63	38.39
4th & 5th Term	38.37	39.17
6th & 7th Term	40.09	40.98
8th & 9th Term	41.81	42.79

Glazier — 08/01/2026

JOB DESCRIPTION Glazier **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per hour:

	07/01/2026	11/01/2026
Glazier	$ 66.22	$ 67.20
Scaffolding, including swing scaffold	71.22	72.20
*Mechanical Equipment	67.23	68.20
**Repair & Maintenance	32.82	33.47

*Mechanical equipment, scissor jacks, man lifts, booms & buckets 30' or more, but not pipe scaffolding.
**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative Repair & Maintenance contract value is under $202,000.

SUPPLEMENTAL BENEFITS
Per hour:

Glazier, Scaffolding and Mechanical Equipment	$ 44.81	$ 45.74
Repair & Maintenance	$ 26.01	$26.37

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
For 'Repair & Maintenance' see (B, B2, I, S) on overtime page.

HOLIDAY
Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
For 'Repair & Maintenance'
Paid: See(5, 6, 16, 25)
Overtime: See(5, 6, 16, 25)

REGISTERED APPRENTICES
Wage per hour:
(1) year terms at the following wage rates:

	07/01/2026	11/01/2026
1st term	$ 23.68	$ 24.06
2nd term	32.23	32.74
3rd term	42.89	43.55
4th term	52.47	53.23

Supplemental Benefits:
(Per hour)

1st term	$ 20.18	$ 20.56
2nd term	28.85	29.39
3rd term	34.77	35.45
4th term	38.18	38.95

8-1087 (DC9 NYC)

Insulator - Heat & Frost — 08/01/2026

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2026	06/01/2027
Insulators	$ 73.26	Additional
Heat & Frost		2.50*

* To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

Insulators	$ 38.51
Heat & Frost	

OVERTIME PAY
See (A, E, *Q, V) on OVERTIME PAGE
* Triple time for Labor Day (If worked)

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms at the following Wages Per Hour:

1st	2nd	3rd	4th
$ 32.97	$ 40.29	$ 47.62	$ 54.95

Supplemental Benefits:

1st	2nd	3rd	4th
$17.33	$21.18	$25.03	$28.88

4-12

Ironworker — 08/01/2026

JOB DESCRIPTION Ironworker **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2026	01/01/2027 Additional
Stone Derrickmen Rigger	$ 78.46	$ 1.84
Stone Handset Derrickman	$ 76.51	$ 1.64

SUPPLEMENTAL BENEFITS
Per hour:

Stone Derrickmen Rigger	$ 49.02
Stone Handset Derrickman	$ 48.01

OVERTIME PAY
See (B, D1, *E, Q, **V) on OVERTIME PAGE
*Time and one-half shall be paid for all work on Saturday up to eight (8) hours and double time shall be paid for all work thereafter.
** Benefits same premium as wages on Holidays only

HOLIDAY
Paid: See (18) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 25) on HOLIDAY PAGE
Work stops at schedule lunch break with full day's pay.

REGISTERED APPRENTICES
Wage per hour:

Stone Derrickmen Rigger:

	1st	2nd	3rd	4th
07/01/2026	$ 38.98	$ 55.17	$ 61.37	$ 67.56

Supplemental Benefits:
Per hour:

07/01/2026	$ 24.77	$ 37.34	$ 37.34	$ 37.34

Stone Handset:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2026	$ 37.51	$ 53.51	$ 59.51	$ 65.51

Supplemental Benefits:
Per hour:

07/01/2026	$ 24.75	$ 36.90	$ 36.90	$ 36.90

9-197D/R

Ironworker **08/01/2026**

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2026	01/01/2027 Additional
Ornamental	$ 48.65	$ 1.05*
Chain Link Fence	48.65	
Guide Rail	48.65	

* To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker: $ 68.84

OVERTIME PAY
See (B, B1, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms at the following wages per hour:

1st	2nd	3rd	4th
$ 25.98	$ 28.45	$ 30.80	$ 34.39

Supplemental Benefits per hour:

1st	2nd	3rd	4th
$ 17.29	$ 18.29	$ 19.29	$ 21.29

4-580-Or

Ironworker — 08/01/2026

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
PER HOUR:

	07/01/2026	01/01/2027
Ironworker: Structural, Bridges, Machinery	$ 59.45	Additional 1.38*

* To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour paid:

Journeyman $ 95.26

OVERTIME PAY
See (B, B1, Q, *V) on OVERTIME PAGE
*NOTE: Benefits are calculated for every hour paid.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES
6 month terms at the following wages per hour:

	1st	2nd	3rd-6th
07/01/2026	$ 30.87	$ 31.47	$ 32.08

Supplemental Benefits

PER HOUR PAID: $ 69.08

4-40/361-Str

Ironworker — 08/01/2026

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
Rockland: Southern section - south of Convent Road and east of Blue Hills Road.

WAGES

Per hour:	07/01/2026
Reinforcing & Metal Lathing:	$ 58.85

SUPPLEMENTAL BENEFITS
Per hour:

Reinforcing & Metal Lathing	$ 46.42

OVERTIME PAY
See (B, E, Q, *X) on OVERTIME PAGE
Wages Per Hour:

At Time & One Half	$ 87.35
At Double Time	115.85

Supplemental Benefit Premiums for Overtime Hours worked:

At Time & One Half	$ 52.77
At Double Time	59.27

*Only $24.00 per hour for non worked hours

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 11, 13, 20, 21, 22, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following Wages Per Hour:

	1st	2nd	3rd	4th
Straight time	$ 22.55	$ 25.00	$ 28.00	$ 30.00
At Time & One Half	33.05	36.60	41.10	44.10
At Double Time	46.65	51.80	57.80	61.80

SUPPLEMENTAL BENEFITS Per Hour:

1st	2nd	3rd	4th
$ 18.17	$ 18.22	$ 17.22	$ 17.22

4-46Reinf

Laborer — 08/01/2026

JOB DESCRIPTION Laborer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2026	07/01/2027 Additional
Striper (Highway/streets):		
Striping-Machine Operator (Thermoplastic & Epoxy)	$ 43.00	+ $ 4.00
Striping - Lineperson (Crew Chief)	$ 47.00	
Flagger - Traffic Safety*	$ 41.00	

*Note- Includes but is not limited to: Positioning of cones and directing of traffic using handheld devices. Excludes the Driver/Operator of equipment used in protection of traffic safety.

SUPPLEMENTAL BENEFITS
Per hour paid:

Journeyworker	$ 25.77

OVERTIME PAY
See (B, H) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 11, 13) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 13) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:

1st Term (1-1999 hours)	$ 32.86
2nd Term (2000-4000 hours)	$ 34.50

Supplemental Benefits per hour:

All Terms	$ 25.77

9-1010-LS

Laborer 08/01/2026

JOB DESCRIPTION Laborer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2026	07/01/2027 Additional
Laborer/Excavation		
**Asbestos and Lead Abatement & Removal, Hazardous Waste Removal (including soil)	$ 46.60	$ 3.04
Basic	46.60	
Flagman	46.60	
Pipelayer	46.60	
*Tree Work, *Landscape	46.60	

*Includes trimming, cutting, planting and/or removal of trees.
** Applies to Heavy & Highway projects

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 57.77

Note: No payment of Supplemental Benefits is required on paid holidays, when employees do not work.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
When an observed holiday falls on a Saturday, work done shall be paid at double time.

HOLIDAY
Paid: See (2, 20) on HOLIDAY PAGE
Overtime: See (2, 5, 6, 11, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1000 hour terms at the following hourly wage rate.

		07/01/2026
1st	0 - 1000	$ 23.30
2nd	1001-2000	27.96
3rd	2001-3000	34.95
4th	3001-4000	41.60

Supplemental Benefits per hour:

All Apprentices	$ 57.77

9-731Ex

Laborer 08/01/2026

JOB DESCRIPTION Laborer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

GROUP 14: Blasters.

GROUP 16: Tunnel workers - including Miners, Drill Runners, Iron Men, Maintenance Men, Conveyor Men, Safety Miners, Riggers, Block Layers, Cement Finishers, Rod Men, Caulkers, Powder Carriers, Miners' Helpers, Chuck Tenders, Track Men, Nippers, Brake Men, Derail Men, Form Men, Bottom Bell, Top Bell or Signal men, Form Workers, Movers, Concrete Workers, Shaft Men, Tunnel Laborers and Caulkers' Helpers.

GROUP 17: All others including: Powder Watchmen, Top Laborers and Changehouse Attendants.

Wages: (per hour)	07/01/2026
Laborer (Tunnel)-FREE AIR:	
Group 14	$ 71.69
Group 16	68.58
Group 17	63.40
Small Bore Micro Tunnel Machines	80% of rates above
For Repairs on Existing Water Tunnels	90% of rates above
For Repairs of Sewer & Drainage Tunnels	85% of rates above
For Repair & Maintenance of all Subway & Vehicular Tunnels	80% of rates above

An additional $ 4.50 per hour for precast concrete segments.
An additional $ 6.50 per hour for liner plate & soil solidification.

Note: Employer shall pay $10.00 per day for each half mile starting at a point 500 feet from the bottom of the shaft.

SUPPLEMENTAL BENEFITS
Per hour:

GROUP 14	$ 63.84
GROUP 16	61.18
GROUP 17	56.62
Small Bore Micro Tunnel Machines	80% of rates above
For Repairs on Existing Water Tunnels	90% of rates above
For Repairs of Sewer & Drainage Tunnels	85% of rates above
For Repair & Maintenance of all Subway& Vehicular Tunnels	80% of rates above

OVERTIME PAY
OVERTIME: For Laborer (Free Air) See (D, M, R*) on OVERTIME PAGE.
For Repair Categories See (B, F, R*) on OVERTIME PAGE.
& Micro Tunneling
* Straight time first 8 hours, double time after 8 hours.

HOLIDAY
Paid: See (5, 6, 9, 11, 12, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 9, 11, 12, 15, 16, 25) on HOLIDAY PAGE

Good Friday may be exchanged for one of the holidays listed.

9-147Tnl/Free

Laborer - Building — 08/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2026	01/01/2027 Additional
Basic Laborer and Mason Tender	$ 46.05*	$ 1.25

*Before calculating premium wage deduct $ 3.50

SUPPLEMENTAL BENEFITS

Per hour:	
Basic Laborer and Mason Tender	$ 31.14

OVERTIME PAY
See (B, B2, E, E2, Q, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1000 hour terms at the following wage rate:

Term:	1st	2nd	3rd	4th
Basic Laborer and Mason Tender 07/01/2026	$ 22.87*	$ 24.62*	$ 26.12*	$ 28.62*

*Before calculating premium wage deduct $0.60

Supplemental Benefits per hour:

All Terms	$ 11.12

9-MTDC(79)

Laborer - Building — 08/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2026	01/01/2027 Additional
Skilled Interior Demolition Laborer:	$ 41.10*	+ $1.00**
General Interior Demolition Laborer:	$ 30.29*	

(General Demolition Laborer performs manual work and work incidental to demolition, such as loading and carting of debris from work site to an area where it can be loaded into trucks for removal).

* Before calculating overtime wages deduct $1.70.

** To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

Skilled Interior
Demolition Laborer: $ 25.19
General Interior
Demolition Laborer: $ 19.51

OVERTIME PAY
See (B, B2, I, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage Per Hour:

1000 hour terms at the following wage rate:

1st	2nd	3rd	4th
$ 22.85*	$ 24.60*	$ 26.10*	$ 28.60*

* Before calculating overtime wages deduct $0.60

Supplemental Benefits Per Hour:

All Terms: $ 10.67

9-MTDC (79-ID)

Laborer - Building — 08/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour: 07/01/2026

Laborer:
Laborer-Concrete
(including flag person) $ 42.53
+ 8.25*
* This portion is not subjected to overtime premiums.

SUPPLEMENTAL BENEFITS
Per Hour
$ 22.20
+ 10.00**
** This portion subjected to overtime premiums only on codes (E,Q)

OVERTIME PAY
OVERTIME: See (A,E,Q) on OVERTIME PAGE attached.
See (B,E,Q,) for work below street level to top of foundation.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 13, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
Terms based on hours listed:

1st	2nd	3rd
0-1334	1334-2668	2669-4000
$ 18.87 + 2.49*	$ 20.49 + 7.32*	$ 26.46 + 7.80*

* This portion is not subjected to overtime premiums.

Supplemental Benefits:
Per hour:

$ 14.70	$ 18.70	$ 18.70

+ 3.18*	+ 4.14*	+ 5.10*

Journeyworker rate applies after 4000 hours
*This portion subjected to same premium as wages.

9-6A/18A/20-C

Laborer - Building — 08/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2026	01/01/2027
Building:		Additional
Plasterer Tender and Spray Fireproofing Tender	$ 46.05*	$ 1.25

* Before calculating overtime wages deduct $ 3.50

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker	$ 31.14

OVERTIME PAY
See (B, B2, E, E2, Q, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1000 hours terms at the following wage.

	1st	2nd	3rd	4th
07/01/2026	$22.87*	$24.62*	$26.12*	$28.62*

* Before calculating overtime wages deduct $0.60

Supplemental Benefits per hour:

All Terms: $ 11.12

9-30 (79)

Laborer - Building — 08/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2026	01/01/2026 Additional
Asbestos, Lead and Hazardous Material Abatement Laborer	$ 42.90	$ 2.66*

NOTE: For Asbestos removal from Mechanical Systems that are NOT to be scrapped see ASBESTOS WORKER Classification
For Re-Roofing Asbestos Removal See ROOFER Classification

*To be allocated at a later date

SUPPLEMENTAL BENEFITS

Per Hour:	
Asbestos, Lead and Hazardous Material Abatement	$ 23.37

Laborer

OVERTIME PAY
See (B, B2, I) on OVERTIME PAGE
Wages Per Hour:

Asbestos, Lead and Hazardous Material Abatement Laborer	$ 62.90

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 28) on HOLIDAY PAGE

REGISTERED APPRENTICES
1000 hour terms at the following wages per hour:

	1st	2nd	3rd	4th
07/01/2026	$22.86	$23.91	$26.98	$29.14

OVERTIME PAY:

	1st	2nd	3rd	4th
07/01/2026	$33.26	$34.83	$39.44	$42.68

SUPPLEMENTAL BENEFIT
Per Hour:

All Terms	$ 16.94

4-NYDC(78)

Laborer - Building — 08/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2026	01/01/2027 Additional
Skilled Demolition Laborer:	$ 43.75*	$ 1.00
General Demolition Laborer:	32.33**	0.62

(General Demolition Laborer performs manual work and work incidental to demolition, such as loading and carting of debris from work site to an area where it can be loaded into trucks for removal).

*Before calculating overtime wages deduct:
$ 3.15

**Before calculating overtime wages deduct:
$ 2.50

NOTE: Total Demolition Only: Demolition shall be the complete demolition (wrecking) or dismantling of entire buildings or structures. Also may include the removal of all or any portion of a roof in which structural change is to occur. Structural change is defined as the removal of structural slabs, steel members, concrete members and penetration through the structural slab.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker:

Skilled Demolition Laborer:	$ 29.65
General Demolition Laborer:	22.71

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

(1) year terms at the following wage.

	1st	2nd	3rd	4th
07/01/2026	$ 22.87*	$ 24.62*	$ 26.12*	$ 28.62*

*Before calculating overtime wages deduct $0.60.

Supplemental Benefits per hour:

All Terms:

$ 11.62

9-79/95

Laborer - Concrete & Asphalt Paving — 08/01/2026

JOB DESCRIPTION Laborer - Concrete & Asphalt Paving **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Group 1: Slurry Seal Coater, Maintenance Safety Surface, Small Power Tool Operator, Play Equipment Installer, Temporary Fence Installer & Repairs, Laborer.

Group 2: Production Paving Work: Shoveler, small equipment operator.

Per hour:	07/01/2026
Concrete Formsetter	$ 50.85 + $ 9.60*
Asphalt Screeperson/Micro Paver	51.45 + $ 9.60*
Asphalt Raker	50.85 + $ 9.60*
Group 1	46.98 + $ 9.60*
Group 2	46.98 + $ 9.60*

* This portion is not subjected to overtime premiums.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker: $ 47.35

Note: No payment of supplemental benefits is required on paid holidays, when employees do not work.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
Note: Saturday premium rate applies from 7:00 am on Saturday to 6:59 am Sunday
Note: Sunday premium rate applies from Sunday 7:00 am to Monday 6:59 am.

HOLIDAY
Paid: See (5, *11, 20) on HOLIDAY PAGE
HOLIDAY:
Overtime: See (21,22)** on HOLIDAY PAGE.

Note: See (5,20) Holiday pay -at the single time pay rate-shall be prorated based on 25% of a day's wages and benefits for each day worked during that calendar week.

* Columbus Day shall be an unpaid holiday. In the event work is performed on Columbus Day, wages shall be paid on a double time basis.

**New Year's Day and Christmas Day: If an employee is performing work on these (2) days the employee will receive the single rate plus 25%.

Note-When Independence day falls on Saturday, it will be observed on that Saturday, however, when it occurs on a Sunday, it will be observed on the Monday.

REGISTERED APPRENTICES
Wage per hour:

2000 hours term:

1st term	2nd term
1-1999	2000-4000
$ 32.86 + $ 9.60*	$ 34.50 + $ 9.60*

* This portion is not subjected to overtime premiums.

Supplemental Benefits per hour:
2000 hours term:

1st term	2nd term
1-1999	2000-4000
$ 19.27	$ 19.27

9-1010H/H

Laborer - Trac Drill — 08/01/2026

JOB DESCRIPTION Laborer - Trac Drill **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Group 1:Chipper/Jackhammer, Powder Carrier, Hydraulic Chuck tender, Chuck Tender and Nipper, Magazine Keeper

Group 2: Hydraulic Trac Drill

Group 3: Air Trac, Wagon and Quarry bar

Group 4: Blaster

Per Hour:	07/01/2026	07/01/2027 Additional
Group 1	$ 46.60	$ 3.04
Group 2	53.95	
Group 3	53.12	
Group 4	59.81	

SUPPLEMENTAL BENEFITS
Per Hour:

All Classifications:	$ 57.77

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
When an observed holiday falls on a Saturday, work done shall be paid at double time.

HOLIDAY
Paid: See (2, 20) on HOLIDAY PAGE
Overtime: See (2, 5, 6, 11, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1000 hour terms at the following hourly wage rate.

		07/01/2026
1st	0 - 1000	$ 23.30
2nd	1001-2000	27.96
3rd	2001-3000	34.95
4th	3001-4000	41.60

Supplemental Benefits per hour:

All Apprentices	$ 57.77

9-731/29

Laborer - Tunnel — 08/01/2026

JOB DESCRIPTION Laborer - Tunnel **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
GROUP 5: Blasters and Mucking Machine Operators

GROUP 6: Tunnel Workers*(including Miners, Drill Runners, Iron Men, Maintenance Men, Inside Muck Lock Tender, Pumpmen, Electricians, Cement Finishers, Rod Men, Caulkers, Carpenters, Hydraulic Men, Shield Drivers, Monorail Operators, Motor Men, Conveyor Men, Safety Miners, Powder Carriers, Pan Men, Riggers, Miner's Helpers, Chuck Tenders, Track Men, Nippers, Brake Men, Form Workers, Concrete Workers, Tunnel Laborers, Caulker's Helpers), Hose Men, Grout Men, Gravel Men, Derail Men and Cable Men.

GROUP 7: Top Nipper

GROUP 8,9: Outside Man Lock Tender, Outside Muck Lock Tender, Shaft Men, Gauge Tender and Signal Men.

GROUP 10: Powder Watchmen, Top Laborers and Changehouse Attendants.

WAGES: (per hour)

	07/01/2026
Laborer (Compressed Air):	
GROUP 5	$ 75.14
GROUP 6	72.46
GROUP 7	71.24
GROUP 8,9	69.83
GROUP 10	61.57

An additional $3.00 per day when using an air spade, jack hammer or pavement breaker.

Note: Employer shall pay $10.00 per day for each one half (1/2) mile or fraction starting from a point 500 feet from the shaft.

SUPPLEMENTAL BENEFITS
SUPPLEMENTAL BENEFITS:
per hour:

GROUP 5	$ 66.51
GROUP 6	64.41
GROUP 7	63.14
GROUP 8,9	62.11
GROUP 10	58.18

OVERTIME PAY
See (D, M, *R) on OVERTIME PAGE
NOTE: Time and one-half to be paid for all overtime repair-maintenance work on existing equipment and facilities.

* Straight time first 8 hours, double time after 8 hours.

HOLIDAY
Paid: See (5, 6, 9, 11, 12, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 9, 11, 12, 15, 16, 25) on HOLIDAY PAGE
Good Friday may be exchanged for one of the holidays listed.

9-147Tnl/Comp Air

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Building

Wages per hour:	07/01/2026	01/01/2027 Additional
Mosaic & Terrazzo Mechanic	$ 62.82	$ 1.06
Mosaic & Terrazzo Finisher	61.22	

SUPPLEMENTAL BENEFITS
Per hour:

Mosaic & Terrazzo Mechanic	$ 31.91* + $11.63
Mosaic & Terrazzo Finisher	$ 31.91* + 11.61

*This portion of benefits subject to same premium rate as shown for overtime

wages.

OVERTIME PAY
See (A, E, Q) on OVERTIME PAGE
Deduct $7.00 from hourly wages before calculating overtime.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
Easter Sunday is an observed holiday.Holidays falling on a Saturday will be observed on that Saturday. Holidays falling on a Sunday will be celebrated on the Monday.

REGISTERED APPRENTICES
Wages Per hour:

	1st 0-1500	2nd 1501-3000	3rd 3001-3750	4th 3751-4500	5th 4501-5250	6th 5251-6000
07/01/2026	$25.90	$33.30	$40.85	$42.00	$50.56	$57.05

Supplemental Benefits per hour:

07/01/2026	$7.26* + 4.07	$9.33* + 5.23	$15.99* + 6.98	$24.31* + 8.14	$25.21* + 9.32	$28.21* + 10.46

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/3

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour:

	07/01/2026	12/07/2026 Additional	06/07/2027 Additional
Tile Setters	$ 66.35	$ 1.28	$ 1.41

SUPPLEMENTAL BENEFITS
Per Hour:
$ 30.56*
+8.56

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
Work beyond 10 hours on Saturday shall be paid at double the hourly wage rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

750 hour terms at the following wage rate:

1st 1-750	2nd 751-1500	3rd 1501-2250	4th 2251-3000	5th 3001-3750	6th 3751-4500	7th 4501-5250	8th 5251-6000	9th 6001-6750	10th 6501-7000
07/01/2026									
$23.09	$28.32	$35.65	$40.86	$44.67	$48.38	$52.23	$57.45	$59.83	$66.35

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th

07/01/2026									
$13.05* + $.77	$13.05* + $.82	$16.16* + $.93	$16.16* + $.98	$17.16* +$1.45	$18.66* +$1.51	$19.66* +$1.94	$19.66* +$1.99	$19.96* +$4.59	$30.56* +$8.56

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	01/04/2027 Additional
Building-Marble Restoration:		
Marble, Stone & Terrazzo Polisher	$ 48.72	$ 0.57

SUPPLEMENTAL BENEFITS

Per Hour:	
Journeyworker	
Building-Marble Restoration:	
Marble, Stone & Polisher	$ 32.78

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
* On Saturdays, 8th hour and successive hours paid at double hourly rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES per hour:

900 hour term at the following wage:

	1st 1-900	2nd 901-1800	3rd 1801-2700	4th 2701
07/01/2026	$ 34.10	$ 38.97	$ 43.84	$ 48.72
Supplemental Benefits Per Hour:				
07/01/2026	$ 31.28	$ 31.78	$ 32.29	$ 32.78

9-7/24-MP

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per Hour:

	07/01/2026	01/04/2027 Additional
Marble Cutters & Setters	$ 65.61	$ 0.75

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 41.38

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage Per Hour:

750 hour terms at the following wage

1st	2nd	3rd	4th	5th	6th	7th	8th
0-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500	7500+
07/01/2026							
$28.35	$42.51	$46.05	$49.59	$53.14	$55.76	$65.61	$65.61

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2026							
$27.95	$30.68	$31.37	$32.05	$32.73	$39.34	$41.38	$41.38

9-7/4

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	12/07/2026 Additional	06/07/2027 Additional
Tile Finisher	$ 50.93	$ 1.05*	$ 1.15*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:
$ 27.16*
+ $8.37

* This portion of benefits is subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (A, *E, Q) on OVERTIME PAGE
*Double time rate after 10 hours on Saturdays

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88-tf

Mason - Building — 08/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	01/04/2027 Additional
Marble, Stone, Maintenance Finishers:	$ 28.56	$ 0.41

Note 1: An additional $2.00 per hour for time spent grinding floor using "60 grit" and below.
Note 2: Flaming equipment operator

shall be paid an additional $25.00 per day.

SUPPLEMENTAL BENEFITS
Per Hour:

Marble, Stone
Maintenance Finishers: $ 16.54

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
*Double hourly rate after 8 hours on Saturday

HOLIDAY
Paid: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
1st term apprentice gets paid for all observed holidays.

REGISTERED APPRENTICES
WAGES per hour:

	07/01/2026
0-750	$ 23.78
751-1500	24.43
1501-2250	25.07
2251-3000	25.70
3001-3750	26.65
3751-4500	27.93
4501+	28.56

Supplemental Benefits:
Per hour:

0-750	$ 12.61
751-1500	13.12
1501-2250	13.65
2251-3000	14.18
3001-3750	14.97
3751-4500	16.01
4501+	16.54

9-7/24M-MF

Mason - Building / Heavy&Highway — 08/01/2026

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	01/04/2027 Additional
Marble-Finisher	$ 51.04	$ 0.53

SUPPLEMENTAL BENEFITS
Journeyworker:
Per hour

Marble- Finisher $ 38.46

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
Work beyond 8 hours on a Saturday shall be paid at double the rate.

HOLIDAY
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
When an observed holiday falls on a Sunday, it will be observed the next day.

9-7/20-MF

Mason - Building / Heavy&Highway — 08/01/2026

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2026
Brick/Block Layer	$ 69.84
Base Wage*	58.49

* For Premium/Overtime calculations purposes only.

SUPPLEMENTAL BENEFITS

Per Hour:

Brick/Block Layer	$ 37.95

OVERTIME PAY

See (A, E, E2, Q) on OVERTIME PAGE
* Base rate is utilized for Calculating Overtime Premiums then adding $ 11.35/hr.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

650 Hr Terms at the following Percentage of Brick/Block Layer "Base Wage" then adding $ 6.10 per hour:

1st	2nd	3rd	4th	5th	6th
40%	50%	60%	70%	80%	90%

Supplemental Benefits per hour:

All Apprentices	$ 26.45

4-1Brk

Mason - Building / Heavy&Highway — 08/01/2026

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2026
Cement Mason	$ 59.87

SUPPLEMENTAL BENEFITS

Per Hour:

Cement Mason	$ 34.81
1.5x OVERTIME	$ 63.30
2X OVERTIME	$ 69.62

OVERTIME PAY

See (B1, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 13, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year terms at the following wage:

1st	2nd	3rd
$ 23.77	$ 28.74	$ 34.27

Supplement Benefits per hour paid:

	1st	2nd	3rd
Straight Time	$ 14.86	$ 15.16	$ 15.27
1.5x OVERTIME	14.89	15.34	15.50
2X OVERTIME	14.91	15.51	15.73

4-780

Mason - Building / Heavy&Highway **08/01/2026**

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
NOTE: Shall include but not limited to Precast concrete slabs (London Walks) Marble and Granite pavers 2'x 2' or larger.
Per Hour:

	07/01/2026	05/01/2026 Additional
Stone Setter	$ 74.57	$ 3.25**
Base Wage	58.36*	

* For Premium/Overtime calculations purposes only.
** To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

Stone Setter	$ 44.75

OVERTIME PAY
See (*C, **E, Q) on OVERTIME PAGE
Base rate is utilized for Calculating Overtime Premiums then adding 16.21/Hr.

* On weekdays the eighth (8th) and ninth (9th) hours are time and one-half and all work thereafter is paid at double the hourly rate.

** On Saturday, the first nine (9) hours are paid at time and one-half and all work thereafter is paid at double the hourly rate.

HOLIDAY
Paid: See (*18) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 10) on HOLIDAY PAGE
Paid: * Must work first 1/2 of day.

REGISTERED APPRENTICES
800 Hour terms at the following base wages per hour then adding $ 7.42/Hr.

1st	2nd	3rd	4th	5th
$ 29.18	$ 35.02	$ 40.85	$ 46.69	$ 52.52

Apprentice Supplemental Benefits:
All Terms: $ 27.29

4-1Stn

Mason - Building / Heavy&Highway **08/01/2026**

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2026
Pointer, Cleaners & Caulkers	$ 66.84

SUPPLEMENTAL BENEFITS
Per Hour:

Pointer, Cleaners & Caulkers	$ 34.25

OVERTIME PAY
See (B, E2, H) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rates per hour.

1st	2nd	3rd	4th
$ 34.96	$ 39.69	$ 46.12	$ 55.30

Supplemental Benefits per hour paid:

1st	2nd	3rd	4th
$ 16.70	$ 20.80	$ 24.55	$ 25.55

4-1PCC

Operating Engineer - Building — 08/01/2026

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

PARTIAL COUNTIES
Dutchess: that part of Dutchess County lying south of the North City Line of the City of Poughkeepsie.

WAGES
NOTE: Construction surveying
Party Chief--One who directs a survey party
Instrument Man--One who runs the instrument and assists Party Chief.
Rodman--One who holds the rod and assists the Survey Crew

Wages:(Per Hour)	07/01/2026
Building Construction:	
Party Chief	$ 81.94
Instrument Man	60.49
Rodman	40.63
Steel Erection:	
Party Chief	$ 84.04
Instrument Man	63.19
Rodman	43.31
Heavy Construction-NYC counties only: (Foundation, Excavation.)	
Party Chief	$ 88.97
Instrument man	66.04
Rodman	55.85

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2026
Building Construction	$ 29.45* + 7.65
Steel Erection	31.25* + 7.65
Heavy Construction	32.06* + 7.64

* This portion subject to SAME premium as wages

Non-Worked Holiday Supplemental Benefit: $ 22.48

OVERTIME PAY
See (A, B, E, Q) on OVERTIME PAGE
Code "A" applies to Building Construction and is subject to double the rate after 7 hours on Saturdays.
Code "B" applies to Heavy Construction and Steel Erection and is subject to double the rate after 8 hours on Saturdays.

HOLIDAY
Paid: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

9-15Db

Operating Engineer - Building, Maintenance, Steel Erection & Heavy Construction — 08/01/2026

JOB DESCRIPTION Operating Engineer - Building, Maintenance, Steel Erection & Heavy Construction **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
STEEL ERECTION:

Group 1: Derrick, travelers, tower, crawler tower & climbing cranes

Group 2: Oiler (Truck Crane)

Group 3: Oiler (Crawler Crane)

BUILDING CONSTRUCTION:

Group 1: Installing, repairing, maintaining, dismantling of all equipment including Steel cutting& bending machines, mechanical heaters, mine hoists, climbing cranes, tower cranes, Linden Peine, Lorain, Liebherr, Mannes and machines of a similar nature; Well Point system, Deep Well pumps, Concrete mixers with loading devices, Concrete plants, motor generators (When used for temporary power and lights(Driving maintenance trucks and mounted-welded machines)-All Pumps(excluding River Cofferdam Pumps and Well Point Pumps), Motorized Concrete Buggies(When three or more are on job site), Skid-Steer and similar machines

Group 2:Maintenance of: Pumps, Generators, Mixers, Heaters

Group 3: Oilers of all gasoline, electric, diesel or air operated Gradalls; Concrete Pumps, Overhead Cranes in Power Houses, Assist in oiling, greasing and repairing of all machines, including: Driving Truck Cranes, Driving and operating Fuel and Grease Trucks, Cherry Pickers(Hydraulic Cranes) over 70,000 GVW and machines of a similar nature

Group 4: Oiler on Crawler Cranes, Backhoes, Trenching Machines, Gunite Machines, Compressors(3 or more in battery)

Group 5: Maintenance on Radiant Mechanical Heaters

HEAVY CONSTRUCTION (Excavation, Foundations, etc)

Group 1:Maintenance of: Generators, Light Towers

Group 2:Maintenance of: Pumps, Mixers including mudsucking

Group 3: Base Mounted Tower Cranes

Group 4: Installing, repairing, maintaining, dismantling(of all equipment including Steel cutting & Bending machines, Fusion Coupling Machines, Vermeer Trenching machines, on-site crushing plant, mechanical heaters(1 through 7),Mine hoists, Tower Cranes, Linden Peine, Lorrain, Lebherr, Mannes or machines of a similar nature, Wellpoints)-Driving maintenance trucks and truck mounted welding machines, burning, welding-operating of accumilator for shield-driven tunnels, in addition to the performance of other duties: Handling, installation, jointing, coupling of all permanent steel and plastic pipe. RIDE UPON MOLES-tunnel boring machines-MICRO TUNNELING SYSTEMS, All temporary pipefitting;When three or more motorized concrete buggies(Ride type)are utilized on the jobsite they shall be serviced, maintained and repaired by the maintenance engineer. The Operating Engineer on autogrades(C.M.I.)is to be assisted by the maintenance engineer who shall in addition perform other duties.

WAGES:	
Per hour:	07/01/2026
Steel Erection:	
Group 1	$ 83.44
Group 2	78.48
Group 3	58.31
Building Construction:	
Group 1	$ 72.50
Group 2	57.45
Group 3	69.18
Group 4	52.71
Group 5	46.16
Heavy Construction:	
Group 1	$ 58.75
Group 2	60.12
Group 3	111.47
Group 4	86.18

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2026

Building Construction:	$ 31.43* + $7.40
Steel Erection & Heavy	31.93* + $7.40

* This portion of benefits is subject to same OT premium as wages.

Non-Worked Holiday Supplemental Benefits:

Building Construction:	$ 22.28
Steel Erection & Heavy:	22.53

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages Per Hour:
(1) year terms at the following wage rates:

1st	2nd	3rd	4th.
$ 39.41	$ 46.58	$ 50.17	$ 53.75

Supplemental Benefits:
Per Hour:

All Terms	$ 17.18* + 7.40

* This portion of benefits is subject to same OT premium as wages.

9-15Ab

Operating Engineer - Building / Heavy&Highway 08/01/2026

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
EQUIPMENT COVERED: Jet-Rodder/Vacuum Truck, Flusher, Sewer Rodder, Stetco Hoist and similar, Sewer Winch/Tugger Hoist and similar, Vacall/Vactor, Closed Circuit Television Inspection Equipment, Chemical Grouting Equipment and similar, John Beame, Meyers and similar.

Per Hour: 07/01/2026

Maintenance Engineer (Sewer Systems)	$ 86.18

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 31.93* + $ 7.40

*This portion of benefits subject to SAME premium as OT wages.

Non-Worked Holiday Supplemental Benefits:
$ 22.53

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour:
(1) year terms at the following wage rates.

1st	2nd	3rd	4th
$ 39.41	$ 46.58	$ 50.17	$ 53.75

Supplemental Benefits:
Per Hour:

All Apprentices:	$ 17.18*
	+ $ 7.40

* This portion of benefits subject to the SAME premium as OT wages

9-15Sewer

Operating Engineer - Building / Heavy&Highway — 08/01/2026

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2026	08/01/2026
Well Driller	$ 44.37	$ 45.63
Well Driller Assistant	38.44	39.53

Hazardous Waste Differential
Added to Hourly Wage:

Level A	$ 3.00
Level B	$ 2.00
Level C	$ 1.00

Monitoring Well Work
Add to Hourly Wage:

Level A	$ 3.00
Level B	$ 2.00

SUPPLEMENTAL BENEFITS
Per Hour:

Well Driller & Assistant	10% of Total Wage at Straight time Wage Rate plus $ 13.50*

*Additional $ 4.25/Hr. for Premium Time Hours Worked

OVERTIME PAY
See (B2, P, S) on OVERTIME PAGE

HOLIDAY

Paid:	See (5, 6, 16, 23) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES
Apprentices at 12 Month Terms

Wages Per Hour:

	1st	2nd	3rd
07/01/2026	$ 29.40	$ 30.43	$ 31.46
08/01/2026	$ 30.80	$ 31.86	$ 32.92

SUPPLEMENTAL BENEFITS
Per Hour:

All Terms	10% of Total Wage at Straight time Wage Rate plus $ 13.50*

*Additional $ 4.25/Hr. for Premium Time Hours Worked

4-138well

Operating Engineer - Building & Steel Erection — 08/01/2026

JOB DESCRIPTION Operating Engineer - Building & Steel Erection **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per Hour:	07/01/2026
STEEL ERECTION:	
Three Drum Derricks	$ 110.48
Cranes, Two Drum Derricks, Hydraulic Cranes & Fork Lifts, Boom Trucks	106.42
Compressors, Welding Machines	61.86
Compressors (not combined with welding machines)	59.21
BUILDING CONSTRUCTION:	
Cranes, Stone Derrick, Boom Trucks, Hydraulic Cranes, Double Drum	$ 107.56
4 Pole Hoists and Single Drum Hoists	101.92
Fork Lifts, Plaster(Platform Machine)Plaster Bucket, Concrete Pumps and all other equipment used for hoisting	88.93
House Cars and Rack & Pinion	81.47
House Cars (New Projects)	72.00
Erecting and dismantling Cranes	58.74
Compressors, Welding Machines(Cutting Concrete-Tank Work), Paint Spraying, Sand Blasting, Pumps(With the exclusion of concrete pumps), House Car (Settlement basis only), All Engines irrespective of power(Power-Vac)used to drive auxiliary equipment Air, Hydraulic, etc., Boilers, Jacking System	89.81
	62.58

APPLICABLE TO BUILDING CATEGORY:
CRANES: Crawler Or Truck

	In Addition To Above Crane Rates
100' to 149' Boom	$ 1.75/hr
150' to 249' "	$ 2.00/hr
250' to 349' "	$ 2.25/hr
350' to 450' "	$ 2.75/hr
Tower Crane	$ 2.00/hr

APPLICABLE TO STEEL CATEGORY:
CRANES: Crawler Or Truck

	In Addition To Above Crane Rates
100' to 149' Boom	$ 2.25/hr
150' to 249' "	$ 2.50/hr
250' to 349' "	$ 2.75/hr
350' to 450' "	$ 3.25/hr
Tower Crane	$ 2.50/hr

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2026
All Operator Classes	$ 29.65* plus $ 6.30

* This portion of the benefits is subject to the same premium as shown for overtime wages.

OVERTIME PAY

See (*B, **C, ***D, O) on OVERTIME PAGE
*Applies to House Cars and Rack & Pinion after 8 hours worked in a day, Saturday, Sunday and Holidays
**Applies to Building Construction category
***Applies to Steel Erection

HOLIDAY

Paid: See (5, 6, 8, 11, 12, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 12, 15, 16, 25, 26) on HOLIDAY PAGE
Codes 8 and 12 apply ONLY to Steel Erection

Code 16 applies ONLY to Building Construction

REGISTERED APPRENTICES
Wage Per Hour:

Apprentices (1) year terms at the following rates:

	1st	2nd	3rd
07/01/2026	$ 46.09	$ 55.84	$ 65.58

Supplemental Benefits Per Hour:

Straight Time	$ 19.15*
	plus $ 6.30

* This portion of benefits subject to the same premium as shown for overtime wages.

9-14 B&S

Operating Engineer - Heavy Construction 1 — 08/01/2026

JOB DESCRIPTION Operating Engineer - Heavy Construction 1 **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
(For Groups 23 - 28, see Operating Engineer - Heavy Construction 2)

Group 1: Tower Crane/Climbing Crane
Group 2: Backhoes (Including all track and rubber tire backhoes over 37,000 lbs), Power Shovels, Steel Erection: Hydraulic Clam Shells, Moles and machines of a similar nature
Group 3: Mine Hoists, Cranes, etc, used as Mine Hoists
Group 4: Gradalls, Keystones, Cranes (With digging buckets), Bridge Cranes, Trenching Machines, Vermeer Cutter and machines of a similar nature
Group 5: Pile Drivers and Rigs (Employing Dock-Builders Foreman), Derrick Boats, Tunnel Shovels,
Group 6: All Drills and machines of a similar nature
Group 7: Back-Filling Machines and Cranes, Mucking Machines, Dual Drum Pavers
Group 8: Mixers (Concrete with loading attachment), Concrete Pavers, Cableways, Land Derricks, Power House (Low pressure units)
Group 9: Concrete Pumps, Concrete Plant, Stone Crushers, Double Drum Hoists, Power Houses (Other than above)
Group 10: Concrete Mixer
Group 11: Elevators
Group 12: Concrete Breaking Machines, Single Drum Hoists, Load Masters, Locomotives and Dinkies (Over 10 tons), Hydraulic Crane-Second Engineer
Group 13: On-Site Concrete Plant Engineers, On-Site Asphalt Plant Engineer and Vibratory Console
Group 14: Barrier Mover, Barrier Transport and machines of a similar nature
Group 15: Compressors (Portable, 3 or more), Truck Compressor (Engineer Driver), Tugger Machines, Well Point Pumps, Chum Drill
Group 16: Boilers(High pressure),Compressors, Pumps(River Cofferdam) and Welding Machines(except where arc is operated by another Operating Engineer) Push Button Machines, All Engines, irrespective of power(Power Pac) used to drive auxiliary equipment, Air, Hydraulic, etc.
Group 17: Utility-Horizontal Boring Rig
Group 18: Utility Compressors
Group 19: Paving-Asphalt Spreader, Autogrades (C.M.I.), Roto-Mill
Group 20: Paving-Asphalt Roller
Group 21 Paving-Asphalt Plant
Group 22: Roller (non paving, all sizes)

WAGES:(per hour)	07/01/2026
Group 1	$ 126.80
Group 2	105.80
Group 3	108.99
Group 4	106.50
Group 5	104.54
Group 6	100.63
Group 7	102.40
Group 8	99.64
Group 9	97.70
Group 10	93.68
Group 11	87.96

Group 12	89.76
Group 13	90.36
Group 14	81.76
Group 15	69.81
Group 16	65.36
Group 17	95.11
Group 18	64.97
Group 19	99.64
Group 20	97.27
Group 21	83.24
Group 22	97.27

Cranes: Crawler or Truck

100' to 149'	$0.50 per hour additional to above Crane Rates
150' to 249'	$0.75 per hour additional to above Crane Rates
250' to 349'	$1.00 per hour additional to above crane Rates
350' to 450'	$1.50 per hour additional to above crane Rates

SUPPLEMENTAL BENEFITS

Per Hour:
Groups 1-22
Regular Time $ 29.65* plus $ 6.30

* This portion of benefits subject to the same premium as shown for wages.

Non-Worked Holiday Supplemental Benefits:
$ 22.80

OVERTIME PAY

See (D, O) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Per Hour:
(1) year terms at the following wage rates:

	1st	2nd	3rd
Groups 1-22	$ 46.09	$ 55.84	$ 65.58

Supplemental Benefits:

Groups 1-22
Regular Time $ 19.15*
plus $ 6.30

* This portion of benefits is subject to the SAME PREMIUM as shown for overtime wages

9-14 HC

Operating Engineer - Heavy Construction 2 — 08/01/2026

JOB DESCRIPTION Operating Engineer - Heavy Construction 2 **DISTRICT** 9

ENTIRE COUNTIES

Bronx, Kings, New York, Queens, Richmond

WAGES

(For Groups 1 - 22, see Operating Engineer - Heavy Construction 1)

Group 23: Cherry Picker (Over 20 tons), Loader (Over 6 yards)

Group 24: Backhoes and Loaders (Up to 37,000lbs), Bulldozers, Scrapers, Turn-A-Pulls, Tugger Hoists, Tractors, Hysters, Roustabout Cranes, Conveyors, Ballast Regulators (Ride On), Track Removal Machine or similar, Motor Graders, Locomotives (10 tons and under),Curb & Gutter Pavers and machines of a similar nature

Group 25: Post Hole Digger, Ditch Winch, Road Finishing Machines, Rollers (5 tons and under, Dual Purpose Trucks, Forklifts, Dempsey Dumpsters, Fireman

Group 26: Service Engineer (Gradalls, Concrete Pumps, Cold Planers Grader)

Group 27: Service Mechanic (Shovels, Draglines, Crawler Cranes, Backhoes, Trenching Machines, Compressors (3 or more in battery)

Group 28: Steam Equipment Operator (Water rigs, steam shovels, power boilers, derrick boats)

WAGES:(per hour)	07/01/2026
Group 23	$ 89.06
Group 24	86.57
Group 25	82.43
Group 26	78.23
Group 27	55.82
Group 28	82.43

Cranes: Crawler or Truck

100' to 149'	$0.50 per hour additional to above Crane Rates
150' to 249'	$0.75 per hour additional to above Crane Rates
250' to 349'	$1.00 per hour additional to above crane Rates
350' to 450'	$1.50 per hour additional to above crane Rates

SUPPLEMENTAL BENEFITS

Per Hour:
Groups 23-28
Regular Time $ 31.93*
+ $7.40

* This portion of benefits subject to the same OT premium as wages.

Non-Worked Holiday Supplemental Benefits:
$ 22.53

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

REGISTERED APPRENTICES

Per Hour:
(1) year terms at the following wage rates:

	1st	2nd	3rd	4th
Groups 23-28	$ 39.41	$ 46.58	$ 50.17	$ 53.75

Supplemental Benefits:

Regular Time $ 17.18*
+ $ 7.40

* This portion of benefits subject to same OT premium as wages.

9-15 HC

Operating Engineer - Marine Dredging — 08/01/2026

JOB DESCRIPTION Operating Engineer - Marine Dredging **DISTRICT** 4

ENTIRE COUNTIES
Albany, Bronx, Cayuga, Clinton, Columbia, Dutchess, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Orange, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES
These wage rates do not apply to Operating Engineers on land-based construction projects. For those projects, refer to the Operating Engineers Heavy/Highway rates. The wage rates listed below apply specifically to all equipment and operators involved in marine dredging work within navigable waters located in the counties listed above.

Per Hour:	07/01/2026	10/01/2026
CLASS A1 Deck Captain, Leverman, Mechanical Dredge Operator, Licensed Tug Operator with MOTV	$ 48.48	$ 49.94
CLASS A2	43.20	44.50

Crane Operator (360 swing)

CLASS B Dozer, Front Loader Operator (On Land)	To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits.	
CLASS B1 Derrick Operator (180 swing), Spider/Spill Barge Operator I/II, Fill Placer, Engineer, Chief Mate, Electrician,Chief Welder,Maintenance Engineer, Licensed Boat, Crew Boat Operator	41.93	43.18
CLASS B2 Certified Welder	39.46	40.65
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	38.38	39.53
CLASS C2 Boat Operator	37.15	38.26
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	30.86	31.79

SUPPLEMENTAL BENEFITS
Per Hour:
THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes:	7% of Hourly Straight time wage + $12.00.	7.5% of Hourly Straight time wage + $12.00.

- Additional $0.63 per hour for Overtime hours

OVERTIME PAY
See (B2, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

Operating Engineer - Survey Crew - Consulting Engineer — 08/01/2026

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
Dutchess: That part in Duchess County lying South of the North City line of Poughkeepsie.

WAGES
Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour: Survey Classifications	07/01/2026
Party Chief	$ 51.16
Instrument Man	42.44
Rodman	36.92

SUPPLEMENTAL BENEFITS
Per Hour:

All Crew Members:	$ 24.53

OVERTIME PAY
OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.

*Double-time paid on the 9th hour on Saturday.

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

9-15dconsult

Painter **08/01/2026**

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2026	05/01/2027 Additional
Brush	$ 55.76	$2.77*
Abatement/Removal of lead based or lead containing paint on materials to be repainted.	55.76	
Spray & Scaffold	$ 58.76	
Fire Escape	58.76	
Decorator	58.76	
Paperhanger/Wall Coverer	57.27	

*To be allocated at a later date.

SHIFT WORK
Agency/Government mandated off-shift work to be paid at time and one-half the hourly wage.

SUPPLEMENTAL BENEFITS
Per hour:

Paperhanger	$ 39.86
All others	36.72
Paperhanger Premium	45.26
Premium	41.23**

**Applies only to "All others" category, not paperhanger journeyworker.

OVERTIME PAY
See (A, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rate.

Per hour:	07/01/2026
Appr 1st term...	$ 21.18
Appr 2nd term...	27.40
Appr 3rd term...	33.30
Appr 4th term...	44.67

Supplemental benefits:

Per Hour:	
Appr 1st term...	$ 18.06
Appr 2nd term...	22.14
Appr 3rd term...	25.59
Appr 4th term...	32.55

8-NYDC9-B/S

Painter **08/01/2026**

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

PARTIAL COUNTIES
Nassau: Atlantic Beach, Ceaderhurst, East Rockaway,Hewlett, Hewlett Bay, Hewlett Neck, Hewlett Park, Inwood, Lawrence, Lido Beach, Long Beach, parts of Lynbrook, parts of Oceanside, parts of Valley Stream, and Woodmere. Starting on South side of Sunrise Hwy in Valley Stream running east to Windsor and Rockaway Ave, Rockville is the boundary line up to Lawson Blvd, turning right going west all the above territory. Starting at Union Turnpike &Lakeville Rd going north to northern Blvd. the west side of Lakeville Rd to Northern Blvd. At Northern Blvd doing east the district north of Northern blvd to Port Washington blvd. West of Port Washington blvd to St.Francis Hospital then north of first traffic light to Port Washington & Sands Point, Manor Haven, & Harbour Acres.

WAGES

Per hour:	07/01/2026	01/01/2027
		Additional
Drywall Taper	$ 60.12	$0.50*

*To be allocated at a later date.

SHIFT WORK
When directly specified in public agency or authority contract documents for an employer to work an irregular or off-shift, all employees who work any shifts between 3pm-11pm or 11pm-7am will be paid wage rate as followed:

$ 67.64

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker: $ 27.61

OVERTIME PAY
See (A, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (4, 6, 8, 11, 18, 19, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1st term	$ 23.83
2nd term	30.50
3rd term	36.42
4th term	48.27

Supplemental Benefits per hour:

1st term	$ 15.73
2nd term	21.67
3rd term	22.86
4th term	25.23

8-NYC9-1974-DWT

Painter - Bridge & Structural Steel — 08/01/2026

JOB DESCRIPTION Painter - Bridge & Structural Steel **DISTRICT** 8

ENTIRE COUNTIES
Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES
Per Hour:
STEEL:

Bridge Painting:	07/01/2026	10/01/2026
	$ 57.00*	Additional
	+ 12.90**	+ 3.64***

ADDITIONAL $7.00 per hour for POWER TOOL/SPRAY, whether straight time or overtime.

*NOTE: All premium wages are to be calculated on base rate per hour only.

** For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

*** To be allocated a later date

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SHIFT WORK
When directly specified in public agency or authority contract documents for an employer to work a second shift and works the second shift with employees other than from the first shift, all employees who work the second shift will be paid 10% of the base wage shift differential in lieu of overtime for the first eight (8) hours worked after which the employees shall be paid at time and one half of the regular wage rate. When a single irregular work shift is mandated in the job specifications or by the contracting agency, wages shall be paid at time and one half for single shifts between the hours of 3pm-11pm or 11pm-7am.

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker:

$ 13.49
+ 31.67*

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage - Per hour:
Apprentices: (1) year terms.

	07/01/2026
1st year	$ 22.80* + 5.64**
2nd year	$ 34.20* + 7.74**
3rd year	$ 45.60* + 10.31**

*NOTE: All premium wages are to be calculated on base rate per hour only.

** For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

Supplemental Benefits - Per hour:

1st year	$ 13.74
2nd year	$ 8.09* + 18.99
3rd year	$ 10.79* + 25.34

*Portion not applicable to May 1st to November 15th and Nov 16th to April 30th period mentioned above.

8-DC-9/806/155-BrSS

Painter - Metal Polisher — 08/01/2026

JOB DESCRIPTION Painter - Metal Polisher **DISTRICT** 8

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2026
Metal Polisher	$ 41.33
Metal Polisher*	42.43
Metal Polisher**	45.33

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker:
All classifications $ 13.99

OVERTIME PAY
See (B, E, P, T) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year term at the following wage rates:

	07/01/2026
1st year	$ 20.67
2nd year	22.73
3rd year	24.80
1st year*	$ 21.06
2nd year*	23.17
3rd year*	25.34
1st year**	$ 23.17
2nd year**	25.23
3rd year**	27.30

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
Per hour:

1st year	$ 9.19
2nd year	9.19
3rd year	9.19

8-8A/28A-MP

Plasterer — 08/01/2026

JOB DESCRIPTION Plasterer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per hour:

	07/01/2026	08/01/2026
Building:		
Plasterer/Traditional &	$ 49.18	$ 49.88
Spraying Fireproofing	+ $6.00*	+ $6.00*

*This portion is not subjected to OT premiums.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker $ 26.73 $ 27.53

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages: (Per hour) 800 hours term:	07/01/2026	08/01/2026
1st term	$ 19.50 + 1.00*	$ 19.69 + 1.00*
2nd term	$ 22.94 + 1.00*	$ 23.16 + 1.00*
3rd term	$ 26.43 + 1.00*	$ 26.68 + 1.00*

*This portion is not subjected to OT premiums.

Supplemental Benefits: (Per hour): (800) hours term:		
1st term	$ 11.95	$ 12.15
2nd term	12.44	12.67
3rd term	13.08	13.35

9-262

Plumber — 08/01/2026

JOB DESCRIPTION Plumber **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2026	07/01/2027 Addtional
Plumber	$ 78.05	+ $3.00
Temporary Service**	$ 62.52	

** Temporary Service- Includes Maintenance of cooling & heating apparatus, maintenance work on pneumatic systems during the construction period, and work on temporary heat. All hours paid at straight time, including holidays.

**THERE ARE NO HELPERS UNDER THIS CLASSIFICATION.

On tower work, bridges, elevated highway, or buildings, where pipe is being installed, fifty (50) or more feet vertically in a free drop from its base, an additional $1.00 per hour.

SHIFT WORK
Shift work, when directly specified in public agency or authority contract documents, and continues for a period of not less than ten (10) consecutive work days. A shift shall consist of seven(7) hours with one-half (1/2) hour for lunch after the first four (4) hours of each shift.
A premium of thirty percent (30%) for wages and supplemental benefits on shift work performed Monday through Friday on the 4 P.M. and midnight shifts.
For shift work performed on weekends the shift premium shall be fifty percent (50%) of wages and supplemental benefits.
For shift work performed on holidays designated below, double time wages and supplemental benefits shall be paid. Also noted that the normal workday Monday through Friday 8:00 A.M. to 3:00 P.M. is not considered shift work, and therefore not subject to shift premium.

SUPPLEMENTAL BENEFITS
Per hour:

Plumber	$ 46.40
Temporary Service	$ 37.04

OVERTIME PAY
See (C, *D, O, V) on OVERTIME PAGE
*Where the plumbing contract price is two million dollars ($2,000,000.00) or less, code D applies.

HOLIDAY
Plumber

Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE.
Repairs & Maintenance
Paid: See (1) on HOLIDAY PAGE.
Overtime: See (5, 6, 25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:

(1/2) year terms at the following wage:

1st	2nd	3rd&4th	5th&6th	7th&8th	9th	10th
$ 19.00	$ 21.00	$ 31.78	$ 33.88	$ 36.73	$ 38.13	$ 50.20

Supplemental Benefits:
(1/2) year term at the following dollar amount:

1st	2nd	3rd-10th
$ 5.43	$ 6.43	$ 24.44

9-1 Const

Plumber - Pump & Tank: Oil Trades Installation & Maintenance — 08/01/2026

JOB DESCRIPTION Plumber - Pump & Tank: Oil Trades Installation & Maintenance **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2026
Pump & Tank	$ 75.00

SUPPLEMENTAL BENEFITS
Per hour:

Plumber	$ 35.81

OVERTIME PAY
Pump & Tank See (B, F, H) on OVERTIME PAGE.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE.
Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE.

9-1-P&T

Plumber - Repairs & Maintenance — 08/01/2026

JOB DESCRIPTION Plumber - Repairs & Maintenance **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2026	01/01/2027 Additional
Repairs & Maintenance	$ 49.96	$ 1.90

Repair & Maintenance work is any repair and/or replacement of present plumbing system that does not change existing roughing or water supply lines. Projects regardless of work type which have approved plans and specifications wherein the plumbing exceeds $250,000 are excluded.

SUPPLEMENTAL BENEFITS
Per hour:

Repair & Maintenance	$ 22.86

OVERTIME PAY
See (B, H) on OVERTIME PAGE.

HOLIDAY
Paid: See (1,15) on HOLIDAY PAGE.
Overtime: See (5, 6, 25) on HOLIDAY PAGE.

9-1 R&M

Roofer — 08/01/2026

JOB DESCRIPTION Roofer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2026	05/01/2027
		Additional
Roofer/Waterproofer	$ 52.50 + $7.00*	+ $ 3.00

* This portion is not subjected to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS
Per Hour: $ 33.12

OVERTIME PAY
See (B, H) on OVERTIME PAGE
Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year term apprentices indentured prior to 01/01/2023

1st	2nd	3rd	4th
$ 18.38	$ 26.25 + 3.50*	$ 31.50 + 4.20*	$ 39.38 + 5.26*

Supplemental Benefits:

1st	2nd	3rd	4th
$ 4.32	$ 16.94	$ 20.17	$ 25.03

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

1st	2nd	3rd	4th	5th
$ 19.95	$ 23.63 + 3.16*	$ 26.25 + 3.50*	$ 31.50 + 4.20*	$ 39.38 + 5.26*

Supplemental Benefits:

1st	2nd	3rd	4th	5th
$ 8.15	$ 15.32	$ 16.94	$ 20.17	$ 25.03

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker — 08/01/2026

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour:

	07/01/2026	08/01/2026
Sign Erector	$ 62.00	$ 64.00

NOTE: For Structurally Supported Overhead Highway Signs (See STRUCTURAL IRON WORKER CLASSIFICATION)

SUPPLEMENTAL BENEFITS
Per Hour:

Sign Erector	$ 59.58	$ 60.62

OVERTIME PAY
See (B, F, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour:
6 month Terms at the following percentage of Sign Erectors wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	40%	45%	50%	55%	60%	65%	70%	75%	80%

SUPPLEMENTAL BENEFITS Per Hour:

07/01/2026

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 19.04	$ 21.62	$ 24.21	$ 26.79	$36.17	$ 39.36	$ 43.50	$ 46.77	$ 50.05	$ 53.32

08/01/2026

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 19.45	$ 22.09	$ 24.72	$ 27.36	$36.81	$ 40.07	$ 44.29	$ 47.62	$ 50.95	$ 54.29

4-137-SE

Sheetmetal Worker — 08/01/2026

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2026	11/01/2026 Additional	05/01/2027 Additional
Sheetmetal Worker	$ 64.82	1.50*	1.50*
Maintenance of Fans	$ 53.40		
Temporary Operation			

*To be allocated at a later date

SUPPLEMENTAL BENEFITS
Per Hour:

All Classifications: $ 55.52

At time and one Half: $ 81.58

At Double Time: $ 107.64

OVERTIME PAY
See (B, *E, E2, Q) on OVERTIME PAGE
* Double the hourly rate on Saturday after 10 Hours

Maintenance of Fans
Temporary Operation: B,E, & Q

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26, 29) on HOLIDAY PAGE

REGISTERED APPRENTICES
Six(6) Month Terms As Follows:
Wages per hour:

1st & 2nd Term	3rd & 4th Term	5th & 6th Term	7th & 8th Term	9th Term
$ 22.57	$ 29.07	$ 35.57	$ 45.37	$ 51.83

Supplemental Benefits Per Hour:

	1st & 2nd Term	3rd & 4th Term	5th & 6th Term	7th & 8th Term	9th Term
Straight Time:	$ 20.47	$ 27.77	$ 32.83	$ 43.37	$ 45.44

At time and one Half:				
$ 30.06	$ 40.82	$ 48.25	$ 59.33	$ 66.77
At Double Time:				
$ 39.64	$ 53.86	$ 63.66	$ 78.28	$ 88.10

4-28

Steamfitter **08/01/2026**

JOB DESCRIPTION Steamfitter **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2026	01/01/2027 Additional
AC Service/Heat Service & Refrigeration Technician	$ 48.35	1.00*

- Includes the installation, service, maintenance, repair and replacement, of refrigeration, air cooling and heating, air conditioning, Oil Burner and Stoker.

- Air Cooling / Heating Equipment installation is not to exceed fifteen (15) tons, or equal to 6,000 CFM or 180,000 BTU combined on any one project.

- Refrigeration Equipment installation is not to exceed five (5) Horsepower combined on any one project.

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour Worked:

AC Service/Heat Service & Refrigeration Technician	$ 21.40 + 3.06*

* Portion of benefit not applicable to overtime hours and paid holidays.

OVERTIME PAY
See (B, E, *K) on OVERTIME PAGE
* See Holidays

HOLIDAY
Paid: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE
Note:
- Additional 15% premium on STRAIGHT-TIME wages if worked (11, 15, 25, 26)
- Time and one half of the hourly rate if worked (5, 6)

REGISTERED APPRENTICES
1 year terms at the following wages per hour:

1st	2nd	3rd	4th
$23.39	$28.25	$32.91	$39.75

Supplemental Benefits for hours worked:

1st	2nd	3rd	4th
$12.84 + 3.06*	$14.50 + 3.06*	$16.22 + 3.06*	$18.52 + 3.06*

* Portion of benefit not applicable to overtime hours and paid holidays.

4-638B-StmFtrRef

Steamfitter **08/01/2026**

JOB DESCRIPTION Steamfitter **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2026	10/01/2026 Additional
Sprinkler/Steam AC & Heat Fitter	$ 70.36	$ 1.50*
Temporary Heat & AC Fitter	$ 53.49	

* To be allocated at a later date.

SHIFT WORK
Add 15% to Hourly Wage and Hourly Supplemental Benefit for "Contracting Agency" Mandated Off Shift Work.

SUPPLEMENTAL BENEFITS
Per Hour:

Sprinkler/Steam Fitter	$ 56.49
Temporary Heat & AC Fitter	$ 46.14

OVERTIME PAY
The posted hourly PREMIUM TIME rates are applicable as follows:
- After 7 hours worked per day for Sprinkler/Steamfitter AC & Heat Fitter
- After 8 hours worked per day for Temporary Heat/AC Fitter
- Hours worked on Saturdays, Sundays and Holidays

Per Hour:

PREMIUM TIME Wages:

Sprinkler/Steam	$ 140.66
Temp Heat/AC	$ 106.92

PREMIUM TIME Supplemental Benefits per hour:

Sprinkler/Steam	$ 112.14
Temp Heat/AC	$ 91.44

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms at the following wages Per hour:

	1st	2nd	3rd	4th	5th
07/01/2026	$ 28.18	$ 35.21	$ 42.24	$ 49.27	$ 56.30

PREMIUM TIME Wages per hour:

	1st	2nd	3rd	4th	5th
07/01/2026	$ 56.30	$ 70.36	$ 84.42	$ 98.48	$ 112.54

Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th
07/01/2026	$ 23.10	$ 28.67	$ 34.23	$ 39.80	$ 45.36

PREMIUM TIME Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th

07/01/2026	$ 45.36	$ 56.50	$ 67.62	$ 78.76	$ 89.88

4-638A-StmSpFtr

Teamster - Asphalt Delivery — 08/01/2026

JOB DESCRIPTION Teamster - Asphalt Delivery **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per Hour:

	07/01/2026
Truck Driver Heavy Construction Asphalt Delivery	$ 47.07

Heavy Construction Work:
Shall include the supply of Asphalt for construction, improvement and modification of all or any part of Streets, Highways, Bridges, Tunnels, Railroads, Canals, Dams, Airports, Schools, Power Generation Plants, where distance between project and asphalt plant is not more than 50 miles.

Truck Driver Light Construction Asphalt Delivery	$ 41.54

Light Construction Work:
Shall include the supply of Asphalt for construction of Single & Multi Family Homes, Town Houses, Apartment Buildings, including Driveways, Streets and Curbs within those projects. Parking Lots, Office Buildings, where distance between project and asphalt plant is not more than 50 miles.

SUPPLEMENTAL BENEFITS

Truck Driver Heavy Construction Asphalt Delivery	$ 61.15
Truck Driver Light Construction Asphalt Delivery	$ 20.32

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE
Note: Employees receive 2 hours of Holiday Pay for each day worked in holiday week (not to exceed 8 hours)

9-282NYAD

Teamster - Delivery of Concrete — 08/01/2026

JOB DESCRIPTION Teamster - Delivery of Concrete **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per Hour:

	07/01/2026
Concrete Delivery Driver	$ 44.50

SUPPLEMENTAL BENEFITS
Per Hour:

Concrete Delivery Driver	$ 54.88

Note:
Over 40 hours worked: time and one half rate $22.59; double time rate $30.12

OVERTIME PAY
See (B, E, P, *R, **U) on OVERTIME PAGE
Note: R* for Holidays 2, 11, & 15 ONLY
U** for Holidays 5 & 6 ONLY

HOLIDAY
Paid: See (5, 6, 11, 25) on HOLIDAY PAGE
Overtime: See (2, 5, 6, 11, 15) on HOLIDAY PAGE

9-282nyc

Teamster - Heavy Construction — 08/01/2026

JOB DESCRIPTION Teamster - Heavy Construction **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per Hour:
Drivers (Debris Removal Street Level and below)

	07/01/2026
Dump Trucks	$ 47.07
Euclid & Turnapull	50.07
Tractor Trailers	50.76
Heavy Equip. Trailer/Tagalong	51.26
Boom Truck	52.51
Goldhofer	53.51
Self Propelled Modular Trailer	53.51
Mobile Concrete Mixer	53.51

SUPPLEMENTAL BENEFITS
Per Hour:

Dump Trucks	$ 61.20
All Others	60.15

Up to 40 Hours Worked

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE
Note: Employees receive 2 hours of Holiday Pay for each day worked in holiday week (not to exceed 8 hours)

9-282 NYHC

Welder — 08/01/2026

JOB DESCRIPTION Welder **DISTRICT** 1

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES
Per hour 07/01/2026

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY

HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

(AA)	Time and one half of the hourly rate after 7 and one half hours per day
(A)	Time and one half of the hourly rate after 7 hours per day
(B)	Time and one half of the hourly rate after 8 hours per day
(B1)	Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday. Double the hourly rate for all additional hours
(B2)	Time and one half of the hourly rate after 40 hours per week
(B3)	Time and one half of the hourly rate after 40 straight hours per week
(C)	Double the hourly rate after 7 hours per day
(C1)	Double the hourly rate after 7 and one half hours per day
(D)	Double the hourly rate after 8 hours per day
(D1)	Double the hourly rate after 9 hours per day
(E)	Time and one half of the hourly rate on Saturday
(E1)	Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
(E2)	Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E3)	Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
(E4)	Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E5)	Double time after 8 hours on Saturdays
(F)	Time and one half of the hourly rate on Saturday and Sunday
(G)	Time and one half of the hourly rate on Saturday and Holidays
(H)	Time and one half of the hourly rate on Saturday, Sunday, and Holidays
(I)	Time and one half of the hourly rate on Sunday
(J)	Time and one half of the hourly rate on Sunday and Holidays
(K)	Time and one half of the hourly rate on Holidays
(L)	Double the hourly rate on Saturday
(M)	Double the hourly rate on Saturday and Sunday
(N)	Double the hourly rate on Saturday and Holidays
(O)	Double the hourly rate on Saturday, Sunday, and Holidays
(P)	Double the hourly rate on Sunday
(Q)	Double the hourly rate on Sunday and Holidays
(R)	Double the hourly rate on Holidays

(S)	Two and one half times the hourly rate for Holidays
(S1)	Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
(T)	Triple the hourly rate for Holidays
(U)	Four times the hourly rate for Holidays
(V)	Including benefits at SAME PREMIUM as shown for overtime
(W)	Time and one half for benefits on all overtime hours.
(X)	Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

(1)	None
(2)	Labor Day
(3)	Memorial Day and Labor Day
(4)	Memorial Day and July 4th
(5)	Memorial Day, July 4th, and Labor Day
(6)	New Year's, Thanksgiving, and Christmas
(7)	Lincoln's Birthday, Washington's Birthday, and Veterans Day
(8)	Good Friday
(9)	Lincoln's Birthday
(10)	Washington's Birthday
(11)	Columbus Day
(12)	Election Day
(13)	Presidential Election Day
(14)	1/2 Day on Presidential Election Day
(15)	Veterans Day
(16)	Day after Thanksgiving
(17)	July 4th
(18)	1/2 Day before Christmas
(19)	1/2 Day before New Years
(20)	Thanksgiving
(21)	New Year's Day
(22)	Christmas
(23)	Day before Christmas
(24)	Day before New Year's
(25)	Presidents' Day
(26)	Martin Luther King, Jr. Day
(27)	Memorial Day
(28)	Easter Sunday

(29) Juneteenth

New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12226

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By: (Check Only One) ☐ Contracting Agency ☐ Architect or Engineering Firm ☐ Public Work District Office Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address ☐ (Check if new or change)

Telephone Fax

E-Mail:

2. NY State Units (see Item 5).

- ☐ 01 DOT
- ☐ 02 OGS
- ☐ 03 Dormitory Authority
- ☐ 04 State University Construction Fund
- ☐ 05 Mental Hygiene Facilities Corp.
- ☐ 06 OTHER N.Y. STATE UNIT
- ☐ 07 City
- ☐ 08 Local School District
- ☐ 09 Special Local District, i.e., Fire, Sewer, Water District
- ☐ 1O Village
- ☐ 11 Town
- ☐ 12 County
- ☐ 13 Other Non-N.Y. State (Describe)

3. SEND REPLY TO ☐ (check if new or change)
Name and complete address:

Telephone Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

☐ New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

☐ Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

_____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

- ☐ 1. New Building
- ☐ 2. Addition to Existing Structure
- ☐ 3. Heavy and Highway Construction (New and Repair)
- ☐ 4. New Sewer or Waterline
- ☐ 5. Other New Construction (Explain)
- ☐ 6. Other Reconstruction, Maintenance, Repair or Alteration
- ☐ 7. Demolition
- ☐ 8. Building Service Contract

8. OCCUPATION FOR PROJECT :

- ☐ Construction (Building, Heavy Highway/Sewer/Water)
- ☐ Tunnel
- ☐ Residential
- ☐ Landscape Maintenance
- ☐ Elevator maintenance
- ☐ Exterminators, Fumigators
- ☐ Fire Safety Director, NYC Only
- ☐ Fuel Delivery
- ☐ Guards, Watchmen
- ☐ Janitors, Porters, Cleaners, Elevator Operators
- ☐ Moving furniture and equipment
- ☐ Trash and refuse removal
- ☐ Window cleaners
- ☐ Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES ☐ NO ☐

10. Name and Title of Requester

Signature

SEE PAGE TWO FOR LAWS RELATING TO PUBLIC WORK CONTRACTS

NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED ANY PUBLIC WORK CONTRACT

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: https://apps.labor.ny.gov/EDList/searchPage.do

For inquiries please call 518-457-5589.

NYSDOL Bureau of Public Work Debarment List 08/14/2026

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5784	A.J.M. TRUCKING, INC.		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL		AKHLAQ OULAKH		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		ALEXANDER DELISA		411 THEODORE FREMND SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	NYC		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL	*****8387	AMERICAN PAVING & MASONRY, CORP.		8 FOREST AVE GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL	*****8654	AMERICAN PAVING, INC.		8 FORREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	NYC	*****8017	AMIN ELECTRICAL CORP.		97-23 218TH STREET QUEENS VILLAGE NY 11429	12/04/2025	12/04/2030
DOL	DOL		ANGELO STANCO		8 FOREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL		ANTHONY CASALE		20 HEATHER RIDGE ROAD TROY NY 12180	05/20/2025	05/20/2030
DOL	DOL		ANTHONY MONGELLI		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	DOL	*****3932	B ROC CONSTRUCTION INC		7307 WOODSIDE ROAD VICTOR NY 14564	05/06/2025	05/06/2030
DOL	DA	*****2404	BJA RENOVATION, CORP		33 DOLLARD DR NORTH BABYLON NY 11703	03/19/2025	03/19/2030
DOL	DOL	*****5078	BLACK RIVER TREE REMOVAL, LLC		29807 ANDREWS ROAD BLACK RIVER NY 13032	10/17/2023	10/17/2028
DOL	DOL		C.M.C CONTRACTORS, INC.		500 WEST PUTNAM AVE SUITE 400GREENWICH CT 06830	09/03/2025	09/03/2030
DOL	DOL		CARLOS F. ESCOBAR		411 THEODORE FREMD AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		CARLOS FIGUEROA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		CESAREO TULA		120 SEARS AVE ELMSFORD NY 10523	09/26/2025	09/26/2030
DOL	DOL	*****2292	CHAMPION MAINTENANCE CONTRACTORS, INC.		211 SOUTH RIDGE STREET RYE BROOK NY 10573	09/03/2025	09/03/2030
DOL	NYC	*****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DOL		CHARLES CASALE		55 MAIN AVENUE WYNANTSKILL NY 12198	05/20/2025	05/20/2030
DOL	DOL		CHARLES CASALE		55 MAIN AVENUE WYNANTSKILL NY 12198	05/20/2025	05/20/2030
DOL	DOL		CHRISTOPHER PEROSI		5507 NESCONSET HIGHWAY MT. SINAI NY 11766	07/17/2025	07/17/2030
DOL	DOL	*****2281	CORRAO TRUCKING, INC.		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL DELISA		211 SOUTH RIDGE STREET RYE BROOK NY 10573	09/03/2025	09/03/2030
DOL	DOL		DANIEL LOHAN		6836 N. LEXINGTON LANE NILES IL 60714	05/28/2026	05/28/2031
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL		DARWIN PEGUESE		6400 BALTIMORE NATIONAL SUITE 602CANTONSVILLE NY 21228	10/24/2024	10/24/2029
DOL	DOL		DAVID FRIEDLANDER		64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		DENISE NAGLE		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030

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DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL	*****2337	EGL DRAINAGE SOLUTION & REPAIRS LLC		5507 NESCONSET HIGHWAY MT. SINAI NY 11766	07/17/2025	07/17/2030
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL		EMIL KISZKO		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION CORP.		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION LLC		4192 SIR ANDREW CIRCLE DOYLESTOWN PA 18902	07/18/2024	07/18/2029
DOL	NYC		ENRICO MANETTA		101 MALBA DR. WHITESTONE NY 11357	04/01/2026	04/01/2031
DOL	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DOL	*****2998	G.E.M. AMERICAN CONSTRUCTION CORP.		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	NYC		GHANSHYAM AMIN		97-23 218TH STREET QUEENS VILLAGE NY 11429	12/04/2025	12/04/2030
DOL	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		GIOVANNI NAPOLITANO		2501 BAYVIEW AVENUE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DA	*****0213	GORILLA CONTRACTING GROUP, LLC		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DA	*****4760	GTX CONSTRUCTION ASSOCIATES, CORP		2501 BAYVIEW AVE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DOL		HENRY WICKE A/K/A HENRY WICKE, JR.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****6961	HUNTER ELEVATOR COMPANY, INC.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL	*****2397	ISLAND BREEZE MARINE, INC.		6400 BALTIMORE NATIONAL CANTONSVILLE MD 21228	10/24/2024	10/24/2029
DOL	DOL	*****5010	J. LINDSLEY ENTERPRISE, LLC		1002 STATE ROUTE 176 FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL	*****0241	J. LINDSLEY ROOFING, LLC		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		J.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JAMES LINDSLEY		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030

DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****7993	JBS DIRT, INC.		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	*****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JENNIFER LINDSLEY		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		JERRY DASTON		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN NAGLE A/K/A JOHN NAGLE, JR.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		JONATHAN DELISA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		JORGE FIGUEROA		411 THEODORE FRMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DA		JOSEPH DEMASCO		33 DOLLARD DRIVE NORTH BABYLON NY 11703	01/30/2026	01/30/2031
DOL	DA		JOSEPH DEMASCO		33 DOLLARD DRIVE NORTH BABYLON NY 11703	03/19/2025	03/19/2030
DOL	DOL		JOSEPH HALL		937 US ROUTE 11 CENTRAL SQUARE NY 13036	10/21/2024	10/21/2029
DOL	DOL	*****2271	JOSEPH HALL COMPANIES LLC		937 US ROUTE 11 CENTRAL SQUARE NY 13036	10/21/2024	10/21/2029
DOL	DOL		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		JRN CONSTRUCTION CO, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002

DOL	DOL		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		KEVIN FUNEZ URBINA A/K/A KEVIN FUNEZ		1009 LYNDALE AVE TRENTON NJ 08629	12/16/2024	12/16/2029
DOL	DOL		KIMBERLY F. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****8760	KJ&J CONSTRUCTION, LLC		1009 LYNDALE AVE TRENTON NJ 08629	12/16/2024	12/16/2029
DOL	DOL		KMA GROUP II, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL	*****1833	KMA GROUP INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KMA INSULATION, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KRIN HEINEMANN		2345 ROUTE 52, SUITE 2N HOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	NYC		KULWANT S. DEOL		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****3716	LIGHTNIN ELECTRIC INC.		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029
DOL	AG	*****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DOL		LIZETTE PONCE		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	NYC	*****7516	MANCO ENTERPRISES OF NY, INC.		44-17 54TH DR. MASPETH NY 11378	04/01/2026	04/01/2031
DOL	NYC	*****1783	MANETTA ENTERPISES, INC. D/B/A MANETTA INDUSTRIES		44-17 54TH DR. MASPETH NY 11378	04/01/2026	04/01/2031
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		MOHAMMAD MIAN		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	NYC		NASEER CHAUDHRY		2349 BRAGG STREET BROOKLYN NY 11229	04/22/2025	04/22/2030
DOL	DOL	*****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****1797	NATIONAL CONSTRUCTION SERVICES, INC		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		NELCO CONTRACTING, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DA		NICHOLAS BARNETT		33 DOLLARD DR BABYLON NY 11703	03/04/2025	03/04/2030
DOL	DOL		NICHOLAS RAO		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DA		NICHOLAS T. ANALITIS		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027

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DOL	DOL		NIKOLA NTONI		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029
DOL	NYC	*****6971	NN CONSTRUCTION, INC.		2349 BRAGG STREET BROOKLYN NY 11229	04/22/2025	04/22/2030
DOL	NYC	*****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL	*****2041	QUALITY STEEL ERECTORS INC.		6836 N. LEXINGTON LANE NILES IL 60714	05/28/2026	05/28/2031
DOL	DOL	*****4772	R.W. LOBDELL CONSTRUCTION LLC		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DOL		ROBBYE BISSESAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL		ROSA GARCIA		411 THEODORE FRMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DA	*****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		SILVANO TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	NYC	*****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	*****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL		STEVEN DELISA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED MUHAMMAD S. JAFRI A/K/A SHARRUKH JAFRI		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4855	TECH INDUSTRIES LLC		20 HEATHER RIDGE ROAD TROY NY 12180	05/20/2025	05/20/2030
DOL	DOL	*****2426	THE MATRUKH GROUP, INC.		4307 28TH AVE PO BOX 9082ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		THOMAS LOBDELL		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL		TIMOTHY PERCY		29807 ANDREWS ROAD BLACK RIVER NY 13612	10/17/2023	10/17/2028
DOL	DA	*****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DOL	*****8485	TULA PLUMBING AND HEATING LLC		120 SEARS AVE ELMSFORD NY 10523	09/26/2025	09/26/2030
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL		VINCENT CORRAO		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		WILLIAM A BELL		7307 WOODSIDE ROAD VICTOR NY 14564	05/06/2025	05/06/2030
DOL	DOL	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028

NYSDOL Bureau of Public Work Debarment List 08/14/2026

Article 8

DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL	*****9494	WND CONSTRUCTION LLC		411 THEODORE FREMD AVENUE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

EXHIBIT C: SPECIFICATIONS

FIT SCIENCE LAB RENOVATION

THE FASHION INSTITUTE OF TECHNOLOGY

100% CONSTRUCTION DOCUMENTS SPECIFICATIONS VOLUME I

AUGUST 19, 2026

SAMUEL ANDERSON ARCHITECTS
307 WEST 38TH ST SUITE 1901 NEW YORK NY 10018 | 212.564.7002 | SAMUELANDERSON.COM

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SECTION 011100

SUMMARY OF WORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. All work as necessary for the demolition and renovation of approximately three quarters of the third floor for the FIT Science Labs Classrooms at Building A located at 340 8th Avenue, New York, NY, as shown on the drawings and within these specifications, to a new fully Science Laboratory Classrooms.

B. The Scope of Work includes scope by mechanical, electrical, plumbing and structural trades, as well as interior architectural renovation with special millwork, metalwork, and custom classrooms. Exterior work includes but is not limited to the installation of new mechanical units on the roof and roofing penetrations required to support new mechanical, plumbing, and structural systems.

C. Comply with the rules and requirements established by The FIT regarding construction/renovation projects including those on occupied floors.

D. Work is to be accomplished while the remainder of the building is in operation and continues to be occupied. Care should be taken in setting up staging areas, access, and daily activities so as to prevent any inconvenience to tenants and visitors to the building.

E. Work is to be done during normal construction hours except if otherwise required for shut- downs, tests and new connections, which shall be scheduled and executed – with prior approval by The FIT - so as to minimize disruptions to the facility, staff and visitors. Special consideration shall be given to the fact that the rest of the building will remain open and in operation throughout the project. All due care must be taken to prevent the spread of dust, chemical vapors, noise and/or vibrations from the construction area into the occupied portions of the building, and to ensure the maintenance of the Landlord's security standards and requirements.

F. Special consideration shall be given to provide materials containing the minimum possible quantities of urea formaldehyde, sulfur ammonia and/or chlorine, including in particular all ply- woods, sealants, adhesives, and rubber products.

G. All MEP/FP and ceiling trades shall participate in a coordination modeling process – immediately upon commencement of the contract and prior to submission of trade shop drawings – to ensure that all elements of MEP and ceiling work are fully coordinated with each other and with related construction. The General Contractor shall lead this process wherein all MEP trades and the ceiling and drywall subcontractors meet, draw coordinated scopes of their trades into a computer model (eg Revit), and present same to The FIT, the Architect, and Engineer for review and approval. No shop drawings for individual trades will be accepted for review until the coordination drawing process has been reviewed, approved, ***and signed off by all relevant parties.***

1.3 SECTION INCLUDES

A. Work of this Section includes the following descriptions:

1. Contractor's duties and responsibilities.

2. Codes.

3. Abbreviations and symbols.

1.4 CONTRACTOR'S DUTIES

A. Except as specifically noted, provide, and pay for:

1. Labor, materials, and equipment.

2. Tools, construction equipment and machinery.

3. Other facilities and services necessary for proper execution and completion of the work.

B. Pay required sales, consumer and use taxes, except as specifically excluded by the Supplementary Conditions.

C. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of Contract Award.

1. Permits.

2. Government fees.

3. Licenses.

D. Give required notices for work under this Contract.

E. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities, including State, and Federal Building Codes which bear on performance of work.

F. Promptly submit written notice to the Architect of observed variance of Contract Documents from the Building Code and other requirements of Public Authorities having jurisdiction.

1.5 APPLICABLE CODES

A. All references to codes and specifications, and all standards referred to in the Specification Sections and on the Drawings shall mean, and are intended to mean, the latest edition, amendment, and/or revision of such reference standard in effect as of the date of these Contract Documents.

1.6 ABBREVIATIONS AND SYMBOLS

A. Reference to a technical society, institution, association, or governmental authority is made in the Specifications in accordance with the following abbreviations.

1. AA Aluminum Association

2. AAMA Architectural Aluminum Manufacturers Association

3. AASHTO American Association of State Highway and Transportation Officials

4. ABMA American Boiler Manufacturers Association
5. ACI American Concrete Institute
6. ACRI Air Conditioning and Refrigeration Institute
7. ADC Air Diffusion Council
8. AFI Air Filter Institute
9. AGI American Gas Institute
10. AGCA Associated General Contractors of America, Inc.
11. AGMA American Gear Manufacturers Association
12. AIA American Institute of Architects
13. AIA American Insurance Association
14. AIMA Acoustical and Insulating Materials Association
15. AISC American Institute of Steel Construction
16. AISI American Iron and Steel Institute
17. AITC American Institute of Timber Construction
18. ALS American Lumber Standards
19. AMCA Air Moving and Conditioning Association
20. ANSI American National Standards Institute, Inc.
21. APA American Plywood Association
22. API American Petroleum Institute
23. AREA American Railway Engineering Association
24. ARI Air Conditioning and Refrigeration Institute
25. ASAHC American Society of Architectural Hardware Consultants
26. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
27. ASME American Society of Mechanical Engineers
28. ASTM American Society for Testing and Materials
29. ATI Asphalt Tile Institute
30. AWI Architectural Woodwork Institute
31. AWPA American Wood Preservers Association

32. AWPI American Wood Preservers Institute
33. AWS American Welding Society
34. AWWA American Waterworks Association
35. BHMA Builders Hardware Manufacturers Association
36. BIA Brick Institute of America
37. BRI Building Research Institute
38. CABRA Copper and Brass Research Association
39. CAGI Compressed Air and Gas Institute
40. CE Corps of Engineers (Army)
41. CRSI Concrete Reinforcing Steel Institute
42. CS U.S. Commercial Standard
43. CSI Construction Specification Institute
44. CTI Cooling Tower Institute
45. DFPA Douglas Fir Plywood Association
46. ETL Electrical Testing Laboratories
47. FGMA Flat Glass Marketing Association
48. FHA Federal Housing Administration
49. FIA Factory Insurance Association
50. FM Factory Mutual Engineering Division Association of Factory Mutual Fire Insurance Companies
51. FPL Forest Products Laboratories
52. FS Federal Specifications
53. FSIWA Federation of Sewage and Industrial Waste Association
54. FTI Facing Tile Institute
55. GA Gypsum Association
56. GTA Glass Tempering Association
57. HPMA Hardwood Plywood Manufacturers Association
58. IBRM Institute of Boiler and Radiator Manufacturers
59. IEEE Institute of Electrical and Electronics Engineering

60. IES Illuminating Engineering Society
61. IPCEA Insulated Power Cable Engineers Association
62. JAN Joint Army-Navy Specifications
63. MAC Masonry Advisory Council
64. MIA Marble Institute of America
65. MLMA Metal Lath Manufacturers Association
66. MS Military Specifications
67. MSS Manufacturers Standardization Society of the Valves and Fittings Industries
68. MSTD Military Standard
69. NAAMM National Association of Architectural Metal Manufacturers
70. NAFM National Association of Fan Manufacturers
71. NAPM National Association of Plastic Manufacturers
72. NBHA National Builders Hardware Association
73. NBS National Bureau of Standards
74. NCMA National Concrete Masonry Association
75. NEC National Electric Code (NFPA Pamphlet No. 70)
76. NELMA Northeastern Lumber Manufacturers Association, Inc.
77. NEMA National Electric Manufacturers Association
78. NEMI National Elevator Manufacturing Industry, Inc.
79. NFC National Fire Code
80. NFPA National Fire Protection Association
81. NFPA National Forest Products Association
82. NHLA National Hardwood Lumber Association
83. NHPMA Northern Hardwood and Pine Manufacturers Association
84. NPA National Particleboard Association
85. NPCA National Paint and Coatings Association
86. NRMCA National Ready Mixed Concrete Association
87. NSC National Safety Council

88. NSF National Sanitation Foundation
89. NSSEA National School Supplies and Equipment Association
90. NTMA The National Terrazzo and Mosaic Association, Inc.
91. NWMA National Woodwork Manufacturers Association
92. OSHA Occupational Safety and Health Administration
93. PCA Portland Cement Association
94. PCI Prestressed Concrete Institute
95. PEI Porcelain Enamel Institute, Inc.
96. PS Product Standard, U.S. Department of Commerce
97. RIS Redwood Inspection Service
98. RTI Resilient Tile Institute
99. SAE Society of Automotive Engineers
100. SBI Steel Boiler Institute
101. SCMA Southern Cypress Manufacturers Association
102. SDI Steel Deck Institute
103. SDI Steel Door Institute
104. SJI Steel Joist Institute
105. SMACNA Sheet Metal and Air Conditioning Contractors National Association
106. SMFMA Sprayed Mineral Fiber Manufacturers Association, Inc.
107. SPIB Southern Pine Inspection Bureau
108. SPR Simplified Practice Recommendations, U.S. Department of Commerce
109. SSPC Steel Structures Painting Council
110. SWFPA Structural Wood Fiber Products Association
111. TCA Tile Council of America
112. TEMA Tubular Exchange Manufacturing Association
113. TIMA Thermal Insulation Manufacturers Association
114. TPI Truss Plate Institute
115. UL Underwriter's Laboratories, Inc.

116. UPC Uniform Plumbing Code
117. USCGS U.S. Coast and Geodesic Survey
118. WCLIB West Coast Lumber Inspection Bureau
119. WRI Wire Reinforcement Institute
120. WWPA Western Wood Products Association

END OF SECTION

SECTION 012020

PROGRESS MEETINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. To enable orderly review of progress during construction and to provide for systematic discussions of problems, the Architect will conduct project meetings throughout the construction period.

B. In general, project meetings will be held weekly at the job site in accordance with a mutually acceptable schedule.

C. The purpose of the project meetings is analysis of problems that might arise between the Owner and the Contractor relative to execution of the work, and review of projected schedules.

1.3 RELATED SECTIONS

A. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility as described in the General Conditions, and are not part of the agenda of project meetings.

1.4 QUALITY ASSURANCE

A. Persons designated by the Contractor to attend and participate in project meetings shall have all required authority to commit the Contractor to solutions as agreed upon in the project meetings.

B. Pre-Installation Conferences: General contractor shall arrange pre-installation conference not less than thirty days prior to starting work.

1. Attendance

a. General Contractor.
b. Architect/Owner's Representative.
c. Manufacturer/Installer's Representative.
d. Other trades as directed by the Architect.

2. Pre-installation conference is required for the following:

a. Miscellaneous metals.
b. Carpentry/ drywall (to review ceiling/alignments).
c. Curtain walls.
d. Polished Concrete
e. Steel and Glass walls
f. Display Niche and Vestibule

1.5 SUBMITTALS

A. Agenda Items: To the maximum extent possible, digitally advise the Owner and Architect at least twenty-four (24) hours in advance of the project meeting regarding all items to be added to the agenda.

B. Minimum Agenda

1. Review work progress since last meeting.
2. Note field observations, problems and decisions.
3. Identify problems which impede planned progress.
4. Review off-site fabrication problems.
5. Develop corrective measures and procedures to regain schedule.
6. Coordinate projected progress with other prime contractors.
7. Review submittal schedules, expedite as required to maintain schedule.
8. Review upcoming schedule of work for next two weeks.

C. Minutes: The Architect will compile minutes of each project meeting and will distribute copies to the Owner and the Contractor. The Contractor shall make and distribute such other copies as he wishes. Minutes shall be distributed within five (5) business days

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 MEETING SCHEDULE

A. Coordinate with the Architect and Owner as required to establish a mutually acceptable schedule for project meetings. (Wednesdays are not acceptable).

3.2 MEETING LOCATION

A. To the maximum extent practicable, project meetings shall be held at the job site. Provide adequate space and facility including table, chairs, and lighting for proper conduct of meeting.

3.3 ATTENDANCE

A. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout the construction period. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspects of the work are involved.

END OF SECTION

SECTION 012300

ALTERNATES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. To allow the Owner to compare total costs where alternate materials and methods might be used, and to enable the Owner's decision prior to awarding the Contract, certain alternates have been established as described in this Section of these Specifications.

1.3 RELATED SECTIONS

A. Where noted herein, pertinent Sections of these Specifications describe the materials and methods required under the various alternates.

1.4 SUBMITTALS

A. Alternates described in this Section are required to be submitted on appropriate form as approved by the Owner.

B. Any additional costs to the Contractor due to the inclusion of alternates shall be included in the amount to be added to the Contract Sum, so that no additional costs shall be borne by the Owner due to the inclusion of the additive alternates.

C. Any deductive costs to the Contractor due to the inclusion of alternates shall be included in the amount to be deducted from the Contract Sum, so that all deductive costs will accrue to the Owner due to the inclusion of deductive alternates.

1.5 PROCEDURES FOR ALTERNATE BIDS

A. Each Bidder shall submit on the Proposal Form all Alternate Bids stated herein. Alternate Bids shall state the difference in price as "additions to" or "deductions from" the Base Bid, unless otherwise noted, for the substitution, omission, or addition to the alternate materials, items or construction from that shown and specified.

B. The Alternate Bids, when accepted, become part of the Contract.

C. Bidder shall carefully check the Drawings and Specifications to determine the extent of each Alternate Bid required.

D. Alternate Bids shall include all overhead and profit applicable thereto.

E. Alternate Bids shall reflect the increase or decrease in cost of all work of every name and nature which may be affected thereby and no subsequent claims for extras by reason of the Contractor's failure to observe this requirement will be considered.

F. The description herein for each Alternate Bid is recognized to be incomplete and abbreviated, but implies that each change must be complete for the scope of the work affected. Refer to the applicable Specification Sections, and to applicable drawings, for the specific requirements of the work, regardless of whether references are so noted in the description of each Alternate. Coordinate related work and modify surrounding work as required to properly integrate with the work of each Alternate. It is recognized that the descriptions of Alternate Bids are primarily scope definitions, and do not necessarily detail the full range of materials and processes needed to complete the work as required. Any change of details, construction, etc., as required to accommodate the Alternate shall be the responsibility of the Contractor and shall be included in his Alternate Bid Price.

G. Except as otherwise described or approved, materials and workmanship of the Alternate Bids shall conform to the requirements specified under the various Sections of the Specifications for similar items of work.

H. Where methods of construction, materials, finishes, or details of installation required by the various Alternate Bids differ from the requirements shown on drawings or specified for corresponding items, the Alternate construction, materials, etc., will be subject to approval by the Architect.

I. The Contractor shall submit shop drawings and samples for the work under each accepted Alternate Bid for approval in conformance with requirements of Section 013300.

PART 2 PRODUCTS

2.1 ALTERNATES

A. ADD-ALTERNATE: Refer to Mechanical Drawings.

PART 3 EXECUTION

3.1 ADVANCE COORDINATION

A. Immediately after award of Contract, and to the maximum extent practicable, thoroughly and clearly advise all necessary personnel and suppliers as to the nature and extent of Alternates as selected by the Owner; use all means necessary to alert those personnel and suppliers involved as to all changes in the work caused by the Owner's selection of alternates.

3.2 SURFACE CONDITIONS

A. Prior to installation of the Alternate items, verify that all surfaces have been modified as necessary to accept the installation and the item or items may be installed in complete accordance with their manufacturer's current recommendations; in the event of discrepancy, immediately notify the Architect and proceed as directed.

3.3 APPROVAL OF ALTERNATE

A. Approval of the Alternate makes all requirements of scope, performance, submissions, service and guarantee binding as if that material name appeared in the Specifications for the Base Bid. All necessary changes in building design or construction to accommodate the alternate materials shall be the sole responsibility of the Contractor without extra cost to the Owner.

END OF SECTION

SECTION 013100

COORDINATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the Project Coordination as specified herein, including but not limited to, the following:

1. General project coordination procedures.

2. Conservation.

3. Administrative and supervisory personnel.

4. Cleaning and protection.

1.3 RELATED SECTIONS

A. Progress meetings - Section 012020.

B. Submittals - Section 013300.

C. Materials and equipment - Section 016000.

D. Contract close-out - Section 017700.

1.4 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

3. Make provisions to accommodate items scheduled for later installation.

4. Show relationship of components shown on separate shop drawings.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.

2. Installation and removal of temporary facilities.

3. Delivery and processing of submittals.

4. Progress meetings.

5. Project close-out activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

PART 2 PRODUCTS

(NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each trade and major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposures during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity (i.e. below 25% or above 70%).
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Acids, bases, or other hazardous chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria and viruses.
17. Rodent, insect and dermestid infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.

26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes administrative and procedural requirements for documenting the progress of construction during performance of the work, including but not limited to, the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.
8. Construction photographs.

1.3 RELATED SECTIONS

A. Progress meetings – Section 012020.

B. Submittals – Section 013300.

C. Coordination – Section 013100.

D. Closeout procedures – Section 017700.

1.4 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.5 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.

2. Specification Section number and title.

3. Submittal category (action or informational).

4. Name of subcontractor.

5. Description of the Work covered.

6. Scheduled date for Architect's final release.

C. Preliminary Construction Schedule: Submit two printed copies; one a single sheet of reproducible media, and one a print.

D. Preliminary Network Diagram: Submit two printed copies; one a single sheet of reproducible media, and one a print; large enough to show entire network for entire construction period.

E. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, and labeled to comply with requirements for submittals. Include type of schedule Initial or Updated and date on label.

F. CPM Reports: Concurrent with CPM schedule, submit three printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

3. Total Float Report: List of all activities sorted in ascending order of total float.

4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

G. Daily Construction Reports: Submit two copies at weekly intervals.

H. Material Location Reports: Submit two copies at monthly intervals.

I. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

J. Special Reports: Submit two copies at time of unusual event.

K. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.

1. Format: Digital.

2. Identification: On back of each print, provide an applied label or rubber stamped impression with the following information:

a. Name of Project.
b. Name and address of photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3. Submit a complete set of photographs. Identify date photographs were taken.

1.6 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

B. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.

C. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.7 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Startup and Testing Time: Include not less than 10 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect’s administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date. Delivery dates indicated stipulate the earliest possible delivery date.

5. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Startup and placement into final use and operation.

7. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Permanent space enclosure.
    c. Completion of mechanical installation.
    d. Completion of electrical installation.
    e. Substantial Completion.

E. Milestones: Include milestones indicated in the schedule.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Purchase of materials.
c. Delivery.
d. Fabrication.
e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity duration’s in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.

b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, and losses.
9. Meter readings and similar recordings.
10. Emergency procedures.
11. Orders and requests of authorities having jurisdiction.
12. Change Orders received and implemented.
13. Construction Change Directives received.
14. Services connected and disconnected.
15. Equipment or system tests and startups.
16. Partial Completions and occupancies.
17. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, duration’s, actual starts and finishes, and activity duration’s.

3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified commercial photographer to take construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in the file name for each image.

D. Preconstruction Photographs: Before starting construction, take four color photographs of Project site and surrounding properties from different vantage points, as directed by Architect. Show existing conditions adjacent to property.

E. Periodic Construction Photographs: Take four color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect may direct photographer for desired vantage points.

END OF SECTION

SECTION 013300

SUBMITTALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete submittal requirements as specified herein, including, but not limited to, the following:

1. Shop drawings and samples.

2. Integrated drawings.

3. Manufacturer's literature.

B. Layout of all work.

1.3 RELATED SECTIONS

A. Progress meetings - Section 012020.

B. Materials and equipment - Section 016000.

C. HVAC – Division 23.

PART 2 PRODUCTS

2.1 WORK LAYOUT

A. Be responsible for properly laying out the work and for the lines and measurements for the work executed under the Contract Documents. Verify the figures shown on the Drawings before laying out the work, and report errors or inaccuracies both orally and in writing to the Architect before commencing work. The Architect or his representative will in no case assume the responsibility for laying out the work. Survey as required to establish grades, datums, benchmarks, and reference points. Layout all work of all trades both horizontally and vertically.

B. The mechanical and electrical trades may be delegated the responsibility to lay out the duct work, piping, and conduit based on the reference lines and benchmarks established and on approved submittals, but the General Contractor shall oversee their layouts and shall ensure that all layouts conform to approved submittals as well as to the Contract Documents.

2.2 SHOP DRAWINGS AND SAMPLES

A. General

1. The Contractor shall be responsible for coordinating the schedule for submittal of shop drawings and samples with his progress schedule and the requirements of the Contract Schedule, and shall promptly submit a coordinated schedule of submission of all shop drawings and samples to the Architect.

2. Failure of the Contractor to schedule and submit shop drawings and samples in ample time for checking, correction, and rechecking will not justify any delay in the Contract Schedule. Allow ample time for items to be tested, including time for retesting if the tests or mock-ups fail.

3. Samples, shop drawings, manufacturers' literature, and other required information shall be submitted in sufficient time to permit proper consideration and action on same before any materials and items are fabricated or ordered. Stagger submissions so that the Architect can review the documents in an orderly and timely manner. All samples of materials requiring laboratory tests shall be submitted to the laboratory for testing not less than 90 days before such materials are required to be shipped to the site. All other samples, manufacturers' literature, and other sample information shall be submitted for approval not less than 30 days before such materials are required to be shipped to the site.

4. Shop drawings for each Section of the work shall be numbered consecutively, and the numbering system shall be retained throughout all revisions. Each drawings shall have adequate clear space for the stamps of the Contractor, Architect, and one of the Architect's consultants.

5. All shop drawings shall be thoroughly checked by the Contractor for compliance with the Contract Documents before submitting them to the Architect and shall bear the Contractor's stamp of approval certifying that they have been so checked. Any shop drawings submitted without this stamp of approval and certification, and shop drawings which, in the Architect's sole opinion, are incomplete, contain errors or have not been checked, or only checked superficially, will be returned unchecked by the Architect for re-submission by the Contractor.

6. In checking shop drawings, the Contractor shall verify all dimensions and field conditions and shall check and coordinate the shop drawings of any Section or trade with the requirements of all other Sections or trades whose work is related thereto, as required for proper and complete installation of the work. The Architect will review shop drawings. The Architect's acceptance of shop drawings is for design only and not method of assembly or erection. Acceptance shall in no way be construed as (1) permitting any departure whatsoever from the Contract Documents; (2) relieving the Contractor of full responsibility for any error in details, dimensions, omissions, or otherwise that may exist; (3) relieving the Contractor of full responsibility for adequate field connections, erection techniques, bracing, or deficiencies in strength; (4) relieving the Contractor of full responsibility for satisfactory performance of all work and coordination with the work of all subcontractors and other contractors; or (5) permitting departure from additional details or instructions previously furnished by the Architect. Acceptance of such drawings shall not be construed as a complete check, nor shall it relieve the Contractor from responsibility for proper fitting of the work, nor from the necessity of furnishing any work which may not be indicated on shop drawings when approved. The Contractor shall be solely responsible for any quantities which may be shown on the shop drawings.

7. No work shall be fabricated, manufactured, or installed from shop drawings stamped "Revise and Resubmit" or "Rejected," and such shop drawings shall be corrected and resubmitted by the Contractor until accepted by the Architect. At least one complete set of "No Exceptions Taken, Corrections Noted" shop drawings shall be kept at the site in the Contractor's field office for reference at all times. "Revise and Resubmit" and "Rejected" shop drawings shall not be permitted at the site, except for reference in regard to approved submittals.

8. Submittals marked "No Exceptions Taken":

    a. Submittals which require no corrections by the Architect will be marked "No Exceptions Taken."

9. Submittals marked "Corrections Noted" or "Accepted as Noted":

    a. Submittals which require only a minor amount of correcting shall be marked "Corrections Noted" or "Accepted as Noted." This mark shall mean that checking is complete and all corrections are obvious without ambiguity. Fabrication will be allowed on work marked "Corrections Noted" or "Accepted as Noted" provided such action will expedite construction and noted corrections are adhered to. If fabrication is not made strictly in accordance with corrections noted, the item shall be rejected in the field, and the Contractor will be required to replace such work in accordance with corrected submittals.

10. Submittals marked "Revise and Resubmit" or "Rejected":

    a. When submittals are contrary to contract requirements or too many corrections are required, they shall be marked "Revise and Resubmit" or "Rejected." No work shall be fabricated under these marks. The Architect shall list his reasons for rejection on the submittals or in the transmittal letter accompanying their return. The submittals must be corrected and resubmitted for approval.

11. All shop drawings and samples shall be identified as follows:

    a. Date of submittal.
    b. Title of project.
    c. Name of Contractor and date of his approval.
    d. Name of subcontractor or supplier and date of submittal to Contractor.
    e. Number of submission.
    f. Any qualification, departure, or deviation from the requirements of the Contract shall be EXPLICITLY NOTED.
    g. Federal Specification or ASTM number where required.
    h. Such additional information as may be required by the Specifications for the particular material being furnished.

12. If the Contractor wishes to deviate from the materials or details as shown in Specifications or Drawings, he shall submit the proposed deviation with shop drawings and/or samples stating the extent and the materials or details being replaced. Submittals must be delivered to the Architect within fourteen (14) calendar days of the signing of the agreement between the Owner and the Contractor. Any such submittal received after that deadline will not be considered. The Contractor shall also submit information on the allowed credit or extra cost required for the proposed deviation, if any, and also all information relating to the work of any other Sections revised by the proposed deviation.

13. The Architect and Engineer will review and approve or reject shop drawings and samples for approval within 20 calendar days, but only for conformance with the design concept of the work and with information contained in the Contract Documents.

14. Incomplete shop drawings will be returned without checking for proper submission, and this shall not be considered as cause for delay of the work or extra compensation to the Contractor.

15. The Contractor shall submit appropriate transmittal forms with every submittal of shop drawings, manufacturer's literature, and samples. The Contractor shall submit all required shop drawings, manufacturer's literature and samples in accordance with the procedures specified herein.

16. Unless otherwise specifically directed by the Architect, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.

17. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

18. Submit one copy of each standard referred to in the Specifications (ASTM, Fed. Spec., etc.) with the submission of each respective shop drawing, sample, or literature.

19. Upon receipt of returned submittals, Contractor shall again review the submittal to ascertain all implications of the A/E comments and marks, and shall distribute the submittal to all relevant subcontractors, taking care to ensure that each is cognizant of relevant notes, comments, and other information.

B. Submission of Shop Drawings

1. Architectural Work: Submit a pdf of each shop drawing to the Architect for approval. If approved, the Architect will return pdf stamped "No Exceptions Taken" or "Make Corrections Noted," and the Contractor shall print the required number of copies. In the event the Architect returns pdf stamped "Revise and Resubmit" or "Rejected," the Contractor shall make indicated changes and resubmit pdf to the Architect.

2. Structural Work and Mechanical Work: Submit pdf of each shop drawing to the Engineer, with pdf to the Architect. For all mechanical submittals, also submit pdfs simultaneously to the Commissioning Agent. If accepted, the Architect shall return pdf stamped "No Exceptions Taken" or "Make Corrections Noted," and the Contractor shall print the required number of copies. In the event the Architect returns pdf stamped "Revise and Resubmit" or "Rejected," the Contractor shall make indicated changes and resubmit pdf to the Engineer and the Architect.

3. Prints: The Contractor shall provide all prints or shop drawings as reasonably required by subcontractors, material suppliers, superintendents, inspectors, and others as required for the work, or as directed by the Architect. The Contractor shall pay all costs in connection with printing and distribution of shop drawings. Also see Article #2.2, 19, above.

C. Submission of Manufacturer's Literature, Including Catalog, Catalog Cuts, Brochures, Charts, Test Data, and Similar Information

1. Manufacturer's literature will receive consideration only when accompanied by the transmittal form properly filled out, as indicated, and listing each item of literature, as well as the Specification Section and paragraph numbers describing such materials. All submittals must include clear and explicit notations indicating exactly which model(s), color(s), accessories, etc., are being submitted. Any deviations from contract requirements shall be stated on the above form or attached to it.

2. Architectural Work: Submit original of manufacturer's literature to the Architect for acceptance. If accepted, the Architect will return it stamped "No Exceptions Taken" or "Make Corrections Noted."

The Contractor shall resubmit corrected literature of all submissions stamped by the Architect "Revise and Resubmit" or "Rejected."

3. Structural Work and Mechanical Work: Submit original of manufacturer's literature to the Engineer and the Architect. If accepted, the Architect will return it stamped "No Exceptions Taken" or "Make Corrections Noted." The Contractor shall resubmit corrected literature to the Engineer and Architect for all submissions stamped "Revise and Resubmit" or "Rejected."

4. All copies of manufacturer's literature required to be resubmitted hereunder shall be original printed material. Pdfs and/or reproductions of printed material will not receive consideration unless they are as precisely legible and clear as original literature.

D. Submission of Samples

1. All samples shall be submitted in triplicate to the Architect unless otherwise indicated in the Specifications, or unless more are required to ensure that supplier and sub-suppliers all receive submittals back.

2. Samples will receive consideration only when each is clearly labeled and when accompanied by the transmittal form properly filled out, as indicated, and listing each sample, as well as the listing of any ASTM, Federal or other standard references specified or applicable and such additional information as may be required by the Specifications for the materials being submitted. Any deviation from the contract requirements shall be so stated on the above form or attached to it.

3. The Architect shall have the right to require submission of samples of any materials, whether or not specifically indicated in the various Sections of the Specifications.

4. Unless otherwise specified, samples of sufficient size to indicate general visual effect shall be submitted. Where samples must show a range of color, texture, finish, graining, or other similar property, the Contractor shall submit sets of pairs illustrating the full scope of the range.

5. Two (2) sample of each submission will be returned to the Contractor; one for the supplier and one for the contractor to store on site for reference by installer and the Architect. Samples stamped "Revise and Resubmit" or "Rejected" by the Architect shall be resubmitted in triplicate by the Contractor.

6. All samples stamped "No Exceptions Taken" or "Corrections Noted" shall be kept at the site in the Contractor's field office facilities for reference at all times. "Revise and Resubmit" or "Rejected" samples shall not be kept at the site.

2.3 INTEGRATED DRAWINGS

A. Within seven (7) days of award of Contract, the HVAC subcontractor shall prepare 3/8" scale drawings in plan and section showing air handlers, fans, pumps, valves, chillers, boilers, duct work, heating and sprinkler piping. This Drawing shall include location of re-heat boxes, grilles, registers, etc., and access doors in finished walls and soffits. Locations shall be fixed in plan by and dimensions from column center lines and/or finished walls, and in elevation from established finish floor benchmarks, in strict accordance with the architectural drawings.

B. The HVAC subcontractor shall lay out on his reproducible the reflected ceiling plan, beam and soffit elevations, ceiling heights, roof openings, etc.

C. The HVAC subcontractor shall prepare and distribute to the Plumbing, Fire Protection, and Electrical subcontractors, the General Contractor, and to the Architect a reproducible of the above.

D. The Plumbing subcontractor shall lay out on his reproducible the piping, valves, clean-outs, etc., indicating locations and elevations and shall indicate the necessary access doors.

E. The Fire Protection subcontractor shall lay out on his reproducible locations of standpipes, mains piping, valves, branch lines, pipe drops, and sprinkler heads.

F. The Electrical subcontractor shall indicate on his reproducible the panels, fixtures, all large (larger than 1" dia.) and all exposed small conduit runs, clearances, pull boxes, junction boxes, low voltage devices, fire alarm devices, A/V devices, etc.

G. The General Contractor shall indicate on his reproducible any structural framing, ceiling hangers, etc.

H. The General Contractor shall review all of the mark-ups by all of the subcontractors, and shall integrate them into one set of drawings, highlighting all conflicts and near-conflicts. He shall then call as many meetings with the subcontractors as are necessary to resolve any conflicts that become apparent. He will call on the services of the Consultant Engineer or Architect where necessary. The General Contractor is responsible for the coordination of the Drawings.

I. On resolution of the conflicts, each subcontractor shall enter his own work on the HVAC subcontractor's reproducibles, in plan and in section, which shall become the Master or Integrated Drawings. The master reproducibles shall be signed by each contributing subcontractor to indicate his acceptance of the arrangement of the work.

J. A reproducible copy of the master Integrated Drawings will be prepared by the HVAC subcontractor. The General Contractor will make distribution.

K. Each subcontractor shall prepare his Shop Drawings in strict accordance with the Integrated Drawings. No fabrication or installation work will be permitted without approved Shop Drawings. It is therefore essential that this procedure be instituted and completed as diligently as possible. The Architect reserves the right to reject any and all work that is fabricated or installed without complying with the approved shop drawings or the final Master Integrated Drawings, with no cost to the Owner.

PART 3 EXECUTION

3.1 COORDINATION OF SUBMITTALS

A. Prior to submittal for Architect's review, use all means necessary to fully coordinate all material and submittals, including the following procedures:

1. Determine and verify all field dimensions and conditions, materials, catalog numbers and similar data.

2. Coordinate as required with all trades and with public agencies involved.

3. Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.

4. Clearly indicate any and all deviations from the Contract Documents.

B. Unless otherwise specifically permitted by the Architect, make all submittals in groups containing all associated items; the Architect may reject partial submittals as not complying with the provisions of the Contract Documents.

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

1.3 RELATED SECTIONS

A. Coordination – Section 013100.

B. Testing and inspection – Section 014100.

C. Divisions 2 through 32 Sections for specific test and inspection requirements.

1.4 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.5 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.6 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

12. Name and signature of laboratory inspector.

13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:

a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.

d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect and Owner seven days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups, unless otherwise directed by the Architect.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 014100

TESTING AND INSPECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the testing and inspection requirements as specified herein.

1.3 RELATED SECTIONS

A. Requirements for testing and inspection shall be described in various Sections of these Specifications. Where no testing and inspection requirements are described but the Owner decides that it is required, the Owner may require additional testing and inspection to be performed at his own expense.

B. Work Not Included

1. Unless otherwise noted in this Section or other Section of work, the Owner will select a pre-qualified independent testing laboratory and inspection professional.

2. Unless otherwise noted in this Section or other Sections of work, the Owner will pay for all initial services of the testing laboratory and inspection professionals as further described in Article 2.1 of this Section of these Specifications.

1.4 QUALITY ASSURANCE

A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E 329-13b "Standard Specification for Agencies Engaged in Construction Inspection, Testing or Special Inspection."

B. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

1.5 PRODUCT HANDLING

A. Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the work.

PART 2 PRODUCTS

2.1 PAYMENTS FOR TESTING AND INSPECTION SERVICES

A. Initial Services: The Owner will pay for all initial testing and inspection services.

B. Retesting: When initial tests and inspections indicate non-compliance with local Codes and the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and inspectors and the costs thereof will be deducted by the Owner from the Contract Sum.

2.2 CODE COMPLIANCE TESTING AND INSPECTION

A. Inspections and tests required by Codes or Ordinances, or by a plan approval authority, shall be paid by for by the Owner unless otherwise noted in this Section or other Sections of work. Retesting or inspection as required shall conform to the requirements of Article 2.1 B of this Section.

2.3 CONTRACTOR'S TESTING

A. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

B. Where operating tests are specified, the Contractor shall test his work as it progresses, on his own account, and shall make satisfactory preliminary tests in all cases before applying for official tests.

C. Tests shall be made in the manner specified, for the different branches of the work. Each test shall be made on the entire system for which such test is required, wherever practical. In case it is necessary to test portions of the work independently, the Contractor shall do so without extra compensation. The Contractor shall furnish all labor, material and apparatus, make corrections and conduct the official test. The test will be conducted in the presence of a representative of the Architect.

D. All parts of the mechanical and electrical work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition. All defects disclosed by these tests shall be corrected to the satisfaction of the Architect, Commissioning Agent, and Engineer without any additional cost to the Owner. Tests shall be repeated on this repaired or replaced work if deemed necessary by the Architect. The Engineer shall be notified at least forty-eight (48) hours in advance of all tests, and shall be represented at tests that he deems necessary. The Contractor shall furnish all necessary instruments, other equipment, and personnel required for such tests.

E. Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered by him to the Architect.

F. If the Architect or Engineer is to observe the inspections, tests or approvals required by the Contract Documents, he will endeavor to do so promptly and, where practicable, at the source of supply.

PART 3 EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY AND INSPECTORS

A. Representatives of the testing laboratory and inspectors shall have access to the work at all times. Provide facilities for such access in order that they may properly perform their functions.

3.2 SCHEDULES

A. Establishing Schedule

1. By advance discussions with the inspection service and testing laboratory selected by the Owner, determine the time required to perform inspections and tests and to issue each of its findings.

2. Provide all required time within the construction schedule.

B. Revising Schedule

1. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the inspectors and testing laboratory as required.

C. Adherence to Schedule

1. When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay will be back-charged to the Contractor.

3.3 TAKING SPECIMENS

A. All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the testing laboratory; all sampling equipment and personnel will be provided by the testing laboratory; and all deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

END OF SECTION

SECTION 015000

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the construction facilities and temporary controls as shown on the drawings and specified herein, including but not limited to, the following:

1. Construction sign.
2. Lifts, stairs, and ladders.
3. Rodent control.
4. Temporary partitions and doors.
5. Field office.
6. Fire protection.
7. Temporary utilities.
8. Temporary toilets.
9. Security.
10. Environmental controls.

1.3 RELATED SECTIONS

A. Materials and equipment - Section 016000.

B. Cleaning - Section 017300.

PART 2 PRODUCTS

2.1 GENERAL

A. Arrange for and provide temporary facilities and controls as specified herein and as required for the proper and expeditious prosecution of the work. Pay all costs, except as otherwise specified, until final acceptance of the work unless the Owner makes arrangements for the use of completed portions of the work after substantial completion.

B. Make all temporary connections to utilities and services in locations acceptable to the local authorities having jurisdiction thereof; furnish all necessary labor and materials, and make all installations in a manner subject to the acceptance of such authorities; maintain such connections; remove the temporary installation and connections when no longer required; restore the services and sources of supply to proper operating condition.

C. Unless otherwise noted, pay all costs for temporary electrical power, temporary water, and temporary heating; provide metering as necessary.

D. A Staging Plan shall be submitted by the Contractor for approval by the Owner. The Staging Plan shall locate all temporary facilities and services, including parking for the Contractor's employees, within the limits of the staging areas, and shall allot ground space to Subcontractors for storage of materials, and the erection of sheds and tool houses. Materials and equipment can only be stored in the staging area. No parking for Contractor's or Subcontractors' employees' vehicles will be allowed in undesignated parking areas. The staging area shall be maintained in good repair, free of mud and standing water, and passable at all times. All materials stored within the project site are the responsibility of the Contractor. At the completion of the work, the staging areas shall be restored to their original condition, gravel removed, topsoil replaced and graded and re-seeded.

2.2 PROJECT IDENTIFICATION

A. No signs or advertisements will be allowed to be displayed on the premises without the approval of the Architect.

B. One construction sign on the site shall be provided by the Contractor and shall be subject to the review of the Architect and the approval of the Owner.

C. Erect the construction sign on the site where directed by the Architect. Provide sign approximately 4 ft. x 8 ft. in size, of 3/4 in. plywood with structural supports. Use Douglas Fir Overlaid Plywood, Grade B-B high density, exterior, good two sides, complying with PS-1. The sign shall be primed and given two coats of alkyd white paint. Lettering shall be black of a type, size, and lay-out as directed by the Owner. Sign shall contain the name of the Building, Owner, Architect, Contractor, and such other reasonable information as the Architect or Owner may require.

2.3 MATERIAL SCAFFOLD/LIFT FOR WORK PERFORMED ON SECOND FLOOR

A. Provide a material scaffold and lift as required for use by all trades. Provide all necessary guards, signals, safety devices, and so on, required for safe operations, and suitable runways from the hoists to each floor level and roof. The construction and operation of the material hoist shall comply with all applicable requirements of ANSI A10.5, the ACG Manual of Accident Prevention in Construction and to all applicable state and municipal codes. Prohibit the use of the material lift for transporting personnel.

2.4 RODENT CONTROL

A. Institute an effective program of rodent control for the entire site within the construction limits. Cooperate with local authorities and provide the regular services of an experienced exterminator who shall visit the site at least once a month for the entire construction period. Provide marked metal containers for all edible rubbish and enforce their use by all employees. Containers shall be emptied and the contents removed from the site as often as required to maintain an adequate rodent control program. If the program of rodent control used is not effective, take whatever steps are necessary to rid the project of rodents, and such action shall not be the basis of a claim for additional compensation or damages.

2.5 TEMPORARY CONSTRUCTION OPENINGS

A. Provide openings in slabs, walls, and partitions where required for moving in large pieces of equipment of all types. Close and/or restore all openings and finish them after the equipment is in place. Structural modification, if required, shall be subject to review by the Architect.

2.6 TEMPORARY PARTITIONS

A. Provide and maintain an 8 foot high temporary partition to enclose the area at the job site and to guard and close effectively the designated area. Provide doors at locations where required for access to the enclosed area. Doors shall be cross-braced, hung on heavy strap hinges, and shall have hasps and padlocks. Submit shop drawings of temporary partition and doors for review of Architect and Owner. Paint the partitions with two coats of approved paint.

B. Refer to Architectural Drawings for location and layout of temporary partitions and doors.

C. Remove the temporary partitions upon completion of the work or at such time before final completion as directed by the Owner.

2.7 TEMPORARY FIELD OFFICES

A. Provide and maintain a field office with a telephone and high speed wifi at the job site with not less than 200 square feet of space. The office shall be complete with light, heat, air conditioning, toilet facilities, electric water cooler, plan racks, four-drawer metal file with lock, shelves for samples, tables, chairs, and janitor service. When it becomes possible to establish an office in the building, office accommodation of approximately the same size as those in the field offices, including the services above, shall be provided and maintained until the issuance of a certificate of substantial completion. Temporary offices shall be removed when no longer required. Provide a high speed wifi connection and pay all charges for installation.

2.8 FIRE PROTECTION

A. Provide and maintain adequate fire protection, ready for instant use, distributed around the project.

B. Make arrangements for periodical inspection by local fire protection authorities and insurance underwriters inspections. Cooperate with said authorities and promptly carry out their recommendations.

C. Open fire will not be permitted within the building enclosure or on the project site.

2.9 TEMPORARY HEAT AND VENTILATION

A. Provide temporary heat as required during construction to protect the work from freezing or frost damage, and as necessary to ensure suitable working conditions for the construction operations of all trades. In areas of the building where work is being conducted, the temperature shall be maintained as specified in the various sections of the Specifications, but not less than 45 degrees Fahrenheit. Under no circumstances shall the temperature be allowed to reach a level that will cause damage to any portion of the work which may be subject to damage by low temperatures.

B. Until the building, or any major portion thereof, is enclosed, temporary heating shall be by smokeless portable unit heaters of type listed by Underwriter's Laboratories, Factory Mutual, and the Fire Marshall. Pay for fuel, maintenance, and attendants required in connection with the portable unit heaters. Interior or exterior surfaces damaged by the use of these space heaters shall be replaced by new materials or be refinished.

C. The building shall be considered enclosed when it has reached the stage when exterior walls have been erected, the roof substantially completed, exterior openings closed up either by the permanently glazed windows and doors, or by adequate temporary closing, and the building is ready for interior masonry and plastering operations.

D. After the building, or any major portion thereof, has been enclosed, the permanent heating system as specified below may be used for temporary heat.

E. When the permanent heating system, or a suitable portion thereof, is in operating condition, the system may be used for temporary heating, provided that the Contractor assumes full responsibility for the entire heating system, and pays all costs for fuel, operation, maintenance, and restoration of the system.

F. Provide adequate ventilation as required to keep the temperature of the building within 10 degrees Fahrenheit of the ambient outdoor temperature when such ambient temperature exceeds 70 degrees Fahrenheit, and to prevent accumulation of excess moisture or to prevent excess thermal movement in the building.

G. When the permanent air circulation system, or a suitable portion thereof, is in operating condition, it may be used without refrigeration or chilling, provided that the Contractor assumes full responsibility for the system which he is using, and pays costs for power, operation, maintenance, and restoration of the system. Provide temporary filters to adequately filter air being distributed through the duct work to the supply outlets; disposable filters shall be placed in front of all exhaust registers to keep construction dirt out of exhaust duct work. The Contractor shall thoroughly clean the interior of the air handling units and duct work prior to acceptance of the work.

H. Upon conclusion of the temporary heating period, remove all temporary piping, temporary heating units, or other equipment and pay all costs in connection with repairing any damage caused by the installation or removal of temporary heating equipment. Thoroughly clean and recondition those parts of permanent heating and air circulation systems used for temporary service.

2.10 TEMPORARY LIGHT AND POWER

A. Make all arrangements with the local electric company for temporary electrical service to the construction site; provide all equipment necessary for temporary power and lighting; and pay all charges for this equipment, the installation thereof, and for current used. The electrical service shall be of 120v and 240v for single phase loads up to 30 amps for all construction tools and equipment without overloading the temporary facilities and shall be made available for power, lighting, and construction operations of all trades.

B. In addition to the electrical service, provide power distribution as required throughout structure. The terminations of power distribution shall be at convenient locations in the building. Terminations shall be provided for each voltage supply complete with circuit breakers, disconnect switches, and other electrical devices as required to protect the power supply system.

1. Provide double duplex outlets at not more than 200' o.c. both directions throughout this building.

C. A temporary lighting system shall be furnished, installed, and maintained as required to satisfy minimum requirements of safety and security. The temporary lighting system shall afford general illumination in all building areas and shall supply not less than 150 watt lamps on 30' centers both directions of floor area for illumination in the areas of the building where work is being performed.

D. All temporary equipment and wiring for power and lighting shall be in accordance with the applicable provisions of the governing codes. All temporary wiring shall be maintained in a safe manner and used so as not to constitute a hazard to persons or property.

E. When the permanent electrical power and lighting systems are in operating condition, they may be used for temporary power and lighting for construction purposes, provided that the Contractor assumes full responsibility for the entire power and lighting system, and pays costs for power, operations, maintenance, and restoration of the system.

2.11 TEMPORARY STAIRS, LADDERS, RAMPS, SIDEWALK BRIDGING AND RUNWAYS

A. Provide and maintain all equipment such as temporary stairs, ladders, ramps, runways, and chutes as required for the proper execution of the work.

B. All such apparatus, equipment, and construction shall meet all requirements of the Labor Law and other state or local laws applicable thereto.

C. As soon as permanent stairs are erected, provide temporary protective treads, handrails, and shaft protection.

D. Covered Walkway: Erect a structurally adequate, protective, covered walkway for passage of persons along adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct covered walkways using scaffold or shoring framing.

2. Provide wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well drained walkways, and similar provisions for protection and safe passage.

3. Extend back wall beyond the structure to complete enclosure fence.

4. Paint and maintain in a manner approved by Owner and Architect.

5. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8” thick exterior plywood.

2.12 TEMPORARY TOILETS

A. Provide and maintain in a sanitary condition enclosed weathertight toilets for the use of all construction personnel at a location within the contract limits. Upon completion of the work, toilets shall be removed. Installation shall be in accordance with all applicable codes and regulations of authorities having jurisdiction. The number of toilet rooms required shall be in accordance with the ANSI Standard Safety Code for Building Construction or other local authorities.

2.13 TEMPORARY WATER SERVICE

A. Provide at a point within 10 feet of the building (or buildings) all water necessary for construction purposes. Make all temporary connections to existing mains; provide temporary meter; and make arrangements to pay for the temporary water service including cost of installation, maintenance thereof, and water used.

B. Furnish drinking water with suitable containers and cups for use of employees. Drinking water dispensers shall be conveniently located in the building where work is in progress.

C. When the permanent water supply and distribution system has been installed, it may be used as a source of water for construction purposes, provided that the Contractor assumes full responsibility for the entire water distribution system, and pays costs for operation, maintenance, and restoration of the system including the cost of water used.

D. At the completion of the construction work or at such time after the Contractor makes use of the permanent water installation, all temporary water service equipment and piping shall be removed, and all worn or damaged parts of the permanent system shall be replaced and equipment placed in first class condition equal to new.

2.14 SECURITY

A. Provide sufficient watchman service to prevent illegal entry or damage during nights, holidays, or other periods when work is not being executed, and such other control watchmen as required during working hours.

B. Provide all temporary enclosures required for protecting the project from the exterior, for providing passageways, for the protection of openings both exterior and interior, and any other location where temporary enclosures and protection may be required.

C. Take adequate precautions against fire; keep flammable material at an absolute minimum; and ensure that such material is properly handled and stored. Except as otherwise provided herein, do not permit fires to be built or open salamanders to be used in any part of the work.

2.15 ENVIRONMENTAL CONTROLS

A. The Contractor shall comply with all applicable Federal, State and local laws, regulations, ordinances, codes and standards concerning environment control. Particular attention shall be given, without limitations, to:

1. Minimization of dust, containment of chemical vapors, control of engine exhaust gases, and control of smoke from temporary heaters.

2. Reduction of water pollution by control of sanitary facilities, proper storage of fuels and other potential contaminants, and prevention of siltation from land erosion.

3. Minimization of noise levels.

4. Proper and legal disposal, off site unless otherwise provided, of waste and spoil resulting from construction activities.

PART 3 EXECUTION

3.1 REMOVAL

A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the work. Remove all such temporary facilities and controls as rapidly as progress of the work will permit or as directed by the Architect.

END OF SECTION

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete product requirements as specified herein, including but not limited to, the following:

1. Product delivery, storage and handling.

2. Storage and protection.

3. Identifying markings.

4. Substitution requirements.

5. Temporary use of equipment.

6. General standards.

1.3 RELATED SECTIONS

A. Execution requirements – Section 017300.

1.4 TRANSPORTATION AND HANDLING

A. Materials, products, and equipment shall be properly containerized, packaged, boxed, and protected to prevent damage during transportation and handling.

B. More detailed requirements for transportation and handling are specified under the technical Sections.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage and liquids from freezing.

7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 IDENTIFYING MARKINGS

A. Name plates and other identifying markings shall not be affixed on exposed surfaces of manufactured items installed in finished spaces.

1.7 PRODUCT APPROVAL STANDARDS

A. Where the words "or approved equal" or other synonymous terms are used, it is expressly understood that they shall mean that the approval of any such submission is vested in the Architect, whose decision shall be final and binding upon all concerned. All submissions are subject to such approval and shall conform to the requirements of Article 1.8 herein.

1.8 SUBSTITUTIONS

A. After the contract has been executed, the Architect will consider a formal request for the substitution of products in place of those specified, under the following conditions:

1. The request is accompanied by complete data on the proposed substitution substantiating compliance with the Contract Documents including product identification and description, performance and test date, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified or named by Addenda, with data relating to Contract time schedule, design and artistic effect where applicable, and its relationship to separate contracts.

2. The request is accompanied by accurate cost data on the proposed substitution in comparison with the product specified, whether or not modification of the Contract Sum is to be a consideration.

B. Requests for substitution based on Para (1) above, when forwarded by the Contractor to the Architect for review are understood to mean that the Contractor:

1. represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified:

2. will provide the same guarantee for the substitution that he would for that specified;

3. certifies that the cost data presented is complete and includes all related costs under this Contract, but excludes costs under separate contracts and the Architect's redesign costs, and that he waives all claims for additional costs related to the substitution which subsequently become apparent; and

4. will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects, at no additional cost to the Owner and at no extension of the contract completion date.

C. Substitutions will not be considered if:

1. they are indicated or implied on shop drawings submissions without the formal request required in Para (1) above; or

2. for their implementation they require a substantial revision of the Contract Documents in order to accommodate their use.

3. The Architect will examine, with reasonable promptness, such substitution submittals, and return of submittals to the Contractor shall not relieve the Contractor from responsibility for deviations and alternatives from the contract plans and specifications, nor shall it relieve him from responsibility for errors in the submittals. A failure by the Contractor to identify in his letter of transmittal material deviations from the plans and specifications shall void the submittals and any action taken thereon by the Architect. When specifically requested by the Architect, the Contractor shall resubmit such shop drawings, descriptive data and samples as may be required to evaluate substitutions.

D. If any mechanical, electrical, structural, or other changes are required for the proper installation and fit of alternative materials, articles, or equipment, or because of deviations from the contract plans and specifications, such changes shall not be made without the consent of the Architect and shall be made without additional cost to the Owner.

1.9 TEMPORARY USE OF EQUIPMENT

A. No equipment intended for permanent installation shall be operated for temporary purposes without the written permission of the Architect.

B. The temporary or trial usage by the Owner of any mechanical device, machinery, apparatus, equipment or any work or materials supplied under this Contract before final completion and written acceptance by the Architect, including equipment and materials used for temporary and/or interim HVAC, shall not be construed as evidence of the acceptance of same by the Owner. The Owner shall have the privilege of such temporary and trial usage, for such reasonable length of time as and when the Architect shall deem to be proper for making a complete and thorough test of same and no claim for damage shall be made by the Contractor for the injury to or breaking of parts of such work which may be caused by weakness or inaccuracy of structural parts or by defective material or workmanship. If the Contractor so elects, he may at his own expense, place a competent person or persons to make such trial usage; such trial usage shall be under the supervision of the Contractor.

1.10 GENERAL REQUIREMENTS

A. In the event that it is necessary for the Contractor to store any materials offsite, he shall first obtain the approval of the Architect. The Contractor shall be responsible for insurance and warehousing charges of any materials stored offsite. The Contractor shall also be responsible for the cost of delivery to the job site of any materials that have been stored offsite.

B. Materials delivered to the job site or stored off site shall be carefully stored and protected from damage. Damaged material shall not be used in the work. The Contractor shall provide, where directed, temporary storage facilities as may be required for the storage of all materials which might be damaged by weather.

C. Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the representative manufacturers, unless otherwise specified.

D. Equipment, plant, and appliances, such as hoists, centering, concrete lifts, construction elevators, cranes, rigging, towers, derricks, walks, ramps, chutes, scaffolding, implements, transportation, cartage and other things necessary and required for the adequate execution of the work and as required by law and applicable Union rules shall be provided and shall be maintained in good and safe mechanical working order, be responsible for their safe use, and remove them when no longer required. Applicable requirements of OSHA shall become and form a part of this document.

E. During handling and installation of work at project site clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

F. To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or pollution, water, ice, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high speed operation, improper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping/handling, theft and vandalism.

G. Require installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to Contractor) unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

H. Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

I. Inspect each item of materials or equipment immediately prior to installation and reject damaged and defective items.

J. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerance if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual-effect choices to Architect for final decision.

K. Recheck measurements and dimensions of the work as an integral step of starting each installation.

L. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work in coordination with entire work. Isolate each unit of work from non-compatible work, as required to prevent deterioration.

M. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.

N. Mounting Heights: See Architect's drawings for explicit information regarding mounting heights of devices, fixtures, hardware, signs and other unis of work. If no information regarding heights provided, or if information is ambiguous or contrary to code or the Contractor's better judgement, notify the Architect for review and resolution prior to preparatory work affecting installation.

END OF SECTION

SUBSTITUTION REQUEST
(After the Bidding/Negotiating Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

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SUBSTITUTION REQUEST

(After the Bidding/Negotiating Phase — Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: ☐

A/E's REVIEW AND RECOMMENDATION

☐ Approve Substitution - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Approve Substitution as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Reject Substitution - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

OWNER'S REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.
☐ Substitution rejected - Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E

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SECTION 016300

MOCK-UPS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Mock-Up Assemblies: Models built accurately using full scale materials for the purpose of study, testing, display, material and methods approval and final approval.

1. Provide submittals and all labor, materials, equipment and services required for the approval of samples, Mock-Up Construction and removal of Work at the end of the project and after final approval; at no additional cost to the Architect or Owner.

1.3 RELATED SECTIONS

A. Submittals - Section 013300.

B. Construction Facilities and Temporary Controls - Section 015000.

1.4 DEFINITIONS

A. Materials mock-ups are intended for review of materials, components and to set standards of workmanship for all portions of assemblies demonstrated. Approval is required prior to release for purchase of materials and/or fabrication, as may be applicable. Mock-ups may or may not be incorporated into the work, as applicable.

B. Installation mock-ups are intended for review and to set standards of workmanship for all portions of assemblies demonstrated. Installation mock-ups are provided “in place” and may be incorporated into the work with the approval of the architect(s).

1.5 MOCK-UP ASSEMBLIES

A. Schedule: A time schedule for the construction of all mock-up assemblies shall be prepared by the Contractor and submitted to the Architect for review, prior to the start of construction. Incorporate Mock-Up Schedule into Construction and Submittal Schedules.

B. Shop Drawings: Prepare and submit shop drawings of each mock-up assembly for review by the Architect. Shop drawings shall indicate all details, dimensions, connections, tolerances, and the relationship of the various parts to each other and to adjoining work.

C. Samples and Product Data: Prior to delivery of materials for mock-up assemblies, submit product data and samples of all materials proposed for use in the construction of the mock-ups for review by the Architect. Samples shall illustrate all characteristics such as scale, color and texture of finishes, sizes, shapes, and physical properties of the materials to be used in the Work.

D. Photographs: All details and features of mock-ups shall be thoroughly documented by color photographs taken from various points of view (at least four). This is in the same format but in addition to the requirement for project photographs in Section 013300 - Submittals.

E. Construction: Refer to drawings for size and location of mock-ups; mock-up numbers coincide with numbers on drawings. All slabs, footings, supporting walls, frames, etc. required for mock-up construction shall be provided by the Contractor.

F. Sequence of Inspection

1. The Architect shall be notified by the Contractor at the start of building all the mock-up assemblies and shall be advised of progress to allow the Architect to schedule inspections.

2. Visual examination of all mock-up assemblies will be made by the Architect, Owner and other interested parties during construction.

3. Mock-ups shall be scheduled well in advance of actual construction of the specified area to allow adjustments in material use, material selections and construction techniques.

4. Should any mock-up assembly fail to receive the approval of the Architect, it shall be taken down or dismantled and rebuilt to the extent necessary or until the Architect's approval has been obtained; at no cost to the Architect or Owner.

5. The rebuilding and completion of any mock-up assembly as necessary to obtain acceptance shall be so timed by the Contractor as to avoid delay in the construction schedule of the project.

6. Obtain the Architect's and University’s acceptance of each finished mock-up before commencing the final corresponding work for the project.

7. Coordinate the product list schedule with the Contractor's Construction Schedule and the Schedule of Submittals, and the time schedule for construction of mock-ups.

8. Approved interior mock-ups shall be incorporated into the permanent construction.

G. Approvals Required: Before ordering the job requirements of any materials for construction of work of sections or of assemblies requiring mock-ups, the Contractor is advised that he shall obtain approvals of the following:

a. Material(s).
b. Mock-up.
c. Shop Drawings.

PART 2 PRODUCTS

2.1 MOCK-UPS ASSEMBLIES

A. Materials and finishes shall comply with the requirements specified in the various sections of the specifications, and shall match previously submitted and approved samples.

B. Mock-ups shall incorporate all related construction materials and finishes having a visual effect upon the completed work.

PART 3 EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Field Measurement: Before ordering any materials for mock-up work, the Contractor shall verify all measurements at the project site and shall be responsible for their correctness. Responsibility for dimensions of materials or assemblies shall rest with the Contractor, who shall be responsible to correct to the Architect's approval, or replace, any misfitting elements. No extra charge will be allowed for differences between actual dimensions and measurements indicated on the drawings.

B. Manufacturers Instructions and Recommendations: Unless more stringent requirements are indicated or specified in individual sections of these specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of substantial completion of the Project.

3.2 MOCK-UP ASSEMBLIES

A. Mock-up List:

1. Provide a 100 square foot mockup of polished, patched, and sealed concrete floor.

END OF SECTION

SECTION 017300

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. General installation of products.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.
6. Correction of the Work.

1.3 RELATED SECTIONS

A. Cutting and patching – Section 017329.

B. Closeout procedures – Section 017700.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies or uncertainties are discovered, notify Architect promptly.

B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg. F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017329

CUTTING AND PATCHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes procedural requirements for cutting and patching. Provide careful, controlled, and coordinated cutting and patching with clean edged and minimal damage of existing masonry and concrete. Limit disturbance of existing material to remain as much as possible.

1.3 RELATED SECTIONS

A. Refer to Divisions 2 through 32 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 22, 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.4 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.5 SUBMITTALS

A. Cutting and Patching: Submit a method describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.

4. Dates: Indicate when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

7. Architect's Approval: Obtain approval of cutting and patching before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.6 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

1. Provide a list of additional elements that are structural elements and that require Architect's or Construction Manager's approval of a cutting and patching proposal.

B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

1. Primary operational systems and equipment.

2. Air or smoke barriers.

3. Fire-protection systems.

4. Control systems.

5. Communication systems.

6. Conveying systems.

7. Electrical wiring systems.

8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.

2. Membranes and flashings.

3. Exterior curtain-wall construction.

4. Equipment supports.

5. Piping, ductwork, vessels, and equipment.

6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.7 WARRANTY

A. Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void warranties.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. In-Place Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. Provide masonry infill and patching to match existing masonry in unit type, mortar type, joint size, and finish.

2. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

3. Finished work shall be indistinguishable from adjacent existing construction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. In-Place Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Carefully cut using a cutting machine, such as an abrasive saw or a diamond-core drill. Cutting at existing concrete and masonry shall be done with care and coordination with all trades to provide minimal cut necessary.

4. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Warranties.
4. Instruction of Owner's personnel.
5. Final cleaning.

1.3 RELATED SECTIONS

A. Execution requirements – Section 017300.

B. Operating and maintenance data – Section 017823.

1.4 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.

9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Advise Owner of changeover in heat and other utilities.

12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

13. Complete final cleaning requirements, including touchup painting.

14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.5 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest-control final inspection report and warranty.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

1.7 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

3. Mark important additional information that was either shown schematically or omitted from original Drawings.

4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Note related Change Orders, Record Drawings and Product Data, where applicable.

D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Drawings and Record Specifications, where applicable.

E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit on digital media acceptable to Architect.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

3. Schedule training with Owner with at least seven days' advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.

2. Review of documentation.

3. Operations.

4. Adjustments.

5. Troubleshooting.

6. Maintenance.

7. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    1). Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 017823

OPERATING AND MAINTENANCE DATA

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the operating and maintenance data as specified herein.

1.3 RELATED SECTIONS

A. Submittals - Section 013300.

B. Contract closeout - Section 017700.

1.4 GENERAL

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.

1. Sub-Contractors shall prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.

1.5 FORM OF SUBMITTALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 MANUAL FOR MATERIALS AND FINISHES

A. Submit pdf of complete manual in final form.

B. Content, for architectural products, applied materials and finishes

1. Manufacturer's data, giving full information on products.

a. Catalog number, size, composition.
b. Color and texture designations.
c. Information required for re-ordering special-manufactured products.

2. Instructions for care and maintenance.

a. Manufacturer's recommendation for types of cleaning agents and methods.
b. Cautions against cleaning agents and methods which are detrimental to the product.
c. Recommended schedule for cleaning and maintenance.

C. Content, for moisture-protection and weather-exposed products

1. Manufacturer's data, giving full information on products.

a. Applicable standards.
b. Chemical composition.
c. Details of installation.

2. Instructions for inspection, maintenance, and repair.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit pdf of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate.

1. Description of unit and component parts.

a. Function, normal operating characteristics, and limiting conditions.
b. Performance curves, engineering data and tests.
c. Complete nomenclature and commercial number of all replaceable parts.

2. Operating procedures

a. Start-up, break-in, routine and normal operating instructions.
b. Regulation, control, stopping, shut-down and emergency instructions.
c. Summer and winter operating instructions.
d. Special operating instructions.

3. Maintenance procedures

a. Routine operations.
b. Guide to "trouble-shooting".
c. Disassembly, repair and reassembly.
d. Alignment, adjusting and checking.

4. Servicing and lubrication schedule.

a. List of lubricants required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

    a. Predicted life of parts subject to wear.
    b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.

9. Each contractor's coordination drawings.

    a. As-installed color coded piping diagrams.

10. Charts of valve tag numbers, with the location and function of each valve.

11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

12. Other data as required under pertinent sections of specifications.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.

    a. Function, normal operating characteristics, and limiting condition.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories of panel boards.

    a. Electrical service.
    b. Controls.
    c. Communications.

3. As-installed color coded wiring diagrams.

4. Operating procedures

    a. Routine and normal operating instructions.
    b. Sequences required.
    c. Special operating instructions.

5. Maintenance procedures

    a. Routine operations.
    b. Guide to "trouble-shooting".
    c. Disassembly, repair and reassembly.
    d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

8. Other data as required under pertinent sections of specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: The respective sections of Specifications.

END OF SECTION

SECTION 024119

SELECTIVE DEMOLITION AND ALTERATION WORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the selective demolition and alteration work as shown on the drawings and/or specified herein, including but not limited to the following:

1. Alterations, selective demolition and removals as noted on drawings and as required to accommodate new construction.

2. Removal of debris.

3. Protection of existing building and spaces to remain, and shoring of the structure as required for structural integrity and personal safety.

4. Protection of existing curbs and sidewalks.

5. Temporary coverage passageways.

6. Alterations, selective demolition and removals of exterior facade where noted.

7. Patching and refinishing of existing surfaces damaged as a result of this work.

8. Protection.

1.3 QUALITY ASSURANCE

A. The Contractor shall comply with the requirements of all applicable Federal, State and local safety and health regulations regarding the demolition of structures including ANSI/NFPD 241-Building Construction and Demolition Operations.

B. The Contractor shall be responsible for any damage to any adjacent structures or buildings to remain.

C. Qualifications: Qualifications of Contractor for work of this Section shall not be less than ten (10) years of field experience in work of this nature.

D. Professional Engineering: The Contractor shall retain the services of a Professional Engineer licensed in the State of New York, who shall design and supervise installation of all underpinning and shoring.

1.4 RELATED SECTIONS

A. Alteration and removal requirements for mechanical and electrical work - Mechanical and Electrical Sections.

1.5 SUBMITTALS

A. Schedule of Demolition Operations: Submit demolition procedures and operational sequence for Architect's review prior to start of work. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:

1. The work of tying in or connecting to operational systems of the building, including electrical, mechanical and security systems.

2. The work of the Owner or any separate Contractor.

3. The structural value or integrity of any element of the project or of adjacent structures.

4. The integrity or effectiveness of weather-exposed and moisture-resistant elements or systems.

5. The efficiency, operational life, maintenance, or safety of operational elements or systems.

B. Notice of Differing Conditions: Submit a written notification if, during the work of demolition and cutting, conditions are discovered which significantly vary from those shown on the drawings. Do not commence work until approval of Architect.

C. Shop Drawings: Submit the following prior to starting work:

1. Submit for Architect's information shop drawings indicating location and typical construction details of temporary dustproof and weatherproof partitions.

2. Submit drawings of temporary structural shoring, bracing, framing or support, for the information of the Architect. Such drawings will be reviewed by the Structural Engineer for the effects of such temporary members on the structural elements to remain. These drawings shall include the reason for such temporary members, the location, the direction and magnitude of design reaction forces on existing structure, and details showing how these reaction forces will be applied to the existing structure.

a. Shop drawings shall be submitted with the Seal of the P.E. engaged by Contractor; P.E. must be licensed in the State of New York.
b. The Architect will receive acknowledgment for concepts shown. Such acknowledgments shall be of the concept only and not of actual capacities or structural design and shall not in any way diminish or limit the Contractor's responsibility for the quality and performance of the work and for protecting existing structures and facilities.

1.6 SPECIAL PRECAUTION

A. Hazardous materials may be encountered during demolition operations including asbestos; comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

1.7 JOB CONDITIONS

A. Condition of Structure

1. The Contractor for the work of this Section shall be held to have visited the site, examined the premises, determined for himself the existing conditions, character of equipment and facilities needed for the performance of the work, and all matters which may in any way affect the work before submitting a bid.

a. Information regarding existing construction or conditions is based on available record drawings which may or may not truly reflect existing conditions. Such information is included on the assumption that it may be of interest to the Contractor, but the Architect, Owner and their consultants do not assume responsibility for its accuracy or completeness.
b. Notify the Architect if, during the course of demolition, conditions are discovered which significantly vary from those shown on the drawings. Do not proceed until authorized by Architect.

2. The Contractor shall accept the condition of the site and structures as found. The Architect and Owner assume no responsibility for condition of site or structures nor the continuation of the condition existing at time of bidding or thereafter.

B. Areas of building to be demolished or altered will be vacated and discontinued in use prior to the start of the work.

1. Surrounding areas of the building shall remain operational by the Owner.

C. Partial Removal

1. Items of savable value to the Contractor may be removed from the structure as the work progresses. Salvaged items must be transported from the site as they are removed.

2. Storage or sale of removed items on the site will not be permitted.

D. Explosives: The use of explosives will not be permitted.

E. Traffic

1. Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.

2. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Utilities

1. Refer to Division 22 and 26 of the specifications for special requirements concerning utilities and services.

2. Maintain any existing utilities required to remain; keep in service and protect against damage during demolition operations.

3. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities.

4. Disconnect and seal any abandoned utilities before starting demolition operations. Coordinate all work with local utility companies having jurisdiction.

1.8 SCHEDULING

A. Before commencing any alteration or demolition work, submit for review by the Architect, and approval of the Owner, a schedule showing the commencement, the order, and the completion dates for the various parts of this work.

B. Before starting any work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the structures to remain, notify the Architect and the Owner 7 days in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.

PART 2 PRODUCTS

Refer to Part 3 - Execution, for Product Requirements

PART 3 EXECUTION

3.1 PROTECTION

A. Take full precautions to protect workmen, passersby or any other persons from falling debris and other hazards of demolition operations.

B. Execute demolition work to insure protection of existing portions of building to remain against damages which might occur from falling debris or other cause. Do not interfere with use of adjacent occupied buildings and areas. Maintain free, safe passage to and from occupied adjacent buildings.

C. Materials Placement: Do not load structure with weight that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.

D. Construction Operations: Do not employ any construction operation, equipment or vehicles that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.

E. Take precautions to guard against movement, settlement, damage, or collapse of any part of building, sidewalks, adjacent property or street passages; be liable for any such movement, settlement or collapse. If such damage does accidentally occur, Contractor shall repair promptly at no cost to Owner.

F. Provide the necessary safeguards to prevent accidents, to avoid all necessary hazards and protect the public, the work and property at all times, including Saturdays, Sundays, and holidays.

G. Be responsible for any and all damages which may arise or occur to any party whatsoever by reason of the neglect in providing proper lights, guards, barriers, or any other safeguards to prevent damage to property, life and limb.

H. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.

1. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain. The Contractor's Professional Engineer shall advise on bracing, shoring, underpinning, or other structural

requirements. The Contractor shall bear all responsibility for prevention of movement or other structural fault.

2. The Contractor shall restore, by repair or otherwise, the portions of structure or their contents altered by the Contractor in furtherance of his underpinning and support operations. Restoration shall be completed to the conditions which existed prior to the start of the work. Any damage caused by inadequate support shall also be restored by the Contractor at no cost to the Owner.

I. Provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in demolition and alteration operations, occupants of the building, public and adjacent property. Any damage caused by the Contractor's operations shall be promptly repaired by the Contractor at no cost to the Owner.

J. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal, and new work are being done, connections made, materials handled, or equipment moved.

K. Take necessary precautions to prevent dust and dirt from rising. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.

L. Provide adequate fire protection in accordance with local Fire Department requirements.

M. Do not close or obstruct walkways, passageways, or stairways. Do not store or place materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.

N. Be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.

O. Erect temporary covered passageways at street level as required by authorities having jurisdiction.

P. Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.

Q. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

3.2 INSPECTION

A. Verify that areas of demolition work are protected and temporary dustproof partitions have been installed.

B. Verify that construction to be removed is not load bearing or has been properly braced, framed or supported.

C. Inspect existing conditions of the project, including elements subject to damage or to movement during demolition and cutting.

D. After uncovering work, inspect the conditions affecting the installation or performance of the work.

1. Report differing or questionable conditions to the Architect in writing; do not proceed with the work until the Architect has provided further instructions.

3.3 PREPARATION

A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work

B. Provide devices and methods to protect other portions of the project from damage.

C. Pollution Controls

1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.

    a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing prior to the start of the work.

3. Provide drainage for temporary water use.

3.4 DEMOLITION AND CUTTING

A. Selectively demolish existing construction in conformance with the drawings and these specifications.

1. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surface to receive installation of work by others and patching of finish surfaces.

2. Do all cutting or removal so as to leave neat, true, plumb and square edges, at edges to remain. Use carborundum or diamond saw equipment for cutting masonry, concrete and stone work, where edges or surfaces are to remain.

3. Do not cut or remove construction which might weaken or impair the structural integrity or strength of the structural framing or support systems which are to remain.

4. Demolish and remove materials as shown on the drawings without damage to the remaining parts of the structure or mechanical/electrical/utility systems.

5. Remove materials so as to not impose excessive loads in supporting walls, floors or framing and so as not to damage remaining undemolished portions of the structure.

6. Where portions of structures are to be removed, remaining portions shall be protected from damage and prepared to fit new construction. Damage to portions of structures to remain shall be repaired.

7. Reinforcing steel in existing structures shall be left in place, cleaned and aligned to provide tie with new work.

8. Existing waterproofing systems and flashings shall be carefully exposed and protected to maintain workable conditions of fitting new work with existing construction.

9. Proceed with demolition in a systematic manner.

10. Demolish concrete and masonry in small sections.

11. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.

B. Shoring

1. Design, provide, erect and maintain necessary temporary shoring, bracing, framing, or support where load bearing structural or supporting members are removed or weakened by cuts or openings or are subject to damage from demolition operations, and otherwise as required for safety or to protect finish surfaces from damage.

2. Construction and adequacy of the shoring shall be the entire responsibility of the Contractor. Any damage caused by the inadequacy of the shoring or other support shall be the responsibility of the Contractor to remedy at no additional expense to the Owner.

3. Shoring and bracing shall remain until new structural framing and/or supports are installed. Coordinate operations fully with other trades.

4. Be ready at any time to promptly provide, add to, or strengthen temporary shoring, bracing, or support for existing work, in case existing construction begins to show signs of structural stress.

3.5 WORKMANSHIP STANDARDS FOR ALTERATION AND REMOVAL WORK

A. Cut, remove, alter, temporarily remove and replace, or relocate existing work as required for performance of the work. Perform such work required with due care, including shoring and bracing.

B. Coordinate patching involving the various trades whether or not specifically mentioned in the respective specification Sections.

C. Materials or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property.

D. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the adjacent buildings.

E. In general, demolish masonry in small sections. Where necessary to prevent collapse of any construction, install temporary shores, struts, or bracing.

F. Materials to be removed by existing elevators shall be put in enclosed containers.

G. Where existing equipment and/or fixtures are indicated to be reused, repair such equipment and/or fixtures and refinish to put in perfect working order. Refinish as directed.

H. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.

I. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. Cut and fold back existing roofing. Cut and remove insulation and related items. Provide temporary weathertight protection as required until new roofing and flashings are installed. Consult the Owner to ascertain if existing guarantee bonds are in force and execute the work so as not to invalidate such bonds.

J. Where utilities are removed, relocated or abandoned, cap, valve, plug, or by-pass to make complete and working installation.

K. Restore existing pipe and duct coverings damaged by work under this Contract to original undamaged condition.

L. Immediately restore to service and repair any damage caused by Contractor's workmen to existing pipe and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems which are not scheduled for discontinuance or abandonment.

M. Upon completion of contract, deliver work complete. Damage that may be caused by Contractor or Contractor's workmen to existing structures designated to remain, grounds, and utilities shall be repaired by Contractor and left in as good condition as existed prior to damaging.

N. Restore finish work of floors, walls, and ceilings remaining in place but damaged or defaced because of demolition or alteration work to condition equal that which existed at beginning of work under this Contract.

O. Where alteration or removals expose damaged or unfinished surfaces or materials, refinish such surfaces or materials, or remove them and provide new or salvaged materials to make continuous surfaces uniform.

P. Perform new work and restore and refinish existing work in conformance with applicable requirements of the specifications, except as follows:

1. Materials for use in repair of existing surfaces, but not otherwise specified, shall conform to the highest standards of the trade involved, and be in accordance with approved industry standards, and shall be as required to match existing surfaces.

2. Workmanship for repair of existing materials shall, unless otherwise specified, be equal to similar workmanship existing in or adjacent to the space where the work is being done.

3. Installation of salvaged items where no similar items exist shall be done in accordance with the highest standards of the trade involved and in accordance with approved shop drawings.

Q. Materials or items designated to become the property of the Owner shall be as shown on the drawings. Remove such items with care and store them in a location at the site to be designated by the Owner.

R. Materials or items designated to be reinstalled shall be as shown on the drawings. Remove such items with care under the supervision of the trade responsible for reinstallation; protect and store until required. Replace materials or items damaged in their removal with similar new material.

S. The existing building shall not be used as a work shop. Neither shall the furnishings or equipment in any room be used as work benches. Should any damage occur during the progress of the work to any furniture, fixtures, equipment, or appurtenances therein, such damage shall be repaired, replaced or made good by the Contractor without extra cost to the Owner.

T. Where removing existing floor finish and base, remove all adhesive and leave floors and walls smooth and flush, ready to receive new finish.

U. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease and loose paint before refinishing.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General

1. Remove from the site debris, rubbish and other materials resulting from work of this Section.

2. Burning of removed materials from demolished structures will not be permitted on the site.

B. Removal: Transport materials removed from demolished structures and legally dispose of off site. Pay any and all fees associated with disposal work. Leave the site in an orderly condition to the approval of the Architect.

3.7 CLEANING UP

A. Remove debris as the work progresses. Maintain existing premises in a neat and clean condition.

END OF SECTION

SECTION 030130

MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the concrete maintenance work as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Patching of concrete to provide surface for finishes.

1.3 RELATED SECTIONS

A. Polished Concrete Finishing – Section 033510.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's complete technical data sheets for the following:

1. Materials.

2. Equipment.

1.5 QUALITY ASSURANCE

A. Installation of the product must be completed by a factory-trained applicator, using mixing equipment and tools approved by the manufacturer.

B. Product must be cement-based having an inorganic binder content which includes a minimum 80% Portland cement per ASTM C150: Standard Specification for Portland cement and other specialty hydraulic cements. Gypsum products are not acceptable.

C. Manufacturer Experience: Provide products of this section by companies which have successfully specialized in production of this type of work for not less than 5 years.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

C. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels indicating brand name, directions for storage, directions for mixing with other components and directions for application.

D. Storage and Protection

1. Store materials in compliance with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

2. Dispense materials from factory-numbered and sealed containers. Maintain record of container numbers

1.7 ENVIRONMENTAL LIMITATIONS/ JOB CONDITIONS

A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting cleaning of concrete operations.

PART 2 PRODUCTS

2.1 MATERIALS

A. Self-Drying, Cement-Based Finish Underlayment by Ardex Engineered Cements (basis of design as listed below) or comparable product by Laticrete, MAPEI, or approved equal.

1. Ardex Featheredge.

2. Primers

a. Other non-porous substrates, such as epoxy coating systems and metal: ARDEX P 82 Ultra Prime

B. Water: Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where maintenance of cast-in place-concrete is to be completed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper completion of the work.

3.2 PREPARATION

A. General: Prepare substrate in accordance with manufacturer's instructions.

B. Concrete:

1. Prior to proceeding please refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean if necessary using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.

2. Substrates shall be inspected in accordance with ASTM F2170 and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor

covering. For areas where moisture vapor emissions exceed the required limits install the appropriate ARDEX Moisture Control System.

3. Crack and Joint Preparation

   a. Moving Joints and Moving Cracks – honor all moving joints and moving cracks up through the installation. A flexible sealing compound such as ARDEX ARDISEAL Rapid Plus Semi-Rigid Joint Sealant may be installed.
   b. Dormant Control Joints and Dormant Cracks – Fill all dormant control joints and dormant cracks with ARDEX ARDIFIX Low Viscosity Rigid Polyurethane Crack & Joint Repair or ARDEX FEATHER FINISH as recommended by the manufacturer.

3.3 APPLICATION OF PATCHING MATERIAL

A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

C. Mixing: Comply with manufacturer's printed instructions and the following.

1. Add 2 1/2 quarts (2.4 L) of clean potable water per 10-pound (4.5 kg) bag.

2. Mix using a 1/2" (12 mm, 650 rpm) low speed heavy-duty mixing drill with an ARDEX T-2 ring mixing paddle. Do not overwater.

D. Application: Comply with manufacturer's printed instructions and the following.

1. Patch material can be installed from a true featheredge up to 1/2" (12.7 mm) over large areas. It can also be installed up to any thickness in small, well-patching material to the substrate with the flat side of a trowel to obtain a solid mechanical bond before applying the desired thickness.

E. Curing: As soon as the patching material can be worked on without damaging the surface (15-20 minutes), standard floor coverings such as VCT, sheet vinyl and carpeting can be installed. If installing wood flooring, or, if high-performance adhesives will be used, such as epoxies or urethanes, patching material must first cure for 16 hours (70°F).

3.4 FIELD QUALITY CONTROL

A. Where specified, field sampling of the underlayment is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

3.5 PROTECTION

A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitableprotection course.

END OF SECTION

SECTION 033510

POLISHED CONCRETE FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the polished concrete floor finish.

1. Diamond grinding, honing, polishing, and application of concrete densifier.

2. Filling of joints, dormant cracks, pits, and minor surface defects associated with polished concrete finishing.

1.3 RELATED SECTIONS

A. Maintenance Of Concrete - Section 030130.

1.4 REFERENCES

A. American Concrete Institute (ACI): ACI 302.1R Guide for Concrete Floor and Slab Construction.

B. ASTM International:

1. ASTM C 171, Standard Specification for Sheet Materials for Curing Concrete.

2. ASTM C 779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.

3. ASTM D 1308, Standard Test Method for Effect of Household Chemical on Clear and Pigmented Organic Finishes.

4. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slab Using In-Situ-Probes.

5. ASTM F 710, Standard Test Method for pH.

C. National Floor Safety Institute (NFSI): NFSI Test Method 101-A Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes.

1.5 PERFORMANCE REQUIREMENTS

A. Provide polished flooring that has been selected, manufactured and installed to achieve the following:

1. Abrasion Resistance: ASTM C 779, Method A, high resistance, no more than 0.008" (0.20 mm) wear in 30 minutes.

2. Reflectivity: Increase of 35% as determined by standard gloss meter.

3. Waterproof Properties: Rilem Test Method 11.4, 70% or greater reduction in absorption.

4. Dynamic Coefficient of Friction: DCOF minimum of 0.45 under wet conditions when measured according to ANSI 326.3.

1.6 SUBMITTALS

A. Shop Drawings: Provide information on shop drawings as follows:

1. Typical layout including dimensions and floor grinding schedule.

2. Plan view of floor and joint pattern layout.

3. Areas to receive colored surface treatment.

4. Hardener, sealer, densifier in notes.

B. Samples: Submit 24" x 24" samples showing sheen and full chemical treatments, including colorant, for Architect's approval.

C. Product Data: Submit product data, including manufacturer’s SPEC-DATA® product sheet, for specified products.

1. Material Safety Data Sheets (MSDS).

2. Preparation and concrete grinding procedures.

D. Quality Assurance for Submittals:

1. Technicians and supervisors must be CPAA certified as a Craftsman or Master Craftsman; submit letter to this effect to the Architect.

2. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties as cited in 1.5 Performance Requirements.

3. Certificates:

a. Product certificates signed by manufacturer certifying that materials comply with specified performance characteristics and criteria and physical requirements.
b. Letter of certification from the National Floor Safety Institute confirming that the system has been tested and has passed Phase Two Level of certification when tested by Method 101-A.
c. Current contractor's certificate signed by manufacturer declaring contractor is an approved installer of polishing system.

4. Manufacturer's installation instructions.

E. Warranty: Submit warranty documents specified.

F. Provide the following:

1. Manufacturer's instructions on maintenance renewal of applied treatments.

2. Protocols and product specifications for joint filing, crack repair and/or surface repair.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Installer must have a minimum of five (5) years' experience installing polished concrete floors and must be trained and certified by both the equipment and chemical manufacturer to process polished concrete and be certified by the Concrete Polishing Association of America (CPAA) as noted in Article 1.6, Para. D.1 herein.

2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

B. Regulatory Requirements: NFSI Test Method 101-A Phase Two Level High Traction Material.

C. Mock-Ups: Provide 100 sf sample panel at job site, at location as directed by the Architect, installed under conditions similar to those which will exist during actual placement.

1. Mock-up will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, color selection and shine.

2. Allow 24 hours for inspection of mock-up before proceeding with work.

3. When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

D. Preinstallation Meetings: Conduct a preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Other items for agenda of preinstallation meetings shall include, but not be limited to, the following:

1. Environmental requirements.

2. Scheduling and phasing of work.

3. Coordinating with other work and personnel.

4. Protection of adjacent surfaces.

5. Surface preparation.

6. Repair of defects and defective work prior to installation.

7. Cleaning.

8. Installation of polished floor finishes.

9. Application of liquid hardener, densifier.

10. Protection of finished surfaces after installation.

E. Coordination with Section 030130:

1. Concrete to receive polished finish shall not contain admixtures, plasticizers, slag, fly ash, or other products replacing Portland cement in the mix.

2. Concrete to receive polished finish shall be wet cured in accordance with ACI 308, "Guide to Curing Concrete."

3. Concrete to receive polished finish shall not contain any air-entraining agents.

4. Floor Flatness and Levelness: Slab to receive polished concrete must conform to the following:

   a. Flatness: Overall value 50; minimum local value 35.
   b. Levelness: Overall value 30; minimum local value 20.

5. Conform to the minimum recommendations of CPAA.

6. Size of aggregate to be coordinated with desired finish per approved sample and mock-up.

1.8 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer's original packaging with identification labels and seals intact.

B. Storage and Protection:

1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

2. Protect concrete slab.

   a. Protect from petroleum stains during construction.
   b. Diaper hydraulic power equipment.
   c. Restrict vehicular parking.
   d. Restrict use of pipe cutting machinery.
   e. Restrict placement of reinforcing steel on slab.
   f. Restrict use of acids or acidic detergents on slab.

1.9 PROJECT CONDITIONS

A. Ambient Conditions: Comply with manufacturer's written recommendations.

1.10 SEQUENCING

A. Sequence With Other Work: Comply with manufacturer's written recommendations for sequencing construction operations.

1.11 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, 10-year finish warranty, commencing on the date of acceptance by the Owner, executed by an authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

B. Special Warranty: Submit manufacturer’s and installers written warranty for polished concrete finish for not less than 2 years.

1.12 EXTRA MATERIALS

A. Contractor to provide maintenance materials to allow for 5% of materials installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Ensure manufacturer has minimum 5 years' experience in manufacturing components similar to or exceeding requirements of project.

B. Polishing System Manufacturers:

1. PROSOCO.
2. W.R. Meadows.
3. Ameripolish.
4. Or approved equal.

C. Appearance Standard: Finished surfaces shall match accepted mockup for aggregate exposure, sheen, clarity, repair visibility, edge treatment, and color where indicated.

1. Aggregate exposure: Medium aggregate exposure.
2. Sheen Level: Semi-polished.
3. Slip Resistance: Finished level surfaces shall provide wet dynamic coefficient of friction of not less than 0.45 when tested in accordance with ANSI/NFSI B101.3

2.2 MATERIALS

A. Equipment to be used for grinding/polishing shall be:

1. Three-head counter rotating variable speed floor grinding machine.
2. Dust extraction system and pre-separator.
3. 75kw MQ power generator or equivalent.

B. Equipment to be used for grinding/polishing shall possess at least 775 lb. of head pressure.

C. Equipment to be used for edge grinding/polishing shall be a hand grinder with dust extraction equipment.

D. Diamond grinding segments shall be:

1. Metal bonds: 40, 60, 80 and 150 grit.

E. Resin bond grinding segments shall be:

1. Resin bonds: 100, 200, 400, 800, 1500, and 3000 grit.

F. Grinding pads for edges shall be:

1. Resin bonds: 40, 60, 80, 100, 200, 400, 800, 1500, and 3000 grit.

G. Equipment to be used for densifying and cleaning the floor after grinding/polishing procedure has been performed:

1. Tennant ride-on auto-scrubber or equivalent with a head pressure of 150 lb.

2. Follow auto-scrubber's manual for cleaning instructions after densifying and conditioning the floor.

3. Do not allow densifier to remain inside the auto-scrubber after densifying.

H. Concrete Densifier: Penetrating, non-yellowing lithium silicate or hybrid silicate densifier compatible with polished concrete finishing and accepted mockup.

1. Acceptable products include the following:

a. Ameripolish: 3D HS or 3D HSL.
b. PROSOCO: Consolideck LS or LS/CS.
c. W. R. Meadows: LIQUI-HARD ULTRA.
d. Curecrete Distribution, Inc.: Ashford Formula or RetroPlate.
e. Or approved equal.

I. Joint Filler and Crack Repair Materials: Semi-rigid materials suitable for polished concrete and traffic conditions, shaveable flush, nonstaining, and compatible with polishing sequence.

1. Acceptable products include the following:

a. PROSOCO: Grind-N-Fill for pinholes and microcracks during grinding where compatible with system manufacturer's recommendations.
b. Or approved equal.

2. All patches to match concrete slab in color and tone.

J. Guard: Provide Manufacturer's standard stain-protection or gloss-enhancing treatment compatible with densifier, color treatment, and accepted mockup.

1. Acceptable products include the following:

a. PROSOCO: PolishGuard (Basis of Design)
b. Ameripolish: SR2, SR2 WB, SR2 Plus, or 3D SP.
c. W. R. Meadows: BELLATRIX.
d. Curecrete Distribution, Inc.: RetroGuard RTU.
e. Or approved equal.

2. Provide protective treatment formulated for polished concrete to increase resistance to staining and chemical spills with out altering the appearance, gloss, texture or slip resistance of polished concrete.

K. Cleaners: Manufacturer's standard neutral cleaner for polished concrete maintenance.

2.3 RELATED MATERIALS

A. Water: Potable water.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive treatment. Notify architect if surfaces are not acceptable. Do not begin application until unacceptable conditions have been corrected.

B. Final polishing system installation shall be equivalent to that as accepted on the mock-up.

3.2 GENERAL POLISHING REQUIREMENTS

A. Coordinate polishing operations with other associated work and trades.

B. Do not use stain or scuff removing agents.

C. Begin and complete polishing within two weeks prior to possession date.

D. Utilize machines to the maximum extent practical to achieve optimum efficiency.

3.3 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive treatment.

B. Clean and prepare surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, dust, and dirt are removed prior to application.

C. Ensure concrete is a minimum of 28 days old.

3.4 APPLICATION

A. To obtain semi-gloss finish, ensure installer follows the applicable procedures incorporating grinding plates in the following order.

1. Verify that the floor is clean and dry prior to polishing procedure.

2. Inspect and verify that the floor does not have curled joints, large cracks, spalling, or lippage. If lippage or curled joints are present, correct prior to commencement of the work of this Section.

3. Using the 80-grit metal bond grinding segment, grind the floor surface at a rate of 500 ft.2/hr. Vacuum the surface to remove loose particulates.

4. Using the 150-grit metal bond grinding segment, grind the floor surface at a rate of 600 ft.2/hr. Vacuum the surface to remove loose particulates.

5. Apply concrete densifier according to manufacturer’s instructions.

6. Squeegee off excess material.

7. Wait 24 hours.

8. Verify that the floor is dry and clear of debris prior to continuation of polishing procedure.

9. Using the 100-grit resin bond polishing segment, grind the floor surface at a rate of 600 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

10. Using the 200-grit resin bond polishing segment, grind the floor surface at a rate of 700 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

11. Using the 400-grit resin bond polishing segment, grind the floor surface at a rate of 700 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

12. Using the 800-grit resin bond polishing segment, grind the floor surface at a rate of 1000 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

13. Using the 1500-grit resin bond polishing segment, grind the floor surface at a rate of 1500 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

14. Using the auto-scrubber, clean the floor thoroughly as per manufacturer's instructions with a white non-woven pad. Pads should be replaced approximately every 30,000 ft.2.

3.5 CONCRETE ENHANCER

A. Allow 24 hours before proceeding with concrete enhancer application.

B. Spray concrete enhancer full strength from container using an industrial sprayer delivering 1/10th of a gallon per minute.

C. Pre-wet micro-fiber applicator with concrete enhancer prior to use.

D. Uniformly spread concrete enhancer with a micro-fiber applicator creating a monolithic, thin, even film, ensuring that the product is not allowed to dry before spreading is complete.

E. Do not over apply concrete enhancer.

F. For optimum performance, apply a second coat at a 90° (right) angle to the first coat, after the first coat is thoroughly dry.

G. Allow 24 hours for concrete enhancer to dry.

H. Burnish with a hogs hair pad at 2000 rpm or substitute a diamond pad if necessary.

3.6 FIELD QUALITY CONTROL

A. Review procedures with installer to correct unacceptable areas of completed polished concrete floor system.

B. Test interior floor for slip resistance in accordance with ASTM D2047.

C. Perform we dynamic coefficient of friction testing in accordance with ANSI/NFSI B101.3.

D. Test Results: Test results will be provided in writing to Owner and Contractor within 24 hours after tests are completed.

3.7 ADJUSTMENTS

A. Polish to higher gloss those areas not meeting specified gloss levels per mock-up.

B. Fill joints flush to surface.

3.8 FINAL CLEANING

A. Mechanically scrub treated floors for seven days with soft to medium pads with approved cleaning solution.

B. Upon completion, General Contractor must remove surplus and excess materials, rubbish, tools and equipment.

C. Protect polished concrete from construction traffic, impact, standing water, staining, adhesive residues, and damage until Substantial Completion.

D. Use breathable, nonstaining protection materials. Do not apply adhesive films directly to polished concrete unless approved in writing by polishing system manufacturer.

E. Repair or refinish damaged areas to match accepted mockup before final acceptance.

END OF SECTION

SECTION 055000

MISCELLANEOUS METALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the miscellaneous metal work as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Rough hardware.
2. Loose steel lintels.
3. Light steel framing and supports not included as part of work of other trades.
4. Steel dunnage beams.
5. Miscellaneous steel trim, corner guards, angle guards and channels.
6. Countertop supports.
7. Masonry support steel.
8. Sleeves in concrete walls and slabs.
9. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section.
10. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.
11. Cutting, fitting, drilling and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section.

1.3 RELATED SECTIONS

A. Structural steel - Section 051200.

B. Painting - Section 099000.

1.4 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

C. Reference Standards: The work is subject to requirements of applicable portions of the following standards:

1. "Manual of Steel Construction," American Institute of Steel Construction.

2. AWS D1-1 "Structural Welding Code," American Welding Society.

3. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning," Steel Structures Painting Council.

4. SSPC PA-1 "Painting Application Specification," Steel Structures Painting Council.

5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute.

D. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.

E. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years' experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coatings within the same facility as outlined herein. The Architect has the right to inspect and approve or reject the galvanizer/galvanizing facility.

F. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of five years and shall provide the Architect with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

G. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

1.5 SUBMITTALS

A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.

B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.

C. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4" weld, weld and tack weld are not acceptable.

D. Certification: For items to be hot-dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Metals

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Steel Plates, Shapes and Bars: ASTM A 36.

3. Steel Bar Grating: ASTM A 1011 or ASTM A 36.

4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

5. Structural Steel Sheet: Hot rolled, ASTM A 1011; or cold rolled, ASTM A 1008, Class 1; of grade required for design loading.

6. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.

7. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

8. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B. Grout: Non-shrink, non-metallic grout conforming to the requirements of Section 033000.

C. Fasteners

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

3. Anchor Bolts: ASTM F 1554, Grade 36.

4. Lag Bolts: ASME B18.2.1.

5. Machine Screws: ASME B18.6.3.

6. Plain Washers: Round, carbon steel, ASME B18.22.1.

7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.

D. Shop Paint: Shop prime all non-galvanized miscellaneous metal items using Series 88 Azeron Primer made by Tnemec, ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403, or "Interlac 393" by International Protection Coatings.

1. If steel is to receive high performance coating as noted in Section 099000, shop prime using primer noted in Section 099000.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Galvanizing Repair Coating: For touching up galvanized surfaces after erection, provide repair coating that is V.O.C. compliant, equal to "Silver Galv" made by Z.R.C. Worldwide or approved equal. Apply to a dry film thickness of 1.5 to 3.0 mils.

2.2 PRIME PAINTING

A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work.

B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.

1. Steel to get high performance coating as noted in Section 099000 shall be cleaned as per SSPC SP.6 "Commercial Blast Cleaning."

C. Application

1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.

2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.

3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.

D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.

E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 GALVANIZING

A. Scope: All ferrous metal exposed to the weather, and all ferrous metals indicated on drawings or in specifications to be galvanized, shall be cleaned and then hot-dipped galvanized after fabrication as provided by Duncan Galvanizing or approved equal.

B. Avoid fabrication techniques that could cause distortion or embrittlement of steel items to be hot-dip galvanized. Fabricator shall consult with hot-dip galvanizer regarding potential warpage problems or handling problems during the galvanizing process that may require adjustment of fabrication techniques or design before finalizing shop drawings and beginning of fabrication.

C. Cleaning: Thoroughly clean metal surfaces of all mill scale, rust, dirt, grease, oil, moisture and other contaminants prior to galvanizing.

D. Application: Hot-dip galvanizing shall conform to the following:

1. ASTM A 143: Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel.

2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A 153: Galvanized Coating on Iron and Steel Hardware - Table 1.

4. ASTM A 384: Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.

5. ASTM A 385: Practice for Providing High Quality Zinc Coatings.

6. ASTM A 924: Galvanized Coating on Steel Sheets.

7. Minimum weight of galvanized coating shall be two (2) oz. per square foot of surface.

E. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

F. All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the weight of the coating, and the appropriate ASTM number.

G. To minimize surface imperfection (e.g.: flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc will not be permitted.

H. After galvanizing all materials not exposed to view must be chromated by dipping material in a 0.2% chromic acid solution.

I. Galvanized surfaces, where exposed to view, must have a smooth, level surface finish. Where this does not occur, piece shall be rejected and replaced to the acceptance of the Architect.

2.4 PROTECTIVE COATINGS

A. Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

2.5 WORKMANSHIP

A. General

1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced tradesman.

2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.

3. All work shall be accurately and neatly fabricated, assembled and erected.

B. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the miscellaneous metal subcontractor to assure himself that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.

C. Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.

D. Holes: Drill or cleanly punch holes; do not burn.

E. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by Architect.

1. Welding

    a. Shall be in accordance with AWS D1.1 Structural Welding Code of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.
    b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces; undercut metal edges where welds are required to be flush.
    c. All welds on or behind surfaces which will be exposed to view shall be done so as to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.

2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.

F. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

G. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section of the Specifications to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

H. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

I. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

J. Exposed Work

1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves,

dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.

2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.

3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

K. Preparation for Hot-Dip Galvanizing: Fabricator shall correctly prepare assemblies for galvanizing in consultation with galvanizer and in accordance with applicable Reference Standards and applicable AGA publications for the "Design of Products to be Hot-Dip galvanized After Fabrication." Preparation shall include but not be limited to the following:

1. Remove welding flux.

2. Drill appropriate vent holes and provide for drainage in inconspicuous locations of hollow sections and semi-enclosed elements. After galvanizing, plug vent holes with shaped lead and grind smooth.

2.6 MISCELLANEOUS METALS ITEMS

A. Rough Hardware

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.

B. Loose Steel Lintels

1. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than eight (8) inches bearing at each side of openings, unless otherwise indicated.

2. Loose lintels shall conform to the following Schedule:

Opening Width (Maximum)	**WALL THICKNESS**		
	4 inches	6 inches	8 inches*
2'-0"	3-1/2" x 3-1/2" x 1/4"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 1/4"
3'-0"	3-1/2" x 3-1/2" x 5/16"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 5/16"

4'-0"	3-1/2" x 3-1/2" x 5/16"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 5/16"
5'-0"	4" x 3-1/2" x 3/8"	6" x 4" x 3/8"	4" x 3-1/2" x 5/16"
6'-0"	5" x 3-1/2" x 3/8"	6" x 4" x 3/8"	5" x 3-1/2" x 5/16"
7'-0"	5" x 3-1/2" x 3/8"	5" x 5" x 1/2"	5" x 3-1/2" x 3/8"
8'-0"	5" x 3-1/2" x 3/8"	5" x 5" x 5/8"	5" x 3-1/2" x 3/8"

* Two angles at all openings in eight (8) inch walls.

3. At columns or vertical surfaces where lintels cannot bear on masonry, provide clip angles sized for structural capacity of lintel.

C. Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.

2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

D. Miscellaneous Steel Trim: Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

E. Corner Guards: Provide steel corner guards where shown. Unless otherwise indicated, use 4" x 4" x 1/4" steel angles to a height of four (4) feet above finished floor with 1-1/4" x 8 1/4" bent steel strap anchors welded to backs of angles at each end and approximately sixteen (16) inches o.c. Set and adjust guards to finish flush with adjacent surfaces.

F. Countertop Supports: Steel framing as indicated or required to support countertops. Conceal framing under countertops and within wall behind countertops. Provide supports to withstand a concentrated load of not less than three hundred (300) lbs. applied at any point with a deflection not to exceed L/240 for the length of the countertop.

G. Trench Drains: Provide Series R-4999 trench frame with Type P or Type A (ADA compliant) grated cover, heavy duty H-25 rating made of ductile iron as manufactured by Neenah Foundry Co., or approved equal, sizes as shown on drawings. Assembly shall have asphalt coating. Grate shall be bolted in place with stainless steel hex head cap screws.

H. Steel Floor Access Door: Provide Series JD steel floor access door for interior use with checkered plate top, angle iron frame and manufacturer's standard hardware as manufactured by Bilco or equal made by Babcock-Davis, Dur-Red Products or approved equal; size as shown on drawings.

I. Masonry Support Steel

1. Provide galvanized steel, relieving angles, plates, accessories and other steel shapes for masonry support steel; for lintels refer to Para. E. herein.

2. Fabricate masonry support steel to allow final adjustment with the closest tolerances possible. Relieving angles which require cutting to fit masonry flashing shall be straightened without deflections.

3. Coordinate masonry support system with concrete work for locations of wedge inserts.

4. Install to meet requirements of building masonry work, face brick coursing and stone placement. Coordinate final adjustments with masonry work as work progresses.

J. Sleeves in Concrete Walls and Slabs

1. Sleeves through concrete walls shall be of Schedule 40 steel pipe with i.d. two (2) inches larger than o.d. of pipe or conduit (including insulation, if any) to be accommodated. Sleeves shall project one-half (1/2) inch on each side of finished wall. Provide rectangular one-quarter (1/4) inch steel plate collar at center, continuously welded to the perimeter of the sleeve, and six (6) inches wider than the o.d.

2. Slots in slabs shall be 12 gauge steel sheet, galvanized, of dimensions indicated, with strap anchors welded in place not more than twelve (12) inches on centers.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where miscellaneous metal is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 ERECTION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.

E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

F. Field Touch-Up of Galvanized Surfaces: Touch-up shop applied galvanized coatings damaged during handling and installation. Use galvanizing repair coating specified herein for galvanized surfaces.

END OF SECTION

SECTION 062000

CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the carpentry work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Blocking and miscellaneous wood, including plywood subflooring and wall lining for electric closets.

2. Rough hardware.

3. Coat closet pole and shelving.

4. Installation only of finish hardware.

5. Installation only of doors and hollow metal frames.

1.3 RELATED SECTIONS

A. Architectural woodwork - Section 064023.

B. Maintenance of Roofing - Section 070150.

C. Steel doors and frames - Section 081113.

D. Wood doors - Section 081416.

E. Finish hardware - Section 087100.

1.4 QUALITY ASSURANCE

A. Lumber Standard: Comply with PS 20.

B. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).

C. Shop fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.

D. Grade Marks: Identify lumber and plywood by official grade mark.

1. Lumber: Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species grouping or

combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.

a. S-Dry: Maximum nineteen (19) percent moisture content as per ASTM D 2016.
b. MC-15 or KD: Maximum of fifteen (15) percent moisture content.

E. Installation of doors, frames and hardware shall conform to the minimum standards of "Installation Guides for Doors and Hardware" of the Door and Hardware Institute.

1.5 SUBMITTALS

A. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.

B. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.

C. Product Data: submit product data for all products of this section.

1.6 PRODUCT HANDLING

A. Deliver carpentry materials to the site ready to use with each piece of lumber clearly marked as to grade, type and mill, and place in an area protected from the elements.

B. Deliver rough hardware in sealed kegs and/or other containers which shall bear labels as to type and kind.

C. Pile lumber for rough usage, when delivered to the site in stacks to insure drainage and with a minimum clearance of six (6) inches above grade. Cover stacks with tarpaulins or other watertight coverings. Store grounds and similar small sized lumber inside the building as soon as possible after delivery.

D. Do not store seasoned lumber in wet or damp portions of the building.

E. Protect fire retardant treated materials against high humidity and moisture during storage and erection.

F. Remove delivered materials which do not conform to specified grading rules or are otherwise not suitable for installation from the job site and replace with acceptable materials.

G. All items specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored and applied under this Section.

H. Hardware shall be sorted and stored in space assigned by Contractor and shall be kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

1.7 JOB CONDITIONS

A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Architect.

B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 PRODUCTS

2.1 WOOD MATERIAL

A. General

1. All wood shall be sound, flat, straight, well seasoned, thoroughly dry and free from all defects. Warped or twisted wood shall not be used.

2. For miscellaneous wood blocking, grounds, furring as required, use Utility Grade Coastal Douglas Fir or Southern Pine, free from knots, shakes, rot or other defects, straight, square edges and straight grain, air seasoned with maximum moisture content of nineteen (19) percent. Wood shall be S4S, S-Dry, complying with PS-20.

3. For plastic laminate countertops or vanities provide 3/4" thick B-B EXT-APA plywood, fire retardant treated as specified herein, or "Duraflake FR" fire retardant composite board with hardwood edge, density of forty five (45) lbs./cubic foot, made by Willamette Industries, Inc.

4. For closet shelving, provide 3/4" thick A-A INT-APA plywood with 1/4" thick hardwood edges, fire retardant treated as specified herein.

5. Plywood and rough carpentry for telephone and electric closets, provide 3/4" thick C-D EXT-APA plywood, fire retardant treated as specified herein.

B. Wood Treatment

1. All interior wood material specified herein shall be fire retardant treated to comply with the AWPA standard U1 to achieve a flame spread rating of not more than 25 (UL Class "FR-S") when tested in accordance with UL Test 723 or ASTM E 84. The fire retardant chemicals used to treat the lumber must comply with FR-1 of AWPA Standard P49 and be free of halogens, sulfates and ammonium phosphate.

   a. After treatment, kiln dry to a moisture content of fifteen (15) percent; if wood is to be painted or finished, kiln dry to a moisture content of twelve (12) percent. Treatment shall be equal to "Dricon" made by Arch Wood Protection Inc. or approved equal. Provide UL approved identification on treated materials.

2. For exterior blocking, roofing and sheet metal, pressure treat wood with copper azole, Type B (CA-B); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWPA Standard U1, (.25 lbs./cubic foot of chemical in wood).

   a. After treatment, kiln dry to a maximum moisture content of fifteen (15) percent. Treatment shall be equal to "Wolmanized Natural Select" made by Arch Wood Protection Inc. or approved equal.

3. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWPA Standard M-4.

2.2 HARDWARE

A. Rough Hardware for Treated Woods and Exterior Use: Hot-dipped galvanized or Type 304 stainless steel.

B. Nails: Common steel wire, untreated for interior work as per ASTM F 1667.

C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers conforming to the following:

1. Bolts: ASTM A 307, Grade A.

2. Nuts: ASTM A 563.

3. Lag Screws and Bolts: ASME B 18.2.1.

D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2; use stainless steel for treated woods and exterior use.

E. Wood Screws: ASME B 18.6.1.

F. Concrete and Masonry Anchors: Standard expansion-shield self-drilling type concrete anchors where so shown or noted on the drawings, or where approved by the Architect.

G. In coat closets, provide 1" OD chrome on steel clothes rod with a wall thickness of 0.125", running full width of closet wall, supported at ends with end brackets and supported in the center from shelf above rod using chrome plated rod support.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where carpentry is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF FINISH HARDWARE

A. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.

B. Unless otherwise noted, mount hardware units at heights established in Section 081113.

C. Install each hardware item in compliance with the manufacturer’s instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure

place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

G. All keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. All construction keys shall be returned to the Owner.

H. Adjusting and Cleaning

1. Adjust and check each operating item of hardware and each door, to ensure proper operation and function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.

2. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.3 INSTALLATION OF DOORS AND FRAMES

A. Preparation

1. Remove welded-in shipping spreaders installed at factory.

2. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

B. Installation

1. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. Install frames in accordance with ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames, unless more stringent requirements are specified herein.
    b. At fire-protection-rated openings, install frames according to NFPA 80.
    c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    d. Install frames with removable glazing stops located on secure side of opening.
    e. Frames set in masonry walls shall have door silencers installed in frames before grouting.
    f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    g. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of Section 072100 "Thermal Insulation."

5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar; refer to Section 042000 "Unit Masonry" for installation of frames in masonry walls.

6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

7. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.

9. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the tolerance given in HMMA 841 of ANSI/NAAMM, current edition.

10. Steel Doors: Fit hollow metal doors accurately in frames to the tolerances given in HMMA 841 of ANSI/NAAMM, current edition.

    a. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

11. Glazing: Comply with installation requirements in Section 088010 "Interior Glass and Glazing" and with standard steel door and frame manufacturer's written instructions.

    a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

C. Wood Doors

1. Condition doors to average prevailing humidity in installation area prior to hanging.

2. Install doors in accordance with manufacturer's instructions.

3. Fit door to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

4. Clearances: Install doors to meet clearance requirements specified in Section 081416.

5. Fire-Rated Doors: Install in corresponding fire-rated frames in accordance with the requirements of NFPA No. 80. Provide clearances complying with the limitations of the authority having jurisdiction.

D. Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

3.4 BLOCKING AND MISCELLANEOUS WOOD

A. General

1. Erect rough carpentry true to line, levels and dimensions required; squared, aligned, plumbed, and securely fastened in place.

2. Shim where required to true up furring, blocking and the like. Use wood or metal shims only.

3. Do all cutting, fitting, drilling and tapping of other work as required to secure work in place and to perform the work included herein. Do all the cutting and fitting of carpentry work, for the work of other trades as required.

B. Blocking and Miscellaneous Wood

1. Furnish and install all wood grounds, furring, blocking, curbs, bucks, nailers, etc., that may be necessary and required in connection with the carpentry and with the work described for any other trades and including required carpentry for electrical fixtures. All blocking and nailers shall be continuous wherever required, whether or not so indicated.

2. Blocking shall be as required for the proper installation of the finished work and for items in mechanical sections as required. Blocking, edgings, stops, nailing strips, etc., shall be continuous, unless distinctly noted otherwise. Provide blocking as required to install all equipment. Provide blocking and nailers where shown or required to fasten interior sheet metal work.

3. Fastening for wood grounds, furring and blocking shall be of metal and of type and spacing as best suited to conditions. Hardened steel nails, expansion screws, toggle bolts, self-clinching nails,

metal plugs, inserts or similar fastenings shall be used, of suitable type and size to draw the members into place and securely hold same.

C. Rough Lumber for Roofing and Sheet Metal

1. Furnish and install all wood nailing strips and wood blocking required in connection with respective types of roofing, fans, flashings, and sheet metal work, using preservative treated wood as herein before specified.

2. Wood blocking shall be of sizes and shapes as indicated on the drawings and/or designed for the reception of curb flashings for roof ventilators and similar items.

3. All nailing strips and blocking shall be carried out in accordance with the printed installation instructions, and/or recommendations of the accepted manufacturer of the roofing materials, and in coordination and cooperation with the sheet metal work trades.

4. All blocking and nailing strips shall be firmly secured in place using counter bored bolt and nut fastenings, or secured by any other proposed flush surfaced fastenings.

5. Wood nailing strips or blocking required to be embedded in concrete work shall be furnished in time due for placing, prior to start of concrete operations. Locations and spacings of nailing strips or blocking shall be performed in coordination with the concrete trades, as required for respective installations.

3.5 ELECTRIC EQUIPMENT MOUNTING BOARDS

A. Furnish and install 3/4" thick plywood panels to the walls of the telephone and electric equipment rooms in accordance with the requirements of the local utility company.

B. Secure to wall using proper devices for substrates encountered, spaced twelve (12) inches o.c., maximum around the edges, 1-1/2" from corners, and in three (3) rows of three (3) each in the field. Recess fastening devices flush with the plywood surface. Adjacent panels shall be butted with 1/16" space between without lapping.

3.6 COAT CLOSET

A. In coat closets provide twelve (12) inches wide plywood shelf running full width of closet, supported on continuous wood pin rail. Below shelf install coat rod as specified herein.

3.7 ROUGH HARDWARE

A. Securely fasten rough carpentry together. Nail, spike, lag screw or bolt as required by conditions encountered in the field and the Contract Documents.

B. Provide rough or framing hardware, such as nails, screws, bolts, anchors, hangers, clips, inserts, miscellaneous fastenings, and similar items of the best quality and of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner.

C. Secure rough carpentry to masonry with countersunk bolts in expansion sleeves or other acceptable manner, with fastenings not more than sixteen (16) inches apart. Secure woodwork to hollow masonry with toggle bolts spaced not more than sixteen (16) inches apart.

D. Countersink bolts in nailers and other rough woodwork and include washers and nuts. Cut bolts off flush with surfaces and peen as may be required to receive finished work.

E. Inserts to secure wood nailers to concrete shall be malleable iron threaded inserts with 3/8" diameter bolts of length to allow for countersinking. Locate at end of each nailer and at intervals not exceeding thirty (30) inches o.c.

F. Furnish to the mason for building into the work, or attaching the work which is to be built in, anchors, bolts, wall plates bolted to masonry, corrugated wall plugs, nailing blocks, etc., which are required for the proper fastening and installation for the work or other items as called for in this Section.

G. Detailed instructions with sketches of necessary requirements, shall be given to the masonry trade showing the location and other details of such nailing devices.

3.8 CLEANING UP

A. General: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends and debris.

B. Sweeping

1. At the end of each working day, or more often if necessary, thoroughly sweep all surfaces where refuse from this portion of the work has settled.

2. Remove the refuse to the area of the job site set aside for its storage.

3. Upon completion of this portion of the work, thoroughly broom clean all surfaces.

END OF SECTION

SECTION 064023

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the architectural woodwork as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Custom millwork lab benches and teacher islands for science laboratory spaces.
2. Wood casework and counters with special veneers.
3. Wood casework and counters with plastic laminate finish.
4. Hardware for casework.
5. Custom wood locker cubbies.
6. Millwork custom access doors.
7. Wood shelving.
8. Wood framing and rough lumber as required for work of this Section.
9. Wood grounds, blocking, nailers, furring as required for work of this Section.
10. All rough hardware and fastenings for work of this Section.
11. Drilling concrete and masonry, drilling and/or tapping metal work, as required, for the installation of work of this Section.
12. Back painting as specified herein.
13. Shop finish of work of this Section, except items indicated herein to be shop primed only.

1.3 RELATED SECTIONS

A. Carpentry - Section 062000.

B. Caulking between architectural woodwork and any wall, floor, or ceiling joints - Section 079200.

C. Wood doors - Section 081416.

D. Field finishing - Section 099000.

E. Appliances – Section 113100.

F. Miscellaneous Equipment – Section 119000.

G. Engineered Quartz Countertops – Section 123661.

1.4 QUALITY STANDARDS

A. The quality standards of the Architectural Woodwork Institute, "Architectural Woodwork Standards," 2nd Edition, dated October 1, 2014, and enhancements 2019 shall apply to all workmanship including materials and installation, for architectural woodwork and by reference are made a part of this specification. All work shall conform to "Premium" grade requirements of the AWI "Architectural Woodwork Standards," unless otherwise modified herein.

B. In the event of a dispute as to the quality grade (or grades), the Contractor shall call upon the Architectural Woodwork Institute for an inspection under AWI's Quality Certification Program which shall include a QCP Inspection and Report. The Contractor agrees to abide by the decision of this Report.. The cost of said inspection and report shall be borne by the Contractor.

C. Employ only tradesmen experienced in the fabrication and installation of architectural woodwork.

D. Woodworking firm must be accredited by the AWI Quality Certification Program (QCP).

E. Provide fire test reports by an accredited testing laboratory of all woodwork demonstrating compliance with fire rating classification as required by Code,.

1.5 SUBMITTALS

A. Shop Drawings

1. Submit shop drawings of all woodwork specified and indicated on the drawings. Shop drawings shall indicate room plans and elevations at 3/4" equals 1'-0" scale and typical construction details at 3" equals 1'-0" scale. Shop drawings shall indicate all materials, thicknesses and finishes.

2. Shop drawings shall show all finish hardware, anchors, fastenings and accessories.

3. Shop drawings shall show all jointing, joint treatment and butt jointing in veneers and plastic laminate.

4. Shop drawings shall coordinate and show all lab equipment and appliances.

5. Shop drawings for wood paneling must show complete elevations of rooms to receive paneling as well as panel matching required by these specifications.

6. Shop drawings for cabinet work must show centerline height and horizontal location of all required internal wall blocking.

7. Where architectural woodwork deviates from AWI standards noted herein, shop drawings must identify these deviations.

B. Samples: Submit samples of each of the following items:

1. Plastic laminate, twelve (12) inches square, including a section of outside corner.

2. Transparent finish for each species of wood veneer laminated to particleboard, twelve (12) inches square, for each finish specified or shown.

3. Opaque finish wood veneer laminated to particleboard, twelve (12) inches square for each color, gloss and finish specified or shown.

4. Each finish type of wood panel, 24" wide x 36" high.

5. Each type and finish of each type of wood cornice, trim, molding, etc., eight (8) inches long, finish as specified.

6. Cabinet hardware.

C. Product Certificates: For each type of product.

1. Composite wood products.

2. Thermally fused laminate panels.

3. Glass.

4. Adhesives.

1.6 QUALIFICATIONS

A. The work of this Section shall be provided by a firm having a minimum of five (5) years' experience on projects of similar size and quality to that specified and shown.

1.7 COORDINATION

A. Coordinate the work of this Section with other appropriate Sections of the specifications to insure proper scheduling for fabrication and installation of the work specified herein

B. Coordinate with partition and finish trades to insure that proper provisions are made for the installation of the work specified herein.

C. Verify all dimensions in the field prior to fabrication of all Architectural Woodwork to assure proper fit.

1.8 PRODUCT HANDLING

A. All materials and work of this Section shall be protected from damage, from time of shipment from shop to final acceptance of work. Cover, ventilate, and protect work of this Section from damage caused by weather, moisture, heat, staining, dirt, abrasions, any other causes which may adversely affect appearance or use, or which may cause deterioration of finish, warping, distortion, twisting, opening of joints and seams, delamination, loosening, etc., of work of this Section.

B. Keep all finish carpentry, millwork, and cabinet work under cover both in transit and at the premises. Do not deliver any finish carpentry, millwork or cabinet work before it is required for installation. Protect such work to avoid damage in transit, during erection and after erection until acceptance of the building; use all such methods to provide the proper protection. Remove such protection when directed by the Architect.

C. Deliver finish carpentry, millwork, and cabinet work in a dry stable condition; protect same against injury and dampness. Do not store or install finish carpentry, millwork or cabinet work until after the concrete, masonry and plaster work are thoroughly dry.

D. Damaged or defective items of work of this Section are subject to rejection and replacement with new by Contractor, at no cost to Owner.

1.9 JOB CONDITIONS

A. Humidity Controls: The ambient relative humidity at the site, including both the storage and the installation areas, shall be maintained between 25% and 55% prior to delivery and through the life of the installation.

B. Determine equilibrium moisture content and maintain required temperature and relative humidity as required for a tolerance of plus or minus one (1) percent of the specified optimum moisture content until woodwork receives specified finishes. Refer to "Guide to Wood Species Selection," AWI, for method of determining equilibrium moisture content values.

C. Examination of Substrate and Conditions: The installer must examine the substrate and the conditions under which the work of this Section is to be performed, and notify the Contractor in writing of unsatisfactory conditions. Do not proceed with work under this Section until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

D. Areas to receive architectural woodwork must be fully enclosed with windows and/or curtain wall installed and glazed, exterior door in place, HVAC systems operational and temporary openings closed. Any plaster, wet grinding and concrete work shall be fully dry.

E. Architectural woodwork shall be allowed to come to equilibrium on site for 7 days prior to installation.

PART 2 PRODUCTS

2.1 BASIC REQUIREMENTS

A. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of nine (9) to twelve (12) percent for exterior work and six (6) to eleven (11) percent for interior work.

B. Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain field measurements and verify all dimensions of shop drawing details as required for accurate fit.

C. Compatibility of Grain and Color: Architect reserves the right to select materials for best compatibility between visually related members and veneers.

D. Machine and sand woodwork to comply with requirements of Standards for specified grade.

E. Fabricate woodwork to dimensions, profiles and details shown. Rout or groove back of flat trim members, kerf backs of other wide flat members except plywood or veneered members.

F. Miter joints by joining, splining and gluing to comply with requirements for the specified grade.

G. Inspect each piece of lumber and plywood or each unit of woodwork after drying; do not use twisted, warped, bowed of otherwise damaged or defective wood.

2.2 GENERAL - MATERIALS

A. Softwood lumber shall conform to the requirements of the latest edition of American Lumber Standards Simplified Practice Recommendation R-16. Grades shall conform to the grading rules of the Association having jurisdiction, and shall bear the official grade and trademark of the Inspection Bureau of the Association and a mark of mill identification.

B. Framing and Rough Lumber: No. 1 KD grade Southern Pine or Dense Construction grade Douglas Fir, having extreme fiber in bending stress of at least 1700 psi, surfaced four sides (S4S). Provide fire retardant treatment meeting requirements of Section 062000.

C. Grounds, Blocking, Nailers, Furring: Southern Pine, Douglas Fir or Sitka Spruce, grade to suit particular purpose and to be straight, square edged, straight grained, surfaced four sides (S4S), and which will retain nails and screws without splitting. Provide fire retardant treatment.

D. Wood Veneers and Lumber: Provide AWI Premium Grade materials and workmanship. For species not listed in the AWS comply with the following:

1. Provide AWS Lumber Grade Premium and AWS Grade AA Veneer, book-matched, minimum 6 inch face veneer width. Kiln dry to 6-8 percent moisture content. Components shall be free of defects and sapwood. Match adjacent pieces for color and grain pattern.

2. Single-Source Requirement for Wood Veneers and Solids: Intent is to provide wood which matches as closely as possible throughout the project. Provide wood veneers and solids from the same distributor, and from the same flitches and solids sources to the greatest extent possible.

E. Lumber: AWI Section 3 with the following requirements:

1. Hardwood for Transparent Finish: Premium Grade, select Plain Sawn, bleached white oak (to match Architect's sample), matching adjoining veneers unless otherwise shown or specified, and free from cat's eyes, bird's eyes, burls, curls or cross grains.

2. Hardwood for Opaque Finish: Any hardwood which, when finished, will not show any grain, imperfection or other surface defects when used with the opaque finish specified.

F. Plywood: AWI Section 4; Veneer core, particleboard, or plywood core unless otherwise specified, and with the following requirements:

1. Hardwood: Premium Grade, face veneers as shown or specified

2. Particleboard: Premium Grade, fire retardant for wall paneling only equal to Duraflake FR and Duraflake for cabinets. In addition, particleboard and MDF shall be certified No-Added Formaldehyde (NAF) or Ultra Low Emitting Formaldehyde (ULEF).

3. Edges: Banded with hardwood in accordance with Premium Grade Standards.

G. Veneer Matching Requirements:

1. Matching Between Adjacent Veneer Leaves: Book match and architectural end match.

2. Matching Within Individual Panel Faces: Balance and Center Match.

3. Method of Matching Panels: Blueprint-matched panels and components

2.3 PLASTIC LAMINATE

A. Face Sheets: NEMA Publication LD3, Grade GP50, Type I, 0.05" thick, as manufactured by WilsonArt, Formica, Nevamar. Color, pattern and finish as selected by the Architect, in laboratories.

B. Backing Sheets: Non-decorative, high-pressure plastic laminate, NEMA LD3, Grade BK20, 0.02" thick.

C. Edges: Finish with plastic laminate to match face and applied before face sheets are applied, unless otherwise shown or specified.

2.4 METAL

A. Steel

1. Structural Steel Shapes and Plates: ASTM A 36.

2. Hot-Rolled Carbon Steel Sheets: Commercial quality, ASTM A 569, may be used for concealed parts only.

3. Finishes

a. Primer for Unexposed Metal: Zinc chromate primer.

2.5 GLASS

A. Comply with the requirements of Section 088000, glass shall be as indicated in the millwork schedule on the drawings; Bendheim-SAA-137 Satin Tech.

2.6 MISCELLANEOUS PRODUCTS

A. Fasteners

1. Wood Screws: FS FF-S-111, type, size, material and finish as required for the condition of use.

2. Nails: FS FF-N-105, type, size, material and finish as required for the condition of use.

3. Anchors: Type, size, material and finish as required for the condition of use.

4. Staples: Upholstery type staples of sufficient strength to hold fabric taut in place without sagging.

B. Adhesives

1. For Laminating Plastic Laminate Surfaces: Urea resin, Type II, as recommended by fabricator.

2. For All Other Uses: polyvinyl acetate resin emulsion or other type as recommended by the fabricator..

2.7 CABINETS WITH PLASTIC LAMINATE FINISH

A. General

1. Fabricate all cabinetry and millwork to the "Premium Grade" standards of the AWI, Section 10.

2. Face construction of cabinets shall be "Flush Overlay."

3. Provide 3/4" thick doors, drawer fronts and fixed panels (including thickness of plastic) except where required to be thicker by Standards; and provide flush units.

4. Provide dust panels of 1/4" thick plywood or tempered hardboard above compartments and drawers, except where located directly below countertops.

5. Exposed Edges: Plastic laminate matching exposed panel surfaces. Ease exposed edge of overlap sheet.

B. Plastic Laminate

1. Plastic laminate as indicated in Finish Schedule and Millwork Schedule in drawings.

2. Plastic Laminate for Horizontal Surfaces: 0.048" thick, general purpose type (high pressure).

3. Plastic Laminate for External Vertical Surfaces: 0.028" thick, general purpose type (high pressure).

4. Plastic Laminate for Post Forming: 0.039" thick, post forming (high pressure).

5. Plastic Laminate for Cabinet Linings: 0.020" thick, cabinet liner (high pressure).

6. Plastic Laminate for Concealed Panel Backing: 0.020" thick, backer type (high pressure).

7. Plastic Laminate Colors and Patterns: As selected by the Architect from manufacturer's standard satin finish products. Acceptable Manufacturers: WilsonArt, Nevamar, Formica.

C. Shop Assembly: All work shall be shop assembled. Work that is too large for entrance into the use area shall be fabricated in attachable sections with provisions for reconnection in the using space.

D. Material Thicknesses: See drawings for general materials thicknesses. Minimum thickness of solid lumber for web frames, trim, bases, etc., shall be 3/4". Minimum thickness of plywood and particleboard shall be 3/4".

E. Sizes: See drawings for woodwork sizes required. The manufacturer shall check field dimensions and verify all openings and actual field conditions prior to fabrication of work.

F. Manufacturer is responsible for rigidity and structural stability.

2.8 BUILT-IN CABINETS, WOODWORK WITH WOOD VENEER FINISH

A. Construction: Details of cabinet and wood work construction shall conform to design as detailed on the drawings and shall be constructed in accordance with AWI Section 10, Premium Grade.

B. Finishing: All work shall be factory pre-finished. No field finishing will be permitted, except minor retouching that is necessary after installation to leave work in perfect condition. Field touch-up shall be accomplished using the same finishes as originally applied at the factory. All finishes shall be free from runs, sags and other visual defects. All wood shall be thoroughly hand smoothed and hand sanded to remove all traces of machine and tool marks. All steel or other metal components shall be deburred, thoroughly cleaned and degreased prior to finishing. Requirements for surface preparation shall be in accordance with AWI Standards specified. Surfaces shall be finished as follows:

1. Wood Species and Cut for Exposed Surfaces: As specified hereinabove.

a. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.

b. Matching of Veneer Leaves: Book match.
c. Vertical Matching of Veneer Leaves: End match.
d. Veneer Matching within Panel Face: Running match.
e. Veneer Matching within Room: Provide casework veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.

2. Semiexposed Surfaces: Provide surface materials indicated below:

a. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
b. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
c. Drawer Bottoms: Hardwood plywood.

3. All wood veneer surfaces shall be given transparent finish as specified herein.

4. Backing Veneer: Provide backing veneer, of same thickness and strength as face veneer for balanced construction, where plywood surface not exposed, not semi-exposed, or not to be finished. Note that interior surface of cabinets, closets, are to be finished.

C. Edge Banding: All visible edges of case and body members fabricated from plywood shall be banded. Transparent finished wood veneer panels shall be banded with wood species to match face veneers.

2.9 CABINET HARDWARE

A. Architectural Woodwork Hardware: Provide the following items, or their approved equal, as required:

1. Hinges: Hafele concealed hinges.

2. Catches: Magnetic; top and bottom.

3. Pulls: Hafele Wire Pull, Finish shall be satin chrome unless otherwise noted in the finish schedule. Hole spacing shall be 96 mm unless otherwise noted on the drawings.

4. Locks: Keyless 1 by Keyless.co, unless otherwise directed by the Architect.

a. Locks: Locks at custom wood lockers in offices shall be selected by the Architect.

5. Drawer Slides (24” maximum width): Accuride, Model 7434, full extension, 100 lb. capacity.

a. Drawer Slides (16” maximum width) Easy Close: Accuride Model 3832C, full extension, 100 lb. capacity.

6. Shelf Supports: Pin and grommet system equal to No. 282.01.701 pin and 282.50.704 grommet made by Hafele.

7. Finish: Satin Stainless Steel.

8. Closet Hardware: Oval wardrobe rails, chrome plated steel with center bracket and wall support brackets made by Hafele or approved equal.

2.10 FABRICATION - GENERAL

A. Provide lumber framing for architectural woodwork, complete with all bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.

B. Do all fabrication from field measurement with provision for scribing as required to meet built-in conditions.

C. Coordinate the work of this Section with the work of other trades.

D. Fabricate units in largest practicable sections. Assemble in the shop for trial fit, disassemble for shipment and reassemble with concealed fasteners.

E. Maintain relative humidity and temperature during fabrication, storage and finishing operations matching that of the areas of installation.

F. Details indicate the required type and quality of construction. Modifications to conform to manufacturer's standards will be considered providing they comply with the Contract Documents, maintain the profiles shown and subject to acceptance by the Architect.

G. Reinforcing shown is minimum. Provide additional reinforcing as required to ensure a rigid assembly. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects affecting serviceability or appearance. Accurately fit all joints, corners and miters. Conceal all fasteners. Make threaded connections up tight so that threads are entirely concealed.

H. Factory finish all items where possible. Defer final touch-up, cleaning and polishing until after delivery and installation.

I. Comply with AWI, Premium Grade standards for sanding, filling countersunk fasteners, back priming and similar preparations for the finishing of architectural woodwork, as applicable to each unit of work.

J. Prepare all countersunk wood screw attachments for wood plugs. Wood plugs shall match surrounding species and grain direction; putty filling is not acceptable.

2.11 FABRICATION - SPECIFIC ITEMS

A. Casework

1. Include all preparations for mechanical, electrical, telephone and plumbing work required.

2. Provide cabinet hardware for casework as shown.

3. Provide dust panels in body webs and between drawer units.

4. Provide wood veneers for exposed surfaces as specified herein before.

5. Hollow core doors will not be permitted.

6. Provide matching veneers for edge treatments of case body members where transparent finishes are indicated or specified.

7. Provide drawers with slides as specified. Drawers shall not rest on web body frames.

8. Provide wood veneers for transparent finish, of matching and continuing grain, for drawer and door edges.

B. Closet and Storage Shelving

1. Provide closet and storage shelving in accordance with AWI Section 600, Custom Grade, unless otherwise shown or specified.

2. Exposed edges shall have hardwood edge bands.

C. Standing and Running Trim: Provide standing and running trim of the sizes, profiles, species and finish as specified or shown and complying with AWI Section 6, Premium Grade.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where architectural woodwork is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 FRAMING

A. Use specified framing lumber, sizes and spacing as indicated on drawings and as required to support loads.

B. Framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels, rigidly secured in place at bearings and connection with nails, lag screws and/or bolts as required by conditions.

3.3 GROUNDS, BLOCKING, NAILERS AND FURRING

A. Provide all wood grounds, blocking, nailers, furring, and the like for work of this Section, where shown and where required, dressed to size indicated or required to suit the condition. Install grounds, blocking, nailers, furring, etc., rigidly, in proper alignment, trued with a long straight edge.

3.4 ROUGH HARDWARE

A. Provide all rough hardware, such as nails, screws, bolts, anchors, hangers, clips and similar items. Hardware shall be of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner. Use galvanized hardware at exterior walls, and at other locations where subject to moisture or where water will be present.

B. Secure wood to concrete and to solid masonry with countersunk bolts in expansion sleeves or other approved manner, to steel with countersunk bolts, to hollow masonry and to drywall with heavy duty countersunk toggle bolts. Space fastenings not more than sixteen (16) inches apart. Hardened cut nails, power-driven fastenings, or other suitable devices may be used where approved by the Architect.

C. Connections and fastenings shall be made in such manner as will compensate for swelling and shrinkage and shall permit the work to remain permanently in place without any splitting or opening of joints.

3.5 INSTALLATION OF CABINET FINISH HARDWARE

A. All items of finish hardware furnished under this Section shall be carefully fitted and secured in place as part of the work of this Section. Locations and positioning of hardware shall be subject to the Architect's approval. Care shall be taken not to mar or damage hardware, or other work. Install doors plumb and true. Hardware shall be fitted to assure operation without forcing.

B. After preliminary fitting of hardware, the Contractor shall remove trim for painting and finishing work; after which he shall reinstall the hardware in a permanent manner.

C. Upon completion of the work, before final acceptance of the building by the Owner, the Contractor shall, in the presence of the Architect, show that all hardware is in satisfactory working order; fit all keys in their respective locks and, upon acceptance of the work, shall tag and deliver all keys to the Architect and Owner.

D. When directed by the Owner, at any time during the first year after the completion of the Contract, the Contractor shall return to the building and adjust and refit the work and hardware, and leave such items in satisfactory working order.

3.6 GENERAL INSTALLATION

A. Wall anchorage and general installation procedures for cabinetry work shall conform to AWI Section 10, Article entitled "EXECUTION", Sub-Article 6.1 with all related sub-paragraphs.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offset in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

3.7 CLOSET AND STORAGE SHELVING

A. Provide closet and storage shelving at the locations shown. Provide hang rods where shown. Set adjustable center hangers.

3.8 CABINET WORK AND MILLWORK

A. General

1. Materials and workmanship shall conform to the Quality Standards of the Architectural Woodwork Institute specified herein and to the drawings.

2. Cabinet work and millwork shall be performed by experienced cabinet work and millwork company, having craftsmen skilled in their trade.

3. Fabricate all cabinet work and millwork completely in the shop, in complete and/or as large units as practical, leaving only fitting, assembly, installation and a minimum of fabrication and finishing to be done at the building. Assembled work shall be rigidly secured and permanently fastened together with concealed fasteners.

4. Afford Architect every facility for inspection of work at shop or mill at such times as the Architect may select.

5. As far as practicable, use concealed fastenings for joining and assembling the work. Where this is impossible, the means of securing shall be placed in inconspicuous places and methods of joining and assembling submitted for Architect's approval prior to fabrication.

6. Mill all finish wood accurately to detail, with clean cut moldings, profiles and lines, machined, sanded smooth, housed, jointed, blocked, put together in the best manner, with provision for swelling and shrinkage, and to assure the work remaining in place without warping, splitting or opening of joints.

7. Cut trim to dimensions and profiles shown, from solid stock.

8. Make all trim and the like in single lengths wherever possible; joints mitered, glued and splined. Continuous members shall have tight flush joints, doweled or splined and glued.

9. Make all joints hairline tight, fitted accurately and joined with hardwood splines or dowels, glued together, or by other method approved by Architect. Use screws, not nails, for fastenings.

10. Gluing shall, where practicable, be by the hot plate press method and glued surfaces shall be in close contact throughout. Glue stains on finished work will not be permitted.

11. Cover surface fastenings, where permitted, with matching wood plugs or wood putty. Finish exposed edges of plywood with matching solid stock. Lock miter external corners; tongue and groove internal corners to allow for contraction and expansion.

12. Machine sand with grain, finish with hand sanding, leave exposed surfaces free from machine or tool marks that will show through the finish.

13. Work which adjoins drywall, concrete, or other finish shall be fitted and scribed in a careful manner and ample allowance shall be given for cutting and scribing.

14. Erect work true to lines, levels and dimensions, square, aligned and plumb, securely and rigidly fastened in place.

B. Cabinet Work: Provide all items of cabinet work indicated on drawings and as herein specified.

1. Tops, sides, backs, bottoms, dividers, shelves, fronts, doors and drawer fronts shall be of plywood or flakeboard core, with the specified wood veneer or plastic laminate as indicated on drawings.

2. Drawer sides and backs shall be 1/2" thick solid clear selected white birch, suitable for clear finish. Drawer bottom shall be 3/8" thick plywood with clear selected white birch veneers, suitable for clear finish.

3. Cabinet doors and drawers shall be flush mounted.

4. Adjustable shelves in cabinets shall have grommets spaced 2" o.c.

5. Fixed shelves shall be dadoed into side supports and glued.

6. Shelves shall be 3/4" thick for spans up to 30"; for spans in excess of 30" to 48" shelves shall be 1" thick.

7. All cabinets shall have closed top, sides, bottom, and back with veneers to match face work. Cabinets to fit accurately into indicated locations; scribe moldings permitted only where indicated.

8. Countertops, counters, counter fronts, shelves, etc., indicated on drawings to have plastic laminate, shall have plastic laminate shop applied to 3/4" thick core, with plastic laminate backing sheet on underside or back of countertops, counters and shelves. Plastic laminate shall be pressure laminated to core with laminate at external corners. Provide concealed wood framing to support plastic laminate counters, securely fastened to wall and to underside of counters.

C. Countertops shall be installed to support a minimum concentrated live load of 150 lbs. acting downward at mid span at outer edge of counter without causing deformation and damage.

3.9 PAINTING AND FINISHING

A. General: All painting and finishing work of this Section shall be shop applied, unless otherwise noted, as specified below. All painting and finishing shall match approved samples. Field finish painting, where specified below, shall be by painting Subcontractor, as specified for in Painting Section.

B. Schedule of Painting and Finishing

1. Shop Primer On:

a. Wood bases.
b. Wood trim and moldings to be field finish painted.
c. Ferrous metal work.

2. Shop Natural Finish On:

a. Wood paneling.
b. Wood cabinets with wood veneers.

C. Back-Painting: All work of this Section in contact with concrete or masonry or other moisture areas and all concealed surfaces of cabinet and millwork, shall be back-painted with one (1) coat of oil based paint prior to installation, shop applied where practicable.

D. Field Touch-Up: Field touch-up shall be the responsibility of the installing Subcontractor, and shall include the filling and touch-up of exposed job made nail or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and mars, and final cleaning up of the finished surfaces.

3.10 CLEAN UP AND PROTECTION

A. Clean Up: At regular intervals during the course of the work, all debris and excess material shall be cleaned up and removed from the site. Upon completion of installation, clean all spaces of debris caused by woodwork installation.

B. Protection: Protect all woodwork from marring, defacement of other damage until final completion and acceptance of the project by the Owner. Repair or replace all defective units prior to final inspection as directed by the Architect. Any units that cannot be satisfactorily repaired in the opinion of the Architect shall be replaced with new units of same original design, at no additional cost to the Owner.

END OF SECTION

SECTION 070150

MAINTENANCE OF MEMBRANE ROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete roof work, including, but not limited to, the following:

1. Cutting and patching existing roofing system to accommodate new construction.

2. Existing roofing assembly and membrane shall maintain watertight conditions and existing warranty.

3. Sheet metal work.

4. Roof insulation as required.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.4 SUBMITTALS

A. Material Safety Data Sheet (MSDS) for products used on this project.

B. Shop Drawings: Submit shop drawings detailing flashing, curbs, insulation, and all new work. Shop drawings and new work shall be approved by roof system manufacturer.

1.5 QUALITY ASSURANCE

A. Have work done by a single firm with at least 5 years' successful experience in comparable work, and which is approved by the Architect and the manufacturer of roofing materials. Use only experienced personnel skilled in operations needed, working under competent supervision. Roofing specialist shall perform specified examinations and submit detailed recommendations concerning methods and materials to be used in making repairs to the Architect through the Contractor.

B. Before starting work, test proposed materials for compatibility with existing materials by installing each in a small area in location of roof opening. Do not proceed until Architect approves tests.

C. Do all work so that existing in force warranty (if any) shall remain in effect; coordinate work with the Owner and roof membrane manufacturers.

1.6 PROJECT CONDITIONS

A. Protect existing finishes. Do not hoist materials against building faces without adequate approved protection from grade to parapet. Protect vegetation and paving from damage due to roofing and flashing work.

B. Do not use incompatible materials or materials that are not compatible with existing materials.

C. Do not uncover existing insulation until ready to do repair Work and install new insulation and covering Work.

D. Avoid unnecessary traffic over roof areas. Use roof areas to perform Work only where unavoidable. When roof areas must be used, protect roof and flashing from damage; use temporary plywood sheets where traffic is mandatory; lay continuously at every traffic pattern and Work area.

E. Should field conditions differ significantly from those shown on drawings, notify Architect in writing and do not proceed without instructions from the Architect.

PART 2 PRODUCTS

2.1 MATERIALS

A. Contractor shall be advised of the following existing roof systems, related components and work required.

B. Roof Materials: New materials to match and be compatible with existing liquid membrane roofing materials manufactured by Soprema; coordinate with the Owner and roof membrane manufacturer. Contractor shall coordinate work with roof membrane manufacturer to ensure continuity of warranty and shall submit written authorization from the roof manufacturers stating that all work has been done in accordance with procedures that allow warranty to remain in effect.

C. Roof Insulation: Flat and tapered; type to match existing.

D. Stainless Steel Flashing Materials: Type 316, 24 gauge minimum.

E. Liquid Flashing System: Liquid cold applied polyester resin flashing membrane compatible with existing and acceptable to roofing manufacturers.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where roof work is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 ROOF INSTALLATION

A. Repair roofing and associated insulation and flashings on the roofing where new cutting and patching is required.

B. Where existing roofing, insulation, or flashings, are damaged during the Work, satisfactorily repair, flash, and otherwise make watertight at least equal to condition when Work began. If damage cannot be satisfactorily repaired, remove damaged portion and provide new materials as appropriate. Do such Work and repairs at no additional cost. Materials, methods, and completed Work are subject to approval of the Owner, Architect, and roof membrane manufacturer.

C. Protect edges, incomplete flashings, and cut existing roofing against water entry at all times.

D. Where practicable, unless otherwise recommended by roofing specialist or materials manufacturers, use materials, systems, quantities, and methods that exactly match existing and keep existing warranty (if any) in effect. Materials used shall be compatible with each other and with existing materials.

E. Make all repairs watertight.

F. Do not remove materials to the extent that the building is subject to water intrusion without providing approved protection. Do not remove more area of existing surfaces that can be repaired in the same working day.

3.3 JOB COMPLETION

A. Contractor shall inspect the completed roof system and correct all defects.

B. A representative of the roofing membrane manufacturer shall inspect the system and notify the contractor of any defects.

1. Roofing inspections are required before and after installation.

2. Furnish sign-off letter by roofing manufacturer.

C. Clean up all debris and equipment.

END OF SECTION

SECTION 078100

SPRAYED FIRE-RESISTIVE MATERIALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the sprayed fire-resistive materials as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Spray-on fireproofing for structural steel and metal decking to match existing.
2. Seal coat over fireproofing in special areas.
3. Painting over existing spray-on fireproofing as necessary.
4. Preparation of surfaces.
5. Field quality control.

1.3 RELATED SECTIONS

A. Structural steel – Section 051200.

B. Firestops and smokeseals – Section 078413.

1.4 SUBMITTALS

A. Product Data: For each fire-resistive product specified.

B. Shop Drawings: Submit structural framing plans indicating the following:

1. Locations and types of surface preparations required before applying sprayed fire-resistive material.
2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:
    a. Applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
    b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
3. Identify restrained and unrestrained assemblies on shop drawings, show required thickness of fireproofing for each assembly.

C. Product Certificates: Signed by manufacturer of sprayed fire-resistive material certifying that the products furnished comply with requirements.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. If primer is to be used steel and/or metal deck, submit certifications by supplier of primer that primer is compatible with materials, and will not impair the required performance of the installed fireproofing. Such certification shall be accompanied by evidence that the primer was successfully used in conjunction with the fireproofing material in a UL test applicable to the construction. Submit certification prior to application of primer.

1. Coordinate with Section 051200 – Structural Steel, and Structural Drawings prior to application of primer.

G. Product Test Reports: Indicate that physical properties of proposed sprayed fire-resistive materials comply with specified requirements based on comprehensive testing of current product formulations by a qualified testing and inspecting agency according to requirements specified in "Quality Assurance" Article.

H. Code Compliance: Proposed product must comply with prevailing Building Code and be approved by those individuals having jurisdiction.

I. Letter from manufacturer stating that the UL Design selected for the project is not load restricted.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Submit data indicating that products containing no detectable asbestos as determined according to the method specified in 40 CFR, Part 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

C. Mockups: After processing of initial submittals and before delivery and installation of fireproofing materials, prepare a sample installation of fireproofing work, approximately 100 sq. ft. in area; providing an example of each type required, applied on each different substrate, to produce each different rating as required and reasonably representative of entire sprayed on fireproofing work, for joint approval by representative of fire resistant material manufacturer and Owner. Work in other areas shall not proceed until mock-up has been completed. Mock-up work which remains in compliance with requirements and is in undamaged and acceptable condition may be retained as final work in place.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, aboveground, so they are kept dry until ready for use. Remove from Project site and discard materials that have deteriorated.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperatures are 40 deg F. or lower, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material to achieve a minimum of four air changes per hour. Use natural means or, where this is inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.8 SEQUENCING

A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosures for interior applications to prevent deterioration of fire-resistive material due to exposure to unfavorable environmental conditions.

2. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.

3. Do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material. Fireproofing shall be considered dry when the moisture content is 6% or less.

4. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.

5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.

6. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, tested, and corrections have been made to defective applications.

7. Protect permanently exposed walls, floor or special surfaces.

1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed fire-resistive materials that fail within the specified warranty period.

1. Failures include, but are not limited to, cracking, flaking, eroding in excess of specified requirements; peeling; and delaminating of sprayed fire-resistive materials from substrates due to defective materials and workmanship within the specified warranty period.

2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

C. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For concealed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated in this Article for material composition and physical properties representative of installed products.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

B. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method. UL design listings requiring a load restriction factor will not be allowed.

C. Material Composition: As follows:

1. Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or Portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property listed as follows:

1. Dry Density: 15 lb./cu. ft. for average and individual densities regardless of density indicated in referenced fire-resistive design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."

2. Thickness: Provide minimum average thickness required for fire-resistive design shown on approved submittals.

a. Fireproofing shall be of thicknesses and density to meet the requirements of the City of New York Building Code.

3. Bond Strength: 430 lbf/sq. ft. per ASTM E 736.

4. Compressive Strength: 5.21 lbf/sq. in. as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch and minimum dry density shall be as specified, but not less than 15 lb./cu. ft.

5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.

6. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.

7. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.

8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch, maximum dry density is 15 lb./cu. Ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.

9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

    a. Flame Spread: 10 or less.
    b. Smoke Developed: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

E. Products: Subject to compliance with requirements, provide products by one of the following:

1. Cementitious Sprayed Fire-Resistive Material

    a. Monokote Type MK-10HB; GCP Applied Technologies.
    b. Cafco 300HS; Isolatek International Corp., Cafco Products.
    c. Type 5MD; SouthWest, Carboline.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS FOR EXPOSED FIREPROOFING

A. General: For exposed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and for minimum physical properties of each product listed, measured by standard test methods referenced with each property.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

B. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method. UL design listings requiring a load restriction factor will not be allowed.

C. Cementitious Sprayed Fire-Resistive Material: Factory-mixed, dry, cement aggregate formulation, chloride-free formulation of Portland cement binders, additives, and inorganic aggregates, mixed with water at Project site to form a slurry or mortar for conveyance and application, complying with the following requirements:

1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination," but with an average density of not less than 22 lb./cu. ft.

2. Bond Strength: 2000 psf minimum per ASTM E 736.

3. Compressive Strength: 100 psi per ASTM E 761.

4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.

5. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.

6. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.

7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. per ASTM E 859.

8. Combustion Characteristics: Passes ASTM E 136.

9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

    a. Flame Spread: 10 or less.
    b. Smoke Developed: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

11. For exterior applications of sprayed fire-resistive material, provide manufacturer's formulation approved for surfaces exposed to the exterior.

D. Products: Subject to compliance with requirements, provide one of the following:

1. Cement-Aggregate Cementitious Sprayed Fire-Resistive Material:

    a. Pyrocrete 239; Carboline Co., Fireproofing Products Div.
    b. Monokote Type Z106HY; GCP Applied Technologies.
    c. F4; Promat Firetemp.
    d. Cafco 400, Isolatek International Corp; Cafco Products.

2.3 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistive designs indicated.

B. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material, used where required by manufacturer to insure proper bond.

C. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistive designs indicated and fire-resistive product manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.

D. Sealer for Sprayed Fire-Resistive Material in Elevator Shafts and Open Area Plenums: Transparent-drying, water-dispersible protective coating by manufacturer of fire-resistive material.

1. Product: Subject to compliance with requirements, provide "Firebond Concentrate" by GCP Applied Technologies, or similar product recommended by the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, to determine whether they are in satisfactory condition to receive sprayed fire-resistive material. A substrate is in satisfactory condition if it complies with the following:

1. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive material with substrate under conditions of normal use or fire exposure.

2. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

3. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Do not proceed with installation of fire-resistive material until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances that could impair bond of fire-resistive material, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

B. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

C. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.

3.3 INSTALLATION

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.

C. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by fire-resistive material manufacturer for material and application indicated.

D. Extend fire-resistive material in full thickness over entire area of each substrate to be protected.

E. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by method recommended by the manufacturer.

F. Where sealers are used, apply products that are tinted to differentiate them from the sprayed fire-resistive material over which they are applied.

G. Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying.

H. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete, all roof mounted mechanical equipment is in place, and the roof is watertight.

I. No fireproofing shall be applied prior to completion of concrete work on steel decking.

J. Installation Sequence of Fireproofing: All patching and repairing of sprayed fireproofing, due to cutting by other trades or testing and inspection, shall be performed under this Section.

K. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided.

3.4 FIELD QUALITY CONTROL (FREQUENCY PER BELOW UNLESS MORE STRINGENT PER BUILDING CODE)

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing and inspecting of completed applications of sprayed fire-resistive material will take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of fire-resistive material for the next area until test results for previously completed applications of fire-resistive material show compliance with requirements.

1. For each 1000-sq. ft. area, or partial area, on each floor, testing and inspecting agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire-resistance design.

a. Thickness for Floors, Roofs, and Walls: From the average of 10 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.

2. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.

3. For each 10,000 sq. ft. area, or partial area, on each floor, testing and inspection agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire resistance design.

a. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: Cohesion and adhesion at frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 736.

4. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."

5. When testing discovers applications of fire-resistive material not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

C. Remove and replace applications of fire-resistive material where test results indicate that they do not comply with specified requirements for cohesion and adhesion or for density, or both.

D. Apply additional fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Cure exposed sprayed fire-resistive material according to product manufacturer's written recommendations to prevent premature drying.

C. Protect fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at the time of Substantial Completion.

D. Coordinate application of fire-resistive material with other construction to minimize the need to cut or remove fire protection. As installation of other construction proceeds, inspect fire-resistive material and patch any damaged or removed areas.

1. Patch and repair fireproofing where Owner’s Testing Agency has performed tests.

E. Repair or replace work that has not been successfully protected.

END OF SECTION

SECTION 078123

INTUMESCENT FIREPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the intumescent fireproofing on fireproofed steel exposed view, as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Intumescent fireproofing for interior application to match existing.

1.3 RELATED SECTIONS

A. Structural steel - Section 051200.

B. Sprayed Fire-Resistive Materials – Section 078100.

C. Painting and finishing - Section 099000.

1.4 REFERENCES

A. ASTM Test Standards

1. ASTM D 2240 – Durometer Hardness (Shore D Only).

2. ASTM D 2794 – Impact Resistance.

3. ASTM D 4060 – Abrasion Resistance.

4. ASTM D 4541 – Bond Strength.

5. ASTM E 84 – Surface Burning Characteristics of Building Materials.

6. ASTM E 119 – Fire Tests of Building Construction and Materials.

B. The Society of Protective Coatings (SSPC):

1. SSPC SP-6: Commercial Blast Cleaning Standard.

C. Underwriters' Laboratories Inc. (UL):

1. Fire Resistive Directory, Volume 1; Current edition. Classification identified as Mastic and Intumescent Coatings (CDWZ)

2. UL 263 - Fire Test of Building Construction and Material

1.5 SUBMITTALS

A. Product Data: Submit product data including manufacturer's technical information indicating product performance characteristics, performance and limitation criteria for each product specified herein.

B. Submit evidence indicating that manufacturer of the intumescent fireproofing coating has reviewed and approved shop primer to be used by the structural steel fabricator; refer to Section 051200, "Structural Steel," for primer description.

C. Submit evidence indication that manufacturer of the intumescent fireproofing coating has reviewed and approved proposed topcoat.

D. Fire Test Evidence: Submit published third party design listings for fire resistance ratings and product thickness. Include evidence that the fire testing was sponsored by the manufacturer and that the material tested was produced at the manufacturer’s facility under the supervision of third party certification personnel.

E. Installation Instructions: Submit manufacturer's written installation instructions.

F. Installer Qualifications: Submit applicator's current certification as a manufacturer trained and approved installer.

G. Shop Drawings: Submit plan, section, elevation and perspective drawings as necessary to depict system configuration, design considerations and application procedures.

H. Selection Samples: For each finish product specified, submit samples representing manufacturer's range of available materials, finishes and shapes.

1.6 QUALITY ASSURANCE

A. Material Manufacturer: Company specializing in manufacturing products listed in this section.

1. Fire Protection Factory Manufacturer: Company specializing in manufacturing the work of this section with a minimum of three years' documented experience, and certified by the material manufacturer.

B. Fire Protection Installer: Company specializing in installing the work of this section with a minimum of three years' documented experience and certified by the material manufacturer.

C. Product

1. All products listed in this section must be manufactured under the appropriate follow-up service with each container bearing the certified label (mark).

2. Intumescent fireproofing shall be a complete system consisting of compatible primer, intumescent fireproofing coating, adhesive, edge sealant and decorative topcoat.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Before proceeding with the work, the installer will apply the primer, intumescent fireproofing, and decorative top coat to a representative substrate section of 10 square feet in size. Areas will be designated by the Architect.

2. Materials must be applied in accordance with the project requirements for fire rating thickness, finish texture and color.

3. The application must be witnessed by the Architect's or Owner's representative and is subject to their approval. Once agreed upon in writing, it serves as a guide for the finished work.

4. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

5. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, sealed, undamaged container with identification label intact. Packaged materials must bear the appropriate labels, seals and designated certification mark for fire resistive ratings.

B. Storage: Store materials in strict accordance with manufacturers documented instructions.

C. Documentation: All batch number, product identification and quantities shall be recorded on appropriate QC documents. A copy of the transport document and manufacturers conformance certificate shall be attached to the material delivery QC form.

D. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Project Environmental Requirements: Substrate and air temperature shall be in accordance with the manufacturer’s requirements.

1. Protect work area from windblown dust and rain. Protect adjacent areas from over spray of fireproofing material.

2. Provide ventilation in areas to receive work of this section during application and minimum 24 hours after application.

B. Temperature and Humidity Requirements: Maintain air temperature and relative humidity in areas where products will be applied for a time period before during and after application as recommended by manufacturer.

1. Do not install intumescent fire protection system when temperature of substrate and/or surrounding ambient air temperature is below 41 degrees F. Temporary protection and heat shall be maintained at this minimum temperature for 24 hours before, during and 24 hours after material application.

2. Steel substrate temperature shall be a minimum of 5 deg F. above the dew point of the surrounding air for a period of 24 hours prior and during the application of the material.

3. If necessary for job schedule, the Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels in the application areas.

4. The relative humidity of the application area shall not exceed a maximum of 85 percent for 24 hours prior, during and 24 hours after the application of the material.

1.9 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of fireproofing system with Work in other sections which would interfere with efficient fireproofing application.

B. Do not apply fire protection materials to supporting structural steel until the concrete toppings and/or roofing applications have been completed and are substantially dry.

1.10 WARRANTY

A. At project closeout, provide to Owner an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

1. Duration: Minimum two years.

PART 2 PRODUCTS

2.1 INTUMESCENT FIREPROOF COATING FOR INTERIOR APPLICATION

A. Acceptable Products

1. “CFP-SPWB Fire Finish” made by Hilti.
2. "Interchar 1120" made by International Paint.
3. "Thermo-Lag Series" made by Carboline.
4. "Albi Clad TF" made by Albi Mfg. Co.
5. "Cafco Spray Film – WB 5" made by Isolatek International for columns only, and WB-3 for beams, joists and girders.

B. Description: A single pack, chlorine-free, water borne intumescent coating site applied over shop applied prime coat (see Section 051200). Coating must meet the following minimum physical requirements:

	PROPERTY	TEST METHOD	VALUE
2.	Dry Applied Density	-	85 PCF
3.	Hardness	ASTM D 2440	60
4.	Compressive Strength	ASTM D 695	500 psi
5.	Bond Strength	ASTM D 4541	145 psi
6.	Abrasion Resistance	ASTM D 4060	0.16 grams loss @1000 cycles
7.	Flame Spread	ASTM E 84	Class A
8.	Smoke Developed	ASTM E 84	Class A

C. Fireproofing Performance: Provide intumescent fireproofing system, tested by independent testing agency in accordance with ASTM E 119/UL 263, and acceptable to authorities having jurisdiction:

1. Listed by UL and bearing the UL label.

D. Structural Steel Fire Resistance Rating

1. Fire Resistance Rating: 4 hours.

2. UL Design Number: To be provided by the manufacturer based on the required UL-listed 4 hour rated fire proofing system and the applicable requirements for the structural steel members.

E. Accessory Materials: Manufacturer's recommended adhesive and edge sealant.

F. Shop Primer Coating: Refer to Section 051200, "Structural Steel."

G. Decorative Topcoat: Approved by the intumescent fireproofing manufacturer and applied in accordance with the topcoat manufacturer's documented instructions, custom colors as selected by the Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. All surfaces to receive the fire protection material must be clean, dry and free of oil, grease, loose mill scale, loose shop primer, dirt, dust or other foreign substances which would impair bond of the fire protection material to the substrate.

B. Do not commence installation of the fire protection system until the contractor, installer and fire protection manufacturer’s representative have examined the surfaces to receive the fire protection and determined the surfaces are acceptable to receive the fire protection material. Commencement of installation is acceptance of substrate.

C. Verify that substrate and workspace temperature and humidity conditions are in accordance with requirements of this section.

D. Verify that all clip hangers, piping, ducts, equipment or other items which would interfere with the installation of the factory-manufactured architectural fire protection system are not positioned or installed until installation is complete.

3.2 PREPARATION

A. Provide masking, drop cloths or other suitable coverings to prevent overspray onto surfaces not intended to be affected by Work in this section.

B. Clean substrate free of dust, dirt, grease or other foreign substances that would impair with the bond of the intumescent fireproofing protection adhesive material.

C. Grind smooth all weld spatter and defects prior to commencement of fire protection installation and touch-up shop primer in the field using same paint as shop primer.

3.3 APPLICATION (FIELD APPLIED)

A. Equipment and installation procedures must conform to the manufacturer's installation instructions. The intumescent fireproofing protection material shall be applied at the required dry film thickness to achieve fire resistance rating specified herein.

B. Install fire protection material only to primed surfaces and in accordance with manufacturer's installation instructions. Refer to Section 051200 for steel shop primer.

C. Final texture and finish of the intumescent fireproofing must be completed prior to the application of the decorative top coat and in accordance with the Architect's approval and approved mock-up samples. Finish shall be level 4 (high end architectural – spray applied, back rolled and sanded smooth).

D. Apply decorative top coat in accordance with the manufacturer's application instructions. Final color, gloss and finish will be determined and approved by the Architect.

3.4 FIELD QUALITY CONTROL

A. The Owner shall retain the services of an independent testing laboratory to inspect and verify the installation of the intumescent fireproofing material in accordance with the provisions of AWCI Technical Manual 12-B, Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide.

B. The fire protection material inspection must be performed prior to the application of the decorative top coat.

C. All test results must be made available to all parties at the completion of each pre-designated area and approved prior to the application of top-coat.

D. Intumescent fireproofing not in compliance with the specification requirements must be corrected prior to the application of the decorative top coat.

3.5 CLEAN UP AND REPAIR

A. Upon completion of installation, all excess material, overspray and debris must be cleared and removed from the job site.

B. Remove fire protection materials from surfaces not required to be fireproofed.

C. All patching and repair to intumescent fireproofing, due to damage by other trades, shall be performed under this section of work. Patching must be performed by the installer of the intumescent fireproofing and applied in accordance with the manufacturer's installation instructions.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 078413

FIRESTOPS AND SMOKESEALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the firestops and smokeseals as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

4. Sealant joints in fire-resistance-rated construction.

5. Penetrations at each floor level in shafts and/or stairwells.

6. Construction joints, including those between top of fire rated walls and underside of floors above; and those between exterior curtain walls and the outer perimeter edge of floor assemblies.

1.3 RELATED SECTIONS

A. Joint sealers - Section 079200.

B. Drywall - Section 092900.

C. Piping penetrations - Division 22.

D. Duct penetrations - Division 23.

E. Protection of Emergency Fuel Lines – Division 23

F. Cable and conduit penetrations - Division 26.

G. Communications -Division 27

1.4 REFERENCES

A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."

B. UL 1479, UBC 7-5 (Both are same as A. above).

C. ASTM E 136 "Standard Test Method for Assessing Combustibility of Materials."

D. UL 263, UBC 7-1 "Fire Tests of Building Construction and Materials"

E. UL 2079 "Tests For Fire Resistance of Building Joint Systems."

F. ASTM E 1399 "Test For Dynamic Movement Conditions."

G. ASTM E 1966 (Same as E. above).

H. ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi."

I. ASTM E 1725 "Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components"

J. UL 1489 "Fire Tests of Fire Resistant Pipe Protection Systems Carrying Combustible Liquids"13

K. Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus."

L. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Firestops."

M. Published Through-Penetration Systems by recognized independent testing agencies.

1. UL Fire Resistance Directory, Volume II of current year.
2. Warnock Hersey Certification Listings, current year.
3. Omega Point Laboratories, current year.

N. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

O. NFPA 101 – Life Safety Code

P. NFPA 70 – National Electric Code

Q. NFPA 72 – National Fire Alarm and Signaling Code

R. Material must have approval for use in New York City.

1.5 SUBMITTALS

A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria, test data and indication that products comply with specified requirements.

B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each firestop system, and each kind of construction condition penetrated and kind of

penetrating item. Include firestop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, for proposed UL listed (or equal) firestop and smokeseal assembly required for the Project.

C. Safety Data Sheets: Submit SDS for each firestop product.

D. Submit qualifications of firestop installer, including letter from firestop manufacturer of products proposed to be installed, wherein manufacturer approves or recognizes as trained/ or certifies installer for installation of that manufacturer's products.

E. Engineering Judgment: For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.6 QUALITY ASSURANCE

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire and the passage of smoke and other gases.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor unless preformed devices are utilized.

1. Installer Qualifications (one of the following):

a. A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors
b. A firm that has been evaluated by UL and found to comply with its “Qualified Firestop Contractor Program Requirements.”
c. A manufacturer’s Accredited Firestop Specialty Contractor (see Part 2.0 for list of acceptable manufacturers).
d. A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this project, whose work has resulted in construction of a minimum of five projects with a record of successful performance.

C. Single Manufacturer Sourcing: Source all firestop products and required accessories from a single manufacturer. See Part 2.0 for list of acceptable manufacturers.

D. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479. The F-rating must be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated. T-rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

1. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

a. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

b. T-Rating: When penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated
   1). T-ratings shall be achieved by utilizing a Low Bio Persistent Endothermic Mat incorporating foil scrim on both sides.
c. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

2. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

E. Firestopping products shall be asbestos free and free of any PCBs.

F. Do not use any product containing solvents or that requires hazardous waste disposal.

G. Do not use firestop products which after curing, dissolve in water.

H. Do not use firestop products that contain ceramic fibers.

I. Mock-Up: Prepare job site mock-ups of each typical Firestop System proposed for use in the project. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.

J. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

   2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.

   3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

K. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of less than or equal to 1 as determined by ASTM G 21.

L. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post-installed." Provide cast-in-place firestop devices prior to concrete placement.

M. Firestop systems do not reestablish the structural integrity of load bearing partitions or assemblies, or support live loads and traffic. Installer shall consult the Structural Engineer prior to penetrating any load bearing assembly.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened containers with manufacturer's name, product identification, lot numbers, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.

B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.

C. All firestop materials shall be installed prior to expiration of shelf life.

1.8 PROJECT CONDITIONS

A. Verify existing conditions and substrates before starting work

B. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.

C. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.

D. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.

E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations.

F. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.

G. Coordinate this work as required with work of other trades.

1.9 SEQUENCING AND SCHEDULING

A. Firestop & Life Safety Design: Obtain all required tested firestop systems before installation and document on shop drawings. Where possible, identify all conditions where tested firestop systems will not meet Project conditions. Obtain Engineering Judgements (EJs) for these conditions from firestop manufacturer and confirm advance approval from Authorities Having Jurisdiction (AHJs).

B. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Invite all applicable parties including installers, general contractors, and firestop manufacturer’s representative to conference.

C. Sequence: Perform work of this and other sections in proper sequence to prevent damage to the firestop systems and to ensure that their installation will occur prior to enclosing or concealing work.

D. Install all firestop systems after voids and joints are prepared sufficiently to accept the applicable firestop system.

E. Do not cover firestop systems until they have been properly inspected and accepted by the authority having jurisdiction.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following manufacturers:

1. Basis-of-Design: Hilti, Inc., Plano, TX, (800) 879-8000, www.hilti.com

2. Firestop systems and products from manufacturers listed below shall be considered in accordance with contract provisions and performance requirements listed in this document:

    a. Specified Technologies Inc.
    b. 3M; Fire Protection Products Division

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:

    a. Semirefractory fiber (mineral wool) insulation.
    b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Joint fillers for joint sealants.

2. Temporary forming materials.

3. Substrate primers.

4. Collars.

5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

D. Smokeseals at top of partitions shall be flexible to allow for partition deflection.

E. Rated and non fire rated smokeseals utilized at joints and penetrations for walls and floors must have acoustical performance qualities. Provide manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C839, ASTM C919 and the following:

    a. Sealant effectively reduces airborne sound transmission through head-of-wall and bottom-of-wall joints and openings to accommodate through-penetrations in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.
    b. Lightweight, semi-foam smoke and acoustical sealant with movement capability of minimum 12.5% in accordance with ISO 11600.
    c. Latex sealant according to ASTM C 834 class OP -18°C with shrinkage according to ASTM C 1241 < 29 % C.
    d. Acoustical Sealant to maintain STC ratings at sound rated partitions as indicated on the drawings.
    e. Sealant has flame-spread and smoke-developed ratings of less than 25 as tested in accordance with ASTM E84.

f. Sealant is mold and mildew resistant per ASTM G21 with a rating of one (1), “no growth”.
g. Proposed acoustic sealant materials and methods shall conform to applicable governing codes having local jurisdiction.
h. Smokeseals at top of partitions shall be flexible to allow for partition deflection.

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Intumescent, Latex Sealant: Single-component, Intumescent, latex formulation.

1. Basis of Design: Hilti Intumescent Firestop Sealant (FS-ONE MAX)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI Intumescent Latex Sealant
b. 3M Fire Barrier Sealant CP 25WB+
c. Or Approved Equal

B. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

1. Basis of Design: Hilti Firestop Putty Stick (CP 618)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI SSP Putty
b. 3M Fire Barrier Moldable Putty
c. Or Approved Equal

C. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum or polyethylene foil on one side.

1. Basis of Design: Hilti Firestop Wrap Strips (CP 648)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI SSW Intumescent Wrap Strips
b. 3M Fire Barrier Wrap Strips
c. Or Approved Equal

D. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

1. Basis of Design: Hilti Firestop Mortar (CP 637)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI SSM Firestop Mortar
b. 3M Fire Barrier Mortar
c. Or Approved Equal

E. Moldable putty pads by

1. Basis of Design: Hilti Firestop Putty Pad (CP 617)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

   a. STI SSP Putty Pads
   b. 3M Fire Barrier Moldable Putty Pads
   c. Or Approved Equal

F. Silicone Foam: Two-component, polyurethane foam that expands and cures in place to produce a flexible, non-shrinking foam.

1. Basis of Design: Hilti Firestop Foam (CP 660)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

   a. 3M Fire Block Foam
   b. Or Approved Equal

G. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless firestop system limits use to non-sag grade for both opening conditions.

2. Basis of Design: Hilti Firestop Silicone Sealant Self Leveling (CFS-S SIL SL)

3. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

   a. STI Self Leveling Silicone Firestop Sealant
   b. 3M Fire Barrier Water Tight Sealant 1003 SL
   c. Or Approved Equal

H. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic or polypropylene sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

1. Basis of Design: Hilti Cast-in Firestop Sleeve (CP 680)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

   a. STI SpecSeal Cast In Firestop Device
   b. 3M Fire Barrier Cast-In Device
   c. Or Approved Equal

I. Low Voltage Cable Management Devices: Factory-assembled round or rectangular metallic sleeve device for use with cable penetrations. Round devices shall contain an integrated smoke seal fabric membrane that can be opened and closed for re-penetration. Rectangular devices shall be modular to accommodate future use.

1. Basis of Design: Hilti Firestop Modular Sleeve System or Firestop Speed Sleeve (CFS-MSL or CP 653, respectively)

2. Substitution requests shall be considered in accordance with contract provisions.

a. STI EZ Path
b. 3M Fire Barrier Pass-Through Device Square
c. Or Approved Equal

J. Drop-In Firestop Devices: Factory-assembled devices for use with combustible or noncombustible penetrants in cored holes within concrete floors. Device shall consist of galvanized steel sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete floor, and neoprene gasket.

1. Basis of Design: Hilti Drop-In Device (CFS-DID)

2. Substitution requests shall be considered in accordance with contract provisions.

K. Firestop Collars : Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

1. Basis of Design: Hilti Firestop Collar (CP643)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI SSC Intumescent Firestop Collar
b. 3M Fire Barrier Plastic Pipe Device
c. Or Approved Equal

L. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

1. Basis of Design: Hilti Firestop Composite Sheet (CFS-COS)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI SpecSeal Composite Sheet
b. 3M Fire Barrier Composite Sheet CS-195+
c. Or Approved Equal

M. Blocks/Plugs: Non curing, re-penetrable intumescent materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways.

1. Basis of Design: Hilti Firestop Block (CFS-BL)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

    a. 3M Fire Barrier Block B258
    b. Or Approved Equal

N. Tub Box Kit: Cast-in place pre-formed plastic tub box kit with three support legs for use with drain piping assembly associated with bathtub installations.

1. Basis of Design: Hilti Tub Box Kit (CP 681)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

    a. STI Firestop Cast in Tub Box
    b. 3M Fire Barrier Cast In Tub Box Assembly
    c. Or Approved Equal

O. Endothermic Mats: Low Bio Persistent Endothermic Mat incorporating foil scrim on both sides. Mat evaluated for protection of cable pathways and liquid fuel lines, for firestopping of through-penetrations and membrane-penetrations, and for achieving T-ratings

1. Basis of Design: Hilti Endo-Shield (CFP-ES) . No substitutions

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

1. Sealant Colors: Color of exposed joint sealants as selected by the Architect.

B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.

C. Multi-Component, Non-Sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.

D. Single-Component, Non-Sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.5 PRE-FORMED FIRE RESISTIVE MATERIALS FOR JOINTS

A. Firestop Top Track Seal: One-piece, pre-formed, polyurethane foam based, firestop seal for use with standard head-joint top tracks and slip-type head joints in fire-rated construction at top of partition to maintain continuity of the fire-resistance-rated assembly indicated. Provide in width and configuration required to accommodate depth and installation of studs and designed to saddle-over the top track.

1. Use only firestop top track seal product that has been UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, space requirements and fire-rating required for each application.

2. Performance Requirements:

a. Movement: +/- 50 percent.
b. Surface Burning Characteristics (U.L. 723) ASTM E84: Flame Spread: 10; Smoke Development: 20.
c. Mold-Mildew Performance (ASTM G21-96): Class 0.
d. VOC (LEED): 0.18 lb./gallon.
e. LBC (Living Building Challenge) compliant; International Living Future Institute, 1501 East Madison Street, Suite 150, Seattle WA. 98122.

3. Basis of Design: Hilti Firestop Top Track Seal (CFS-TTS)

B. Perimeter Fire Barrier System: One-piece, pre-formed, polyurethane foam based, firestop seal for use with building perimeter joints between fire-resistance-rated floors and exterior wall assemblies.

1. Use only firestop perimeter joint device that has been ASTM E2307 tested for specific fire-rated construction conditions conforming to construction assembly type, space requirements, and fire-rating required for each application.

2. Basis of Design: Hilti Edge of Slab QuickSeal (CFS-EOS QS)

2.6 MINERAL FIBER/CERAMIC WOOL NON-COMBUSTIBLE INSULATION (FIRE SAFING)

A. Provide min. 4 pcf safing insulation; Thermafiber Safing Mineral Wool Insulation by Thermafiber, Inc. (an Owens Corning company), Roxul Safe Fire Safing Insulation by Rockwool, Mineral Wool Safing by Johns Manville or approved equal to suit conditions and to comply with fire resistance and firestop manufacturer's requirements.

B. Material shall be classified non-combustible when tested per ASTM E 136.

C. For pre-condensed mineral wool products, the following shall serve as the basis of design:

1. Hilti Speed Plug (CP 777)

2. Hilti Speed Strips (CP 767)

3. Hilti Top Track Plug (CFS-TTS MD P FS)

2.7 HILTI TOP TRACK COVER (CFS-TTS MD C FS)MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce

firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 CONDITIONS REQUIRING FIRESTOPPING

A. Building Exterior Perimeters

1. Where exterior facing construction is continuous past a structural floor, and a space (i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.

a. If mineral wool is part of firestop system, the mineral wool must be completely covered by appropriate thickness of UL or Warnock Hersey listed firestop sealant or spray, as listed in an ASTM E 2307 approved firestop system.

2. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.

3. Where an exterior wall passes a perimeter structural member, such as a girder, beam, or spandrel, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space

would otherwise remain open between the interior face of the wall and the structural member, provide firestopping to continuously fill such open space.

B. Interior Walls and Partitions

1. Construction joints between top of fire rated walls and underside of floors above, shall be firestopped.

2. Firestop system installed shall have been tested by either UL or Omega Point, including exposure to hose stream test and including for use with steel fluted deck floor assemblies.

3. Firestop system used shall allow for deflection of floor above.

C. Penetrations

1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.

2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.

3. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall of opening.

D. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.4 INSTALLING THROUGH PENETRATION FIRESTOPS

A. General: Comply with the through penetrations firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 INSTALLING FIRESAFING INSULATION

A. Install fire safing insulation utilizing welded or screw applied galvanized steel impaling pins and retaining clips; space clips or pins 24" o.c. maximum.

B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/floor edges, depth of insulation top to bottom shall be at least four (4) inches.

C. Cover top of all safing insulation with firestop sealant or spray.

3.7 FIELD QUALITY CONTROL

A. Inspecting agency employed and paid by the Owner will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor, Owner and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, Contractor must repair or replace firestopping so that it complies with requirements.

3.8 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which openings and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to product firestopping complying with specified requirements.

END OF SECTION

SECTION 079200

JOINT SEALERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the joint sealers work as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Flashing reglets and retainers.

2. Coping joints.

3. Exterior wall joints not specified to be sealed in other Sections of work.

4. Interior wall joints not specified to be sealed in other Sections of work, including caulking to fill between architectural woodwork and any wall, floor and/or ceiling imperfections.

5. Control and expansion joints in walls.

6. Joints at wall penetrations.

7. Joints between items of equipment and other construction.

8. All other joints required to be sealed to provide a positive barrier against penetration of air and moisture.

1.3 RELATED SECTIONS

A. Roofing - Division 7.

B. Firestop sealants – Section 078413.

C. Glazing sealants - Section 088010.

D. Sealant within drywall construction - Section 092900.

E. Sealant at tile work - Section 093000.

1.4 QUALITY ASSURANCE

A. Qualification of Installers: Use only personnel who are thoroughly familiar, skilled and specially trained in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.

1.5 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.

1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.

B. Samples: Submit the following:

1. Color samples of sealants, submit physical samples (not color chart).

2. Sealant bond breaker and joint backing.

C. Product Data: Submit manufacturer's technical information and installation instructions for:

1. Sealant materials, indicating that material meets standards specified herein.

2. Backing rods.

D. Submit manufacturer's certification as required by Article 1.6 herein.

E. Submit results of testing required in Article 1.4 herein.

1.6 MANUFACTURER'S RESPONSIBILITY AND CERTIFICATION

A. Contractor shall require sealant manufacturer to review the Project joint conditions and details for this Section of the work. Contractor shall submit to the Architect written certification from the sealant manufacturer that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vaportight seals (as applicable), and that materials supplied meet specified performance requirements.

1.7 PRECONSTRUCTION COMPATIBILITY AND ADHESION TESTING (EXTERIOR WALL SEALANTS ONLY)

A. Submission: Prior to mockups and sample installations, submit samples of materials contacting or affecting exterior wall joint sealants to manufacturers for compatibility and adhesion testing.

B. General Requirements: Confirm compatibility and adhesion for all concealed and exposed sealant materials in contact with glazing, other sealants, flashings, metal framing, and shims before constructing and testing full-size mockups and sample installations.

C. Timing: Allow at least 3 months for testing and result analysis to avoid work delays.

D. Corrective Actions: Investigate failed materials and obtain written sealant manufacturer recommendations for remedies (e.g., primers, cleaners, curing conditions).

E. Definitions, Compatibility: Ability of sealants and substrates to contact each other without softening, staining, oil exudation, discoloration, or other adverse effects.

F. Definitions, Adhesion: Mechanical or chemical bonding ability between sealants and substrates at their interface.

G. Specimen Sizes and Shapes: As required by the manufacturer's testing laboratory, unless otherwise specified.

1.8 TESTS REQUIRED

A. Adhesion in Peel Testing, Test Methods:

1. ASTM C794, Adhesion and Peel of Elastomeric Joint Sealants, modified for project-specific substrates, reporting cohesive or adhesive failure mode. Test samples of sealants, flashings, and metal framing in contact with concealed and exposed sealants.

2. ASTM C1135, Determining Tensile Adhesion Properties of Structural Sealants, modified for project-specific substrates, excluding manufacturer-modified interpretations. Test samples of exterior structural glazing and metal framing with structural sealants under standard and project-specific environmental conditions (primed and unprimed). Sealant manufacturer's modified interpretations of ASTM C 1135 will not be permitted.

3. Report: Include testing date(s), project ID, test method, substrates, sealants, preparation details, results (failure type and force in pounds per linear inch), recommendations (primer optional if equal or better unprimed performance), and remarks (e.g., color changes, voids, blistering).

B. Compatibility Testing, Test Methods:

1. ASTM C1248, Staining of Porous Substances by Joint Sealants, modified for project-specific substrates. Test samples of sealants with concealed and exposed materials (primed and unprimed).

2. ASTM C1087, Determining Compatibility of Liquid Applied Sealants with Accessories Used in Structural Glazing Systems, modified for project-specific substrates, excluding manufacturer-modified interpretations. Test samples of dry glazing gaskets, spacers, shims, and setting blocks with structural sealants.

3. Report: Include testing date(s), project ID, test method, preparation details, sealant details (name, type, movement capability, batch number), substrates, equipment, curing conditions, test variations, observed effects (e.g., discoloration, adhesion failure, stain measurements), recommendations (primer optional if equal or better unprimed performance), and remarks (e.g., voids, bubbling).

1.9 PRECONSTRUCTION FIELD-ADHESION TESTING

A. Procedure: Before installing exposed exterior elastomeric sealants, test adhesion to joint substrates as follows:

B. Location: Test joints where indicated or as directed by the Architect, with the Architect and manufacturer's technical representative present.

C. Method: For each sealant and substrate type:

D. Install 60-inch-long test joints using final laboratory-recommended materials and methods; allow curing.

E. Make a cross cut and two 3-inch side cuts, marking 1 inch from the cross-cut end.

F. Pull the 3-inch sealant piece at 90 degrees for 10 seconds, then at 180 degrees for 10 seconds, extending to the manufacturer's recommended distance.

G. Repair joints per manufacturer recommendations.

H. Rejection: Sealants showing adhesive failure, insufficient elongation, or noncompliance with specified performance will be rejected by the Architect. Discontinue use of associated materials and notify the manufacturer and Architect immediately.

I. Report: Submit a written summary of each compatibility and adhesion test.

1.10 ENVIRONMENTAL CONDITIONS

A. Temperature: Install all work of this Section when air temperature is above forty (40) degrees F. and below eighty (80) degrees F., unless manufacturer submits written instructions permitting sealant use outside of this temperature range.

B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

1.11 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section, before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

C. Storage

1. Store sealant materials and equipment under conditions recommended by their manufacturer.

2. Do not use materials stored for a period of time exceeding the maximum recommended shelf life of the material.

3. Material shall be stored in unopened containers with manufacturers' name, batch number and date when shelf life expires.

1.12 WARRANTY

A. Special Installer's Warranty

1. Terms: The Installer shall provide a written warranty, signed by the Installer, to repair or replace elastomeric joint sealant work failing to maintain a weathertight system within the warranty period.

2. Period: 5 years from the date of Substantial Completion.

B. Special Manufacturer's Warranties

1. Terms: The elastomeric sealant manufacturer shall provide written warranties (covering weatherseal and stain resistance), signed by the manufacturer, to furnish sealants for repair or replacement of those failing to provide airtight and watertight joints, or failing in adhesion, cohesion, abrasion resistance, stain resistance, weather resistance, durability, or exhibiting unspecified deterioration within the warranty period.

2. Periods:

a. Silicone Sealants: 20 years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

A. Exterior Wall Sealant: Provide one (1) part non-sag sealant equal to "DOWSIL 790" or "DOWSIL 795" made by The Dow Chemical Company, "Silpruf SCS 2000" or "LM SCS 2700" made by G.E., "Spectrem 1" or "Spectrem 3" made by Tremco conforming to the minimum standards of ASTM C 920, Type S, Grade NS, Class 50.

B. Interior Sealant: Provide a one (1) part acrylic based sealant conforming to ASTM C 834, equal to "AC-20+ Silicone" made by Pecora, Masterseal NP 520 by BASF or equal made by Tremco.

C. Colors: Colors selected from manufacturer's standard selection.

2.2 MISCELLANEOUS MATERIALS

A. Back-Up Materials: Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, equal to "HBR" made by Nomaco Inc. or approved equal, twenty-five (25) percent wider than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Provide back-up materials only as recommended by sealant manufacturer in writing.

B. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.

C. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.

D. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.

E. Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached. Materials shall be used per manufacturer's printed instructions.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where joint sealers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with instructions and recommendations of the manufacturer and in accordance with ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.

B. Sample Section of Sealant

1. During sealant installation work in exterior wall, the manufacturer of sealant shall send their representative to the site, under whose supervision a section of the wall (used as "control section")

shall be completed for purposes of determining performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of control section.

2. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.

3. Accepted control section shall be standard to which all other sealant work must conform.

C. Supervision: The Contractor shall submit to the Architect written certification from the sealant manufacturer that the applicators have been instructed in the proper application of their materials. The Contractor shall use only skilled and experienced workmen for installation of sealant.

D. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. Neatly point or tool joint to provide the contour as indicated on the drawings.

E. Preparation and Application

1. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.

2. Stone, masonry and concrete surfaces to receive sealant shall be cleaned where necessary by grinding, water blast cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.

   a. Do not use any acid or other material which might stain surfaces.
   b. Remove laitance by grinding or mechanical abrading.
   c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil and water free, or vacuuming joints prior to application of primer or sealant.

3. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.

4. Do not seal joints until they are in compliance with drawings, or meet with the control section standard.

5. Joint Size and Sealant Size: Joints to receive sealant shall be at least 1/4" wide. In joint 1/4" to 3/8" wide, sealant shall be 1/4" deep. In joints wider than 3/8" and up to 1" wide, sealant depth shall be one half the joint width. For joints wider than 1", sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside face of joint to closest point of the filler.

6. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape prior to priming. Apply primer with clean brush and only when temperature is above 45 deg. F.

7. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape

for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately twenty-five (25) percent compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.

8. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to the sides of the joint and not backing.

9. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.

10. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C 1193. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.

11. Replace sealant which is damaged during construction process.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

   a. Perform 5 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 5,000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION

SECTION 081113

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the steel doors and frames work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Interior hollow metal doors and frames for fire-rated and unrated door openings.
2. Trimmed openings.
3. Interior hollow metal vision panels.
4. Preparation of metal doors and frames to receive finish hardware, including reinforcements, drilling and tapping necessary.
5. Preparation of hollow metal doors to receive glazing where required.
6. Steel louvers for hollow metal doors.
7. Furnishing anchors for building into masonry and drywall.
8. Factory prime painting of work of this Section.

1.3 RELATED SECTIONS

A. Installation of doors and frames - Section 062000.

B. Wood Doors - Section 081416.

C. Finish Hardware - Section 087100.

D. Glass and Glazing - Section 088010.

E. Gypsum Drywall - Section 092900.

F. Painting and Finishing - Section 099000.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, compliance with standards referenced herein, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

1. Coordinate glazing frames and stops with glass and glazing requirements.

D. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.

D. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40" or less above the sill.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.

3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating as required by prevailing Building Code in 30 minutes of fire exposure.

E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

F. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

G. Fire rated assemblies must have UL approved label.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.

B. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames under cover at building site. Conform to the requirements of ANSI/SDI A250.11 for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 PRODUCTS

2.1 FABRICATION - GENERAL

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.

B. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

C. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."

D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

2.2 MANUFACTURERS

A. Provide products manufactured by Steelcraft, Curries, Ceco Door Products, Fleming, Pioneer or approved equal meeting these specifications.

2.3 FRAMES

A. Materials

1. Frames for interior openings shall be either commercial grade cold-rolled steel conforming to ASTM A 1008, Type B or commercial grade hot-rolled steel conforming to ASTM A 1011, Commercial Steel, Type B. Metal thickness shall be not less than sixteen (16) ga. for frames in openings 4'-0" or less in width; not less than fourteen (14) ga. for frames in openings over 4'-0" in width.

B. Design and Construction

1. All frames shall be welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Knock-down frames are not permitted.

2. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16” positive thermal break and integral vinyl weatherstripping.

3. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.

4. Jamb depths, trim, profile and backbends shall be as shown on drawings.

    a. Frames at drywall partitions shall be formed with double return backbends to prevent cutting into drywall surface.

5. Welded frames shall have corners mitered and reinforced and faces of welded frames shall be continuously back welded full depth and width of frame conforming to NAAMM Standard HMMA-820; face joints shall be hairline.

6. Minimum depth of stops shall be 5/8". Cut-off (Sanitary or hospital type) stops, where scheduled, shall be capped at forty-five (45) degrees at heights shown on drawings, and all jamb joints below cut-off stops shall be ground and filed smooth, making them imperceptible. Do not cut off stops on frames for soundproof, light proof or lead-lined doors.

7. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.

    a. Mullions shall have 16 ga. internal steel stiffeners welded not less than 4" o.c.

8. Hardware Reinforcements

    a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully-templated mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates.

    b. Minimum thickness of hardware reinforcing plates shall be as follows (contractor shall provide larger and thicker plates as required to accommodate weight of door):
        1). Hinge and pivot reinforcements - seven (7) ga., 1-1/4" x 10" minimum size.
        2). Strike reinforcements - twelve (12) gauge.
        3). Flush bolt reinforcements - twelve (12) gauge.
        4). Closer reinforcements - twelve (12) gauge.
        5). Reinforcements for surface mounted hardware - twelve (12) gauge.

9. Floor Anchors

    a. Provide adjustable floor anchors, providing not less than two (2) inch height adjustment.
    b. Minimum thickness of floor anchors shall be fourteen (14) gauge.

10. Jamb Anchors

a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the wire type. Anchors shall be not less than 0.156" diameter steel wire. The number of anchors provided on each jamb shall be as follows:
   1). Frames up to 7'-6" height - three (3) anchors.
   2). Frames 7'-6" to 8'-0" height - four (4) anchors.
   3). Frames over 8'-0" height - one (1) anchor for each 2'-0" or fraction thereof in height.

b. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb as follows:
   1). Frames up to 7'-6" height - four (4) anchors.
   2). Frames 7'-6" to 8'-0" height - five (5) anchors.
   3). Frames over 8'-0" height - five (5) anchors plus one additional for each 2'-0" or fraction thereof over 8'-0".

c. Frames to be anchored to previously placed concrete or masonry shall be provided with minimum 3/8" concealed bolts set into expansion shields or inserts at six (6) inches from top and bottom and twenty-four (24) inches o.c. Reinforce frames at anchor locations with sixteen (16) gauge sheet steel stiffeners welded to frame at each anchor.

11. Anchors in exterior frames and in masonry walls shall be hot dip galvanized per ASTM A 153.

12. Frames for installation in masonry wall openings more than 4'-0" in width shall have an angle or channel stiffener factory welded into the head. Such stiffeners shall be not less than twelve (12) gauge steel and not longer than the opening width and shall not be used as lintels or load bearing members.

13. Dust cover boxes (or mortar guards) of not thinner than twenty-six (26) gauge steel shall be provided at all hardware mortises on frames to be set in masonry or plaster partitions.

14. Ceiling Struts: Minimum 3/8" thick x 2" wide steel.

15. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.

16. Loose glazing stops shall be of cold rolled steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium-or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.

17. Except on weather-stripped frames, drill stops to receive three (3) silencers on strike jambs of single door frames and two (2) silencers on heads of double-door frames.

C. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth. Frames shall then be chemically treated to insure maximum paint adhesion and shall be coated on all surfaces with one coat of rust-inhibitive baked-on alkyd primer standard with the manufacturer which is fully cured before shipment to a dry film thickness of 2.0 mils.

1. Frames set in masonry walls shall be grouted in as described in Section 042000 "Unit Masonry." These frames shall have surfaces in contact with grout shop coated with epoxy coating equal to Series 27 FC Typoxy made by Tnemec or approved equal spray applied at 4 to 6 mils, passing NFPA 101, Class A for smoke and flame spread, tested per ASTM E 84.

2.4 HOLLOW METAL DOORS

A. Materials: Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A 1008, Commercial Steel, Type B and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than eighteen (18) gauge.

B. Design and Construction

1. All doors shall be of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".

2. All doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.

3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty-two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound deadened and thermal insulated the full height of the door with an inorganic non-combustible batt type material.

4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.

5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than fourteen (14) gauge, extending the full width of the door and spot welded to both faces.

6. Edge profiles shall be provided on both vertical edges of doors as follows:

   a. Single-acting swing doors - beveled 1/8" in two (2) inches.
   b. Double acting swing doors - rounded on 2-1/8" radius.
   c. No square edge doors permitted.

7. Hardware Reinforcements

   a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
   b. Minimum gauges for hardware reinforcing plates shall be as follows (contractor shall provide larger and thicker plates as required to accommodate weight of door):
      1). Hinge and pivot reinforcement - seven (7) gauge.
      2). Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers - twelve (12) gauge.
      3). Reinforcements for all other surface mounted hardware - sixteen (16) gauge.

8. Glass Moldings and Stops

   a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on drawings.

b. Fixed moldings shall be securely welded to the door on the security side.

c. Loose stops shall be not less than twenty (20) gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced eight (8) inches o.c. Snap-on attachments will not be permitted. Stops shall be flush with face of door.

9. Louvers shall be sixteen (16) gauge sheet steel, stationary type, closely spaced inverted "V" blade design, flush with face sheets of door, integral with and welded to door. Fifty (50) percent free area, unless indicated otherwise on drawings.

C. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall then be chemically treated to insure maximum paint adhesion and shall be coated, on all exposed surfaces, with manufacturer's standard rust-inhibitive alkyd primer as specified for frames which shall be fully cured before shipment.

D. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in any direction, including in a diagonal direction.

2.5 LABELED DOORS AND FRAMES

A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings as scheduled on drawings. Such doors and frames shall be labeled by Underwriters' Laboratories or other nationally recognized agency having a factory inspection service.

B. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.

2.6 HARDWARE LOCATIONS

A. The location of hardware on doors and frames shall be as noted in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" of the Door Hardware Institute unless otherwise required by prevailing Handicapped Codes.

2.7 CLEARANCES

A. Fabricate doors and frames to meet edge clearances as follows:

1. Jambs and Head: 1/8" plus or minus 1/16".

2. Meeting Edges, Pairs of Doors: 1/8" plus or minus 1/16".

3. Bottom: 3/4" if no threshold, 3/8" at threshold.

B. Fire rated doors shall have clearances as required by NFPA 80.

2.8 MANUFACTURING TOLERANCES

A. Manufacturing tolerance shall be maintained within the limits given in HMMA 841 of ANSI/NAAMM, current edition.

2.9 PREPARATION FOR FINISH HARDWARE

A. Prepare door and frames to receive hardware:

1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.

2. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

B. Provide reinforcements for both concealed and surface applied hardware:

1. Drill and tap mortise reinforcements at factory, using templates.

2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

2.10 REJECTION

A. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware or work of other trades, shall be removed and replaced with new at no cost.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where steel doors and frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Refer to Section 062000 for installation procedures for all work of this Section.

END OF SECTION

SECTION 081416

WOOD DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the wood doors as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Solid core flush wood doors.

2. Fire rated flush wood doors, all scheduled wood doors shall be fire rated.

1.3 RELATED SECTIONS

A. Installation of wood doors - Section 062000.

B. Hollow metal frames - Section 081113.

C. Finish hardware - Section 087100.

D. Glass and glazing – Section 088010.

E. Field painting – Section 099000.

1.4 SUBMITTALS

A. Product Data: Submit door manufacturer’s product data, specifications and installation instructions for each type of wood door.

1. Include details of core and edge construction and trim for openings.

2. Include factory finish specifications.

3. Include certifications to show compliance with specifications.

4. Include certification to show compliance with AWI and WDMA requirements specified herein.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for finishing and other pertinent data.

1. Include requirements for veneer matching.

C. Submit the following

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated"; latest edition "Premium" grade and WDMA “Extra Heavy Duty” Performance Level.

1. Only manufacturers that are certified and listed by AWI to be QCP qualified are acceptable for this project.

2. Provide letter of licensing for Project indicating that doors comply with requirements of grade specified.

C. Fire Rated Wood Doors: Doors complying with Category A, Positive Pressure or Neutral Pressure testing standards per UBC 7-2-1997 and UL 10-C (UBC 7-2-1994 and UL 10B) that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Door Schedule, based on testing according to NFPA 252.

1. Conform to prevailing Code requirements to determine which pressure standard (Positive or Neutral) is required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) in excess of permitted standard noted in Article 2.5 herein, or show telegraphing of core construction in face veneers.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

a. Solid Core Flush Wood Doors: Life of installation.

PART 2 PRODUCTS

2.1 SOLID CORE FLUSH WOOD DOORS (FOR REFERENCE, AS ALL WOOD DOORS ARE FIRE RATED)

A. Provide AWI PC-5 Premium Grade hot pressed 5-ply solid core particleboard doors, 1-3/4" thick, conforming to standards specified herein. Subject to meeting standards specified herein, the following manufacturers are acceptable: Masonite, VT Industries, Mohawk or approved equal.

1. Core shall consist of a formed flat panel consisting of wood particles bonded together with synthetic resins or other added binder, with an average density of 30 to 32 lbs. per cubic foot. The material shall meet or exceed the requirements of ANSI A208.1, Grade 1-LD-2 covering mat formed particleboard with face screw holding of 124 lbs., modulus of rupture of minimum 700 psi and modulus of elasticity of not less than 148,000 psi.

2. Core shall be capable of satisfying this WDMA TM-7 cycle slam test for 1 million slams for surface mounted hardware. Where the manufacturer's core does not meet this criteria, stiles and rails must measure a minimum of 5-1/2" and must be fabricated of hardwood.

a. Surface mounted hardware must be installed with minimum 1-1/4" screw penetrations using threaded to the head screws; coordinate with Section 087100.

B. Cross Bands: Shall be 1/16" thick hardwood extending full width of door and laid with grain at right angles to face veneers. Cross bands and faces shall be laminated to the core with Type I MF or PVA glue.

C. Stiles, Rails: Stile and rail shall be a minimum of 1-3/8" solid hardwood or structural composite lumber (after trimming) laminated to the core. Stiles and rails must be securely glued to the core with no voids allowed. Stiles and rails must be capable of screw holding of 550 lbs. per WDMA TM-10.

D. Vertical door edge must be capable of screw holding of 550 lbs. per WDMA TM-10; horizontal door edge must be capable of screw holding of 400 lbs. per WDMA TM-10.

E. Doors with transparent finish to have center balanced, slip matched, quarter sliced, Select Bleach Oak veneer. Veneer to conform to AWI, "AA" grade veneer with 3" wide leaf. Minimum veneer thickness shall be not less than 1/50" after sanding.

1. Veneers shall be continuous or end matched at transoms.

F. Doors shall have hinge loading capacity of 500 lbs. per WDMA TM-8.

G. Where glass lites are noted, factory cut openings. Trim openings with solid hardwood moldings of same type of wood as face veneer. Lite openings in 20 minute rated doors shall have manufacturer's 20 minute approved hardwood system.

H. Doors to be field painted shall have MDO face.

2.2 FIRE RATED WOOD DOORS ("B" LABEL) – ALL SCHEDULED WOOD DOORS SHALL BE FIRE RATED.

A. Provide mineral core 1-3/4” thick solid core wood doors conforming to standards specified herein, manufactured by one of the manufacturers noted above. Stile construction on both stiles shall conform to the following:

1. Stile edge screw withdrawals when tested in accordance with ASTM D 1037-78 shall exceed 650 lbs. This applies to both stiles.

2. Stile edge split resistance when tested in accordance with ASTM D 143-52 (78) Modified must exceed 950 lbs. This applies to both stiles.

B. Door to have face finish as specified above in Article 2.1.

1. Where the core is free of urea formaldehyde, provide a layer of veneer over the substrate prior to application of finish veneer to prevent telegraphing of patterns from the adhesive.

C. Blocking: For surface mounted hardware only, provide composite blocking designed to maintain fire resistance of door but with improved screw-holding capability of same thickness as core and with minimum dimensions as follows:

1. 5-inch top rail blocking.

2. 5-inch bottom rail blocking.

3. 1 – 5" x 18" lock block at cylinder or mortise locksets.

4. 2 – 5" x 18" lock blocks at exit devices.

D. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.3 SHOP FINISH

A. Transparent Finish: Finish in the shop with clear satin catalyzed polyurethane finish conforming to AWI System “Catalyzed Polyurethane Transparent”.

B. Opaque Finish: For doors to be field painted, shop prime on all surfaces with one coat of alkyd wood primer applied to a dry film thickness of 1.5 mils.

2.4 FABRICATION

A. Prefit and premachine wood doors at the factory.

B. Comply with the tolerance requirements specified herein. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.

D. Doors shall be factory sized to door opening so that trimming and fitting are not required in the field.

E. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances unless otherwise indicated.

1. Three degree bevel or bevel to suit frame sizes indicated, with 3/16" prefit in width, +0/-1/32" tolerances. Prefit top of door 1/8" + 1/16"/-0" and undercut as required by floor condition. Undercut shall not exceed 1/8" from bottom of door to top of finished floor; where threshold occurs undercut shall not exceed 1/8" from bottom of door to top of threshold.

2. Comply with requirements in NFPA 80 for fire-rated doors.

F. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3 unless otherwise noted. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2. Provide concealed intumescent seals at fire-rated pairs of doors meeting the requirements of U.L. 10 C.

G. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kinds of doors required.

2.5 SOURCE QUALITY CONTROL

A. Once installed, maximum allowable warp, bow, cut or twist in doors shall be 1/16" as measured by the 1/16 inch feeler gauge and a straight-edge extending from corner to corner of the door face at stiles, top and bottom rails and along both diagonals.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Section 062000 for installation of wood doors.

END OF SECTION

SECTION 083113

ACCESS DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the access doors as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Frameless recessed panel access doors at drywall ceilings and walls.

2. Access doors in Acoustibuilt ceiling.

3. Framed flush panel access doors at masonry and tile walls.

4. Provide access doors and frames for access from occupied spaces to the following, where indicated or required, and as directed by the trades of Divisions 23 and 26.

a. All shutoff or balancing valves.
b. Fire dampers, as required.
c. Points of duct access.
d. Pull boxes.
e. Controls of mechanical and electrical items.
f. Masonry shafts for pipes and conduits, as required.
g. Pipe spaces, if required.
h. Inlets of fans.
i. Fusible link and splitter damper at filter bank.
j. Automatic damper and motor.
k. Equipment not otherwise accessible.

1.3 RELATED SECTIONS

A. Drywall - Section 092900.

B. Ceramic tile - Section 093000.

C. Valves and connections - Division 23.

1.4 QUALITY ASSURANCE

A. For actual installation of the work of this Section, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the skills required.

B. Fire-Resistance Ratings: Wherever a fire-resistance classification is shown, or for construction where access doors are installed, provide required access door assembly with panel door, frame, hinge and latch from manufacturers listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for the rating shown.

1. Provide UL label on each access panel.

2. Provide flush, key operated cylinder lock.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

1.5 SUBMITTALS

A. Before any materials of this Section are delivered to the job site, submit complete manufacturer's literature to the Architect. Submit plans and schedules showing size and location of each and every access door for Architect's acceptance prior to installation.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Provide access door assembly manufactured by Milcor Inc, or equal made by Nystrom Inc., Karp Associates, Inc. or approved equal. Assembly shall be an integral unit complete with all parts and ready for installation.

B. Acoustibuilt Seamless Ceiling Access Panel: Castworks GFRG Access Panel as manufactured by Armstrong World Industries or approved equal.

C. Fabricate units of continuous welded steel construction. Grind welds smooth and flush with adjacent surfaces. Provide attachment devices and fasteners of the type required to secure access panels to the types of supports shown.

D. Frames for Masonry and Tile Wall Only (Flush Panel Units)

1. Fabricate frame from sixteen (16) gauge steel. Provide frame with exposed flange not less than one (1) inch wide around perimeter of frame for the following construction:

a. Exposed masonry.
b. Tile finish.

2. For installation in masonry construction, provide frames with adjustable metal masonry anchors.

E. Frameless Units for Drywall Surfaces (Recessed Panel Units): Provide access doors without exposed frames for drywall adhered to recessed panel.

F. Panels: Fabricate from fourteen (14) gauge steel, with concealed spring hinges set to open to 175 degrees. Provide removable pin type hinges of the quantity required to support the access panel sizes used in the work. Finish with manufacturer's factory applied baked enamel prime coat applied over phosphate protective coating on steel.

G. Locking Devices

1. For non-rated access doors, provide flush, screwdriver operated cam locks of number required to hold door in flush, smooth plane when closed.

2. For fire rated doors, provide locks as described in paragraph 1.04, B. herein.

H. Inserts and Anchorage: Furnish inserts and anchoring devices which must be built into masonry for the installation of access panels. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where access doors are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 COORDINATION

A. Coordinate all work with the mechanical trades to insure proper locations and in a timely manner to permit orderly progress of the total work.

B. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

D. Remove and replace panels or frames which are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 087100

FINISH HARDWARE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

B. The required hardware items for doors are indicated in hardware sets shown herein. Should any opening be omitted, the contractor shall contact the Architect for the correct hardware.

1.2 RELATED WORK

A. Installation of finish hardware – Section 062000

B. Steel doors and frames – Section 081113

C. Wood doors – Section 081416

D. Painting & Finishing – Section 099000

1.3 SUBMITTALS

A. General: Submit the following in accordance with the provisions of the general contract documents.

B. Hardware Schedule: Submit three (3) copies of the hardware schedule. Follow Door and Hardware Institute (DHI) guide lines for scheduling. At the beginning of the schedule furnish an index, which list each door number with appropriate heading number and hardware set number. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other work. Furnish final schedule after samples, manufacturer's data sheets have been approved. HORIZONTAL SCHEDULES WILL NOT BE ACCEPTED.

C. Product Data: Submit three (3) copies of the manufacturer's data for each item of hardware. Include whatever information may be necessary to show compliance with requirements. Submission shall clearly identify item submitted. Facsimile documents or copies of facsimile documents will not be accepted.

D. Keying Schedule: A key schedule showing all key numbers and spaces to which each permits entry, shall be provided. Consult with OWNER and provide necessary assistance required for development of the schedule before submitting final key schedule. After final approval has been received, the schedule along with the key gathering envelopes containing keys for each lock endorsed with lock number and space designation shall be turned over to the OWNERS.

E. Samples: Prior to submittal of the final hardware schedule and prior to delivery of hardware, submit one (1) sample of each exposed hardware unit. Sample will be reviewed by the ARCHITECT for design,

color and texture only. Compliance with other requirements is the exclusive responsibility of the CONTRACTOR. Samples approved by the ARCHITECT shall be turned over to the OWNER for attic stock.

F. Wiring Diagrams: Supplier shall furnish riser diagrams, wiring diagrams and point to point diagrams for all electrical hardware specified herein. These diagrams shall be included with the initial draft of the hardware schedule.

1.4 QUALITY ASSURANCE

A. Standards: All finish hardware shall conform to all of the following standards:

1. Testing Laboratories: Underwriters Laboratory (UL) and or Warnock Hersey Fire Laboratories Division: All fire rated doors shall have hardware assemblies approved by one of the listed laboratories. Panic hardware UL Listed only.

2. National Fire Protection Association: NFPA 80 and NFPA 101.

3. Builders Hardware Manufacturers Association (BHMA).

4. American National Standards Institute (ANSI).

5. American Disabilities Act (ADA).

C. Supplier: Finish hardware shall be furnished by those having a minimum of 5 years of builders hardware experience and shall have in their employ at least one AHC to interpret plans, detailed drawings and specifications.

1.5 PRODUCT HANDLING

A. Handle, store, distribute, protect and install in accordance with the manufacturers instructions. Deliver packaged material in original containers with seals unbroken and labels intact. Deliver assemblies completely identified and with adequate protection for storage, handling and installation.

B. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control the handling and installation of hardware which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses; both before and after installation.

1.6 PROJECT CONDITIONS

A. Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated and as necessary for proper installation and function. Deliver packaged hardware items to the proper locations for installation.

B. Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware.

1.7 WARRANTIES

A. The hardware manufacturers shall provide full replacement warranty as listed below. Replacement warranty shall not include any labor cost.

1.	Surface Closers	25 years.
2.	Locksets etc.	10 years
3.	Exit Devices	3 years
4.	Balance of hardware	1 year

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Hand of Door: The drawings show the swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door swing shown. Approval of the door and door hardware schedule does not relieve the contractor of the responsibility of providing the correctly handed door.

B. Base Metals: Produce hardware units of the basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness but in no case of lesser quality material.

C. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware, which has been prepared for self-tapping sheet metal screws.

D. Screws: Furnish screws for installation, with each hardware item. Finish exposed screws to match the hardware finish.

E. Tools for Maintenance: Furnish a complete set of specialized tools as needed, for the OWNERS continued maintenance, removal and replacement of hardware.

F. Concealed Fasteners: Provide concealed fasteners for hardware units which are exposed when the door is closed except to the extent no standard manufacturer's units are available with concealed fasteners. Use thru bolts only where necessary to adequately fasten hardware to the door.

2.2 HINGES

A. All hinges shall be full mortise five knuckle ball bearing type, template, with non-rising loose pins. All outswing doors shall have non-removable pins (NRP).

B. All hinges for 1-3/4" thick doors shall be 4-1/2" wide in the open position. For other thickness doors, and trim projections, hinges shall be of a width to permit unobstructed swing of the doors.

C. Size and weight of hinges shall conform to the following:

Up to 36" ----------4-1/2" Standard Weight
Over 36" to 43" ----------5" Heavy Weight
Over 43” ---------- Continuous Hinge PBB CG31

D. Quantity of hinges shall be provided to conform to the following:

Doors up to 60" in height ----------2 hinges
Doors 60" to 90" in height ----------3 hinges
Doors 90" and over ---------l hinge every 30" in height

E. All hinges shall be the products of one manufacturer.

2.3 LOCKSETS, LATCHSETS ETC.

A. Unless otherwise noted, all locksets and latchsets shall be heavy duty mortise type, and shall have the following features:

1. Curved lip strikes with proper lip lengths as required.
2. Wrought steel box strike.
3. Auxiliary deadlatching.

2.4 KEYS, KEYING AND CYLINDERS

A. Keys: All keys shall be nickel silver. Furnish a quantity of keys as follows.

1.	Master Keys	6 each per group
2.	Change Keys	3 each per cylinder
3.	Control Keys	3
4.	Construction Keys	3

B. Keying: All locks shall be construction keyed and great grand master keyed to the existing 6 pin Corbin Russwin grand master key system. The hardware supplier shall meet with the Owner to establish the keying requirements. All master keys shall be hand delivered to the Owner by the manufacturer or his representative.

C. Cylinders: All cylinders shall be furnished with visual key control.

2.5 DOOR CLOSING DEVICES

A. All door closers shall meet ANSI A156.4 Grade 1 requirements. All closers shall be barrier free. Furnish all required brackets, filler plates and any others items required to insure proper installation and operation.

B. All closers shall be installed so that closer bodies are positioned on room side of doors to and from corridors, i.e., in-swing doors shall be regular arm. Out-swing doors shall have a parallel arm. Regular arm shall be used in connecting doors between rooms.

PART 3 - EXECUTION

3.1 GENERAL

A. Approval: As soon as practical after award of Contract and before a hardware schedule is prepared, and before any hardware is ordered or delivered to the project, the CONTRACTOR shall submit to the ARCHITECT for his written approval, copies of sample list, listing each of the different items of builders hardware and catalog cuts of each item.

B. Templates: As soon as the hardware schedule is approved the hardware supplier shall furnish to the various fabricators, required templates for fabrication purposes. Templates shall be made available not more than (10) days after receipt of the approved hardware schedule.

C. Packaging and Marking: All hardware shall be shipped with proper fastenings for secure application. Each package of hardware shall be legibly marked indicating the part of the work for which it is intended. Markings shall correspond with the item numbers shown on the approved hardware schedule. Keys shall be tagged within each package set and plainly marked on the face of the envelope with the key control number, door designation and all identification as necessary.

D. Delivery: Delivery shall be made to the project site to the attention of the GENERAL CONTRACTOR. Where delivery of special hardware is required at any fabricator's plant, the hardware supplier shall make such delivery.

3.2 INSTALLATION

A. Mount hardware units at heights noted in design drawings. Otherwise mount heights as recommended in "Recommended Locations for Builders Hardware" by BHMA.

B. Install each hardware unit in compliance with the manufacturer's recommendations.

3.3 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer. Replace units that cannot be adjusted.

B. Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance make a final check, and adjust all hardware items in such space or area. Adjust door control devices and compensate for final operation of heating and ventilating equipment.

C. Instruct OWNERS personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.4 HARDWARE SETS

A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards or practices, or to meet state and local codes or proper door operation shall be furnished whether or not specifically called out in the following listed groups.

B. Products shall be furnished as specified. Substitutions will not be permitted.

HARDWARE SET #1
Each to have:

	Hinges	Stanley (see description) x 619
1	Storeroom Lock	Corbin ML2057 x 114X x 619
1	Temporary Core	Corbin (to suit)
1	Permanent Core	Corbin (to match building standard) x US26D

1	Surface Closer w/stop	LCN 4040XP-Cush x 689
1	Set Smoke Seals	NGP 5050C @ jambs & head

HARDWARE SET #2
Each to have:

	Hinges	Stanley (see description) x 619
1	Privacy Lock	Corbin ML2060-V50 x 114X x 619
1	Temporary Core	Corbin (to suit)
1	Permanent Core	Corbin (to match building standard) x US26D
1	Surface Closer w/stop	LCN 4040XP-Cush x 689
1	Set Smoke seals	NGP 5050C @ jambs & head

HARDWARE SET #3
Each to have:

	Hinges	Stanley (see description) x 619
1	Passage Set	Corbin ML2010 x 114X x 619
1	Surface Closer w/stop	LCN 4040XP-Cush x 689
1	Set Smoke Seals	NGP 5050C @ jambs & head

HARDWARE SET #4
Each to have:

	Hinges	Stanley (see description) x 619
1	Power Transfer	Securitron CEPT10 x US32D
1	Set Automatic Flush Bolts	Burns 7842 x US26D
1	Dust Proof Strike	Burns 545 x US32D
1	Electric Lock	Corbin ML20906-M92 x SEC x 114X x 619
1	Temporary Core	Corbin (to suit)
1	Permanent Core	Corbin (to match building standard) x US26D
1	Coordinating Closer	Dorma TS9315GSR/PT x 689
1	Overhead Stop	Dorma 912S x US26D
1	Set Smoke Seals	NGP 5050C @ jambs & head
1	Set Astragal Seals	NGP 172NA
2	Door Contacts	(9byy security vendor)
1	Card Access System	(by security vendor)

HARDWARE SET #5
Each to have:

	Hinges	Stanley (see description) x 619
1	Power Transfer	Securitron CEPT10 x US32D
1	Electric Lock	Corbin ML20906 x SEC x 114X x 619
1	Temporary Core	Corbin (to suit)
1	Permanent Core	Corbin (to match building standard) x US26D
1	Surface Closer w/stop	LCN 4040XP-Cush x 689
1	Set Smoke Seals	NGP 5050C @ jambs & head
1	Door Contact	(9byy security vendor)
1	Card Access System	(by security vendor)

HARDWARE SET #6
Each to have:

	Hinges	Stanley (see description) x 619
2	Exit Devices	Corbin ED5200A x 114-910 x 619
2	Surface Closer w/stop	LCN 4040XP-Cush x 689
2	Set Smoke Seals	NGP 5050C @ jambs & head

HARDWARE SET #7
Each to have:

	Hinges	Stanley (see description) x 619
1	Office Lock	Corbin ML2053 x 114X x 619
1	Temporary Core	Corbin (to suit)
1	Permanent Core	Corbin (to match building standard) x US26D
1	Surface Closer w/stop	LCN 4040XP-Cush x 689
1	Set Smoke Seals	NGP 5050C @ jambs & head

END OF SECTION

SECTION 088010

INTERIOR GLASS AND GLAZING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the glass and glazing as shown on the drawings and/or specified herein, including but not limited to glazing of the following:

1. Interior Borrowed Lites.

2. Interior mirrors, frameless.

1.3 RELATED SECTIONS

A. Hollow metal doors and frames - Section 081113.

B. Wood Doors – Section 081416.

C. Framed mirrors - Section 102800.

1.4 REFERENCES

A. Comply with the recommendations of the following references unless more stringent requirements are indicated herein.

1. FGMA Publications: FGMA Glazing Manual.

2. AAMA Publications: AAMA TIR-A7 Sloped Glazing Guidelines and Glass Design for Sloped Glazing.

3. LSGA Publications: LSGA Design Guide.

4. SIGMA Publications: TM-3000 Vertical Glazing Guidelines and TB-3001 Sloped Glazing Guidelines.

5. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201.

6. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E l52, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

7. Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested per ASTM E 163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

8. 16 CFR 1201, Safety Standards for Architectural Glazing, Sealed Insulating Glass Manufacturing Association.

9. ASTM C 920, Elastomeric Joint Sealant.

10. SAFETY ANSI Z97.1.

11. Fire Resistant ASTM E 152.

1.5 PERFORMANCE REQUIREMENTS

A. Glass Design: Glass thicknesses indicated on drawings and/or specified herein are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed Code.

1. Maximum Lateral Deflection: For glass supported on all four edges, provide thickness required that limits center deflection at design pressure to 1/100 times the short side length or 0.75", whichever is less.

B. Glass units shall be annealed, heat strengthened, fully tempered or laminated where required to meet wind and/or snow loads and safety glazing requirements, as shown, specified or recommended by the glass fabricator and as required by the prevailing Building Code.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, glazing instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements, including performance requirements.

B. Submit compatibility and adhesion test reports from sealant manufacturer indicating materials were tested for compatibility and adhesion with glazing sealant, as well as other glazing materials including insulation units.

C. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials; all samples shall bear the name of the manufacturer, brand name, thickness, and quality.

D. Warranties: Provide written warranties as specified herein.

1.7 QUALITY ASSURANCE

A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of five years experience in type of work required by this Section and which is acceptable to manufacturers of primary materials; and with a successful record of in-service installations similar in size and scope to this Project.

C. Glass Thickness: Glass thicknesses shown on drawings and/or specified herein are minimum thicknesses. Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."

2. IGMA Publications: IGMA TM-3000, "Vertical Glazing Guidelines for Sealed Insulating Glass Units."

E. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

F. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

H. Manufacturer shall be ISO 9001-2000 Certified.

I. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies

1.8 TESTS

A. Preconstruction Sealant Test: Submit samples of materials to be used to glazing sealant manufacturer to determine sealant compatibility. Include samples of glass, gaskets, glazing materials, framing members, and other components and accessories of glazing work. Test in accordance with ASTM C 794 to verify what type of primers (if any) are required to ensure sealant adhesion to substrates.

1. Submit minimum of nine pieces of each type and finish of framing member, and nine pieces of each type, class, kind, condition, and form of glass, including monolithic, laminated, and insulating glass for adhesion tests.

2. Provide manufacturer's written report and recommendations regarding proper installation.

1.9 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within limits established by manufacturers of materials and products used.

B. Temperature Limits: Install sealants only when temperatures are within limits recommended by sealant manufacturer, except, never install sealants when temperatures are below 40 deg. F.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and GANA Manual.

1. Protect materials from moisture, sunlight, excess heat, sparks and flame.

2. Sequence deliveries to avoid delays, but minimize on-site storage.

1.11 WARRANTIES

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Manufacturer's Special Project Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, within specified warranty period indicated below, replacements for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking or deterioration in metallic coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than five (5) years after date of substantial completion.

C. Manufacturer’s Special Project Warranty on Laminated Glass: Manufacturer’s standard form, made out to Owner and signed by laminated glass manufacturer agreeing to replace laminated glass units that deteriorate as defined in “Definitions” Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty period five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 GLASS MATERIALS AND PRODUCTS (ALL GLASS SHALL BE LOW IRON)

A. Clear Float Glass: ASTM C 1036, Type I (Transparent, Flat), Class 1 (Clear), Quality q3, minimum 1/4" thick.

B. Clear Tempered Glass: ASTM C 1048, Condition A (Uncoated), Type I (Transparent, Flat), Class 1 (Clear), Quality q3, Kind FT, minimum 1/4" thick. Tempered glass must be certified by SGCC to meet applicable standards. Tempered glass shall also conform to the following:

1. Length and Width: For 2.9 mm to 6.0 mm; +/-1.6 mm.

2. Diagonal: +/- 3.0 mm.

3. Edgework: Belt seaming or diamond wheels. 1.5 mm seam of upper and lower glass edges. No sharp edges.

4. Corners: No more than 3.0 mm from square.

5. Float Glass Defects: Must meet the requirements of ASTM C 1036. The most common defects are scratches, stones gaseous bubbles and edge chips. Tables in the glass standards have limits for size/quantity of defects.

6. Tempered glass shall have a minimum surface compression of 10,000 psi.

7. Tempered glass to be heat-treated by horizontal (roller hearth) process with inherent roller-wave distortion parallel to the bottom edge of the glass when installed.

8. Flatness Tolerances

   a. Roller-Wave or Ripple: The deviation from flatness at any peak shall be targeted not exceed 0.003” as measured per peak to valley for 1/4” (6mm) thick glass.
   b. Bow and Warp: The bow and warp tolerances shall not exceed 1/32” per linear foot.
   c. Fully tempered glass shall be heat soaked to EN 14179-1:2005-European Heat Soaking Standard.

C. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer conform to ASTM C 1172, and as follows:

1. Interlayer Color: Clear.

2. Interlayer Material: Provide Sentry Glass Plus by Dupont, Kuraray America, 0.030" thick at vertical applications, and 0.060" thick at sloped or horizontal applications.

3. Minimum thickness of 1/4".

D. Fire-Rated Glazing: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

1. Basis of Design: Subject to compliance with requirements, provide McGrory Glass, Inc; Pyrobel fire rated glass or comparable product by Pilkington North America.

E. Frameless Mirrors: 1/4", Quality q2, clear float glass with silver, copper, and organic coating and as follows:

1. Edges: Uniformly ground and polished.

2.2 GLAZING MATERIALS AND PRODUCTS

A. General: Provide sealants and gaskets with performance characteristics suitable for applications indicated. Ensure compatibility of glazing sealants with insulating glass sealants, with laminated glass interlayers, and with any other surfaces in contact.

B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A hardness of 50.

C. Backer Rod: Closed cell non-gassing polyethylene rod with rod diameter 25% wider than joint width.

D. Dense Elastomeric Compression Seal Gaskets: Provide molded or extruded neoprene or EPDM gaskets, Shore A hardness of 75±5 for hollow profile, and 60±5 for solid profiles, ASTM C 864.

E. Cellular, Elastomeric Preformed Gaskets: Provide extruded or molded closed cell, integral-skinned neoprene, Shore A 40±5, and 20% to 35% compression, ASTM C 509; Type II.

F. Preformed Glazing Tape: Provide solvent-free butyl-polyisobutylene rubber with 100% solids content complying with ASTM C1281 AAMA A 800 with integral continuous EPDM shim. Provide preformed glazing tape in extruded tape form.

G. Setting Blocks: Provide 100% or silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants. Length to be not less than 4". Width for setting blocks to be 1/16" more than glass thickness and high enough to provide the lite recommended by glass manufacturer. When thickness of setting block exceeds 3/4" the glass manufacturer must be consulted for sizes and configuration. In a vented system, setting block shall be designed so as to not restrict the flow of water within the glazing rabbet to the weep holes.

1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.

2. Structural Silicone Glazing: Provide silicone setting blocks where structural silicone occurs at sills and at insulating units with silicone edge seals.

H. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55±5.

I. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.

J. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.

K. Mirror Adhesive: Palmer's "Mirro-Mastic"; mastic must be compatible with mirror backing.

1. Clips: No. 4 finish Type 304 stainless steel.

2.3 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

C. Grind smooth and polish exposed glass edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Presence and functioning of weep system.

3. Minimum required face or edge clearances.

4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GENERAL GLAZING STANDARDS

A. Install products using the recommendations from the manufacturer of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in the “GANA Glazing Manual”.

B. Install glass in prepared glazing channels and other framing members.

C. Install setting blocks in rabbets as recommended by referenced glazing standards in GANA Glazing Manual” and “IGMA Glazing Guidelines”.

D. Provide bite on glass, minimum edge and face clearances and glazing material tolerances recommended by “GANA Glazing Manual”.

E. Provide weep system as recommended by “GANA Glazing Manual”.

F. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

G. Distribute the weight of glass unit along the edge rather than the corner.

H. Comply with manufacturers and referenced industry standards on expansion joint and anchors; accommodating thermal movement; glass openings; use of setting blocks, edge, face, and bite clearances; use of glass spacers; edge blocks and installation of weep systems.

I. Protect glass edge damage during handling and installation.

J. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing or plaster.

K. Remove and replace glass that is broken, chipped cracked or damaged in any way.

3.4 GLAZING

A. Glazing channel dimensions, as indicated on Shop Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead. Install setting blocks at the one greater points of each lite along the horizontal mullion.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

K. Flush Glazing

1. If the butt joint in the metal framing is in the vertical direction, the glazier shall run the tape initially on the head and sill members going directly over this joint. Should the butt joint in the metal framing run horizontally, tapes must first be applied to the jambs so that it crosses over the joint.

2. Each tape section shall butt the adjoining tape and be united with a tool to eliminate any opening.

3. Do not overlap the adjoining length of tape or rubber shim as this will prevent full contact around the perimeter of glass.

L. Off-Set Glazing

1. Where the glazing legs are off-set, the difference in the rabbet width shall be compensated by employing different glazing tapes with different diameter shims. The difference in shim shall be equal to the size of the off-set. The thinner tape shall be positioned first on the glazing leg closest to the interior. The thicker tape shall be cut to the exact length of the dimension between the applied tapes, and installed on the outermost glazing leg.

2. Immediately prior to setting glass, paper backing shall be removed. Apply a toe bead of sealant 6" in each direction, from each corner.

3. Locate setting blocks in the sill member at quarter points, or if necessary to within 6" of each corner. Setting blocks must be set equal distance from center line of the glass and high enough to provide the recommended bite and edge clearances.

4. Set edge block according to glass manufacturer’s recommendations.

5. Set Glass: The glass shall be pressed firmly against the tape to achieve full contact.

6. In a vented system, apply a heel bead (air seal) of sealant around the perimeter of glass, between the sole of the I.G. unit and the base of the rabbet of the metal framing developing a positive bond to the unit and to the metal framing. The bead of the sealant shall be deep enough so that it will partially fill the channel to a depth of 1/4" between the glass edge and the base of the metal framing rabbet.

7. Interior stops shall be set, and glazing tape spline for the appropriate face clearance shall be rolled into place, compressing the glass to the shim within the glazing tape.

3.5 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant as recommended by glass manufacturer or glass frame manufacturer.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape where noted on approved shop drawings.

3.6 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

1. Exterior glazing gasket shall be set a minimum of 1/8” below exterior glazing stop to create a channel for sealant installation.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.8 FRAMELESS MIRRORS

A. Apply mastic to back of mirror "pats" spaced 4 pats/sq. ft.; adjust mirror so that it is plumb and in place to avoid distortion of reflecting images. Allow 1/8" space between back of mirror and wall surface.

1. Apply "pats" using Palmer Electric Applicator.

B. Apply stainless steel clips at mirror top and bottom; securely clip to substrate using non-corrosive anchors. At drywall back-up anchors must be secured to studs or steel wallplate spanning from stud to stud.

3.9 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

F. Glass to be cleaned according to:

1. GANA Glass Informational Bulletin GANA 01-0300 – “Proper Procedure for Cleaning Architectural Glass Products”.

2. GANA Glass Informational Bulletin GANA TD-02-0402 – “Heat Treated Glass Surfaces are Different”.

G. Do not use razor blades, scrapers or metal tools to clean glass.

END OF SECTION

SECTION 090140

MAINTENANCE OF EXTERIOR STUCCO

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the exterior stucco restoration as shown on the drawings and/or specified herein, including but not limited to, the following:

1. A thorough inspection of all existing stucco surfaces in cooperation with the Architect to verify the full scope of restoration and re-construction work required. The Contractor shall provide appropriate access to all stucco surfaces along with all necessary equipment and labor to sound all stucco surfaces and make probes in existing stucco assemblies as required for full inspection and analysis of existing materials, connections and supports, etc. The Contractor shall be responsible for temporary protection to maintain weather tightness of inspected areas until the restoration work is complete.

2. Removal and repair of all damaged and delaminated stucco material.

3. Removal of paint from stucco surfaces.

4. Repair of cracks in otherwise sound stucco surfaces by routing out and filling with approved compound.

B. Provide all supervision, labor, materials, equipment and services required for stucco restoration and related work, as indicated on Drawings, as specified in this Section, and as may be required by conditions and authorities.

C. The specific intent of this Section is to provide for restoration of stucco surfaces to sound condition and original appearance through repairs, patching, replacement, and stabilization. All work required to achieve this objective shall be included.

1.3 QUALITY ASSURANCE

A. Restoration Specialist: The Subcontractor that performs the stucco restoration work shall be regularly engaged in the restoration of stucco on historic buildings. The Subcontractor shall demonstrate to the satisfaction of the Architect that he has successfully performed and completed in a timely manner at least 10 projects similar in scope and type to the required work within the past 5 years. The subcontracting of any work included in this Section, except for that accepted by the Architect in writing prior to award of the Contract, is specifically prohibited.

B. Source of Materials: Obtain materials for stucco restoration from a single source for each type of material required to ensure a match in quality, color, and texture.

C. Field Supervised Construction: Notify the Architect before beginning stucco restoration work. Obtain Architect's approval of restored and new stucco mock-ups before proceeding with the Work.

D. Allowable Tolerances: All new stucco repairs shall be feathered to exactly match (in texture and profile) and continue existing edges and contours of stucco walls and surfaces. Repairs shall be true and flat in connection with adjacent stucco when checked with an 8'-0" straight edge. Visual irregularities shall be corrected in all cases. Ridges, ledges and irregularities in the work shall be cause for work to be rejected by Architect. Remove rejected work and provide new stuccowork complying with requirements of this Section at no additional cost to the Government. Do not exceed 1/8" in 8'-0" for bow or warp of surface or for plumb or level.

E. Coordinate stucco work with work of other sections to ensure proper completion of the Work.

1.4 SUBMITTALS

A. Qualification Data: Submit qualification data for firm and personnel specified in "Quality Assurance" Article that demonstrates that both firm and personnel have capabilities and experience complying with the requirements specified. For firm and foreman, provide a list of least 3 completed projects similar in size and scope to the work required on this project. This information shall be submitted with the bid.

B. Program of Work: Submit a written program for each phase of the stucco restoration work.

1. Include detailed description of materials and methods to be used for each type of stucco restoration work.

2. If alternate methods and materials to those specified are proposed for any phase of stucco restoration work, provide written description. Provide evidence of successful use on comparable projects and demonstrate effectiveness for use on this project.

C. Product Literature: Submit manufacturer's published technical data for each product to be used in the work of this Section including recommendations for application and use. Include test reports and certificates verifying that the project complies with the specified requirements.

D. Stucco Analysis Report: Provide laboratory analysis of existing stucco materials.

E. Prepare mock-ups for approval as specified in Article 1.6 "Mock-ups," below.

1.5 MOCK-UPS

A. General: Before beginning general stucco restoration work, prepare mock-up panels to provide standards for work of this Section. Do not proceed with stucco restoration until Architect has approved relevant mock-up panel.

1. Prepare a 4' x 4' mock-up of stucco finish and a 2'-0" long crack repair sample, both at actual repair locations on the building as selected by the Architect.

2. Mock-ups must be performed by the crew that will be executing the work and following requirements of this Section.

3. Repeat mock-up panels as necessary to obtain approval by the Architect.

4. Protect approved mock-ups to ensure that they are without damage, deterioration, or alteration until time of Substantial Completion.

5. Approved mock-ups will represent the minimum acceptable standard for stucco restoration work. Subsequent work that does not meet standard of approved mock-up will be rejected.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver materials to the site until they have been approved by Architect.

B. Deliver and store in the original sealed containers, bearing the manufacturer's label indicating grade, type and color.

C. Deliver materials and handle so as to prevent the inclusion of foreign materials and the damage of materials by water, and in ample time to facilitate inspection and tests.

D. Store all materials in spaces designated by Architect. All such spaces shall comply with applicable federal, state, and city laws and regulations and shall be locked and inaccessible to those not employed under this Section, except the Architect. Maintain the temperature and humidity in all storage spaces within the ranges specified by the manufacturer or fabricator of stored products. Protect all materials from direct ground contact and inclement weather.

1.7 PROJECT CONDITIONS

A. Laws and Regulations: Perform all work of this Section in compliance with all applicable federal, state, and local laws and regulations.

B. Do not apply stucco when ambient temperature is less than 32 degrees or when less that 40 degree F, and falling.

C. Protect of Persons: Take all necessary measures to protect all persons, whether or not they are involved with work of this Section, from harm caused by work of this Section.

D. Protection of Building: Protect building elements and finishes from damage or deterioration caused by work of this Section using all means necessary. Repair any damage to materials or finishes to the satisfaction of the Architect at no additional cost to the Government.

E. Protect contiguous work from soiling, spattering, moisture, deterioration and other harmful effects from the work performed under this section.

F. Material Safety: All chemical materials shall be safe in use and shall comply with all applicable federal, state, and local laws and regulations.

G. Contract Drawings

1. The Drawings are two-dimensional representations of three-dimensional objects and do not show all surfaces. Perform work on all surfaces of projections, reveals, ornament, and other elements associated with areas on which work is indicated.

2. It is recognized that Drawings do not cover every condition. It is intended that any conditions not detailed shall be developed through compliance with performance criteria, as indicated for detailed areas and stipulated in these specifications.

3. Visit site and become familiar with conditions and surfaces to be restored and examine the drawings and specifications for the materials of the various surfaces and the extent of stuccoing, and from there determine extent of work and type of stucco application required for each respective surface as specified herein.

H. Access for Inspection and Approvals: Provide Architect access on a regular basis to all locations on which work is ongoing, and where work has been completed to allow for inspections and approvals. Provide means of access and safety precautions required to facilitate inspections and approvals.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Grade and Quality: Materials shall conform to requirements of this Section and shall be new, free from defects, and of recent manufacture.

B. Manufacturer's Instructions: Comply with material manufacturer's instructions for use of products (including surface preparation, mixing, applying, drying, etc.). In case of conflict with requirements of this Section, the more stringent requirements shall govern.

C. ASTM Standards: All materials shall comply with relevant ASTM standards.

2.2 PLASTER/STUCCO MATERIALS

A. Test of Existing Stucco Materials: Contractor to remove sample of existing stucco and obtain laboratory analysis of component materials as part of scope of work. Material analysis to be performed at a qualified testing laboratory approved by Architect.

B. Stucco Materials: Provide stucco to match original material in accordance with laboratory analysis.

1. Sand: To match aggregate size and color of original.

2. Cement: To match color of orignal.

3. Lime: Hydrated lime, Type S.

4. Water: Clean, fresh, potable and free from amounts of oil, acids, alkalis and organic matter injurious to the plaster and from contaminants that may cause staining or efflorescence.

5. Stucco Patching Material: Jahn M15 single-component, cementitious, mineral based mortar designed for the restoration of masonry surfaces; product completely vapor permeable and containing no latex or acrylic bonding agents or additives**.**

C. Assembly: New stucco assembly to match existing stucco assembly. Provide sand, cement and lime in mixes equal to originals for each successive coat: Scratch, brown and finish. Color to match.

D. Miscellaneous Equipment:

1. Stiff natural bristle brushes.

2. Soft clean rags.

3. Eye and skin protection.

4. Putty knives or paint scrapers, metal, and plastic.

5. Wire brush (for removing rust bloom only).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions where stucco restoration is to be executed and notify Architect of conditions detrimental to the proper and timely completion of work. Correct all conditions that might affect proper execution and durability of stuccowork in a manner acceptable to Architect before beginning work.

3.2 PREPARATION

A. Wash all stucco surfaces prior to intensive cleaning and restoration.

B. Remove paint, using specified paint stripper in accordance with manufacturer's instructions. Flush all surfaces with clean water after stripping.

3.3 STUCCO REPAIRS GENERAL

A. Replicate, repair and restore stucco surfaces to match adjacent existing finish and texture and thickness.

B. Stucco repairs shall be executed edge to edge in long strips or large areas for each separate coat. Where breaks are necessary lap new work over adjoining work.

C. Bring the finished surface of the stucco to a true plane. When complete, the surface shall be clean, free from blisters, pits, discoloration, cracks or other defects.

D. Sequence stucco installation properly with the installation and protection of other work. Build in the work of others and do all cutting and patching of stucco in this connection. Where abutting other built-in materials, stucco shall be finished tightly against them and be neatly trimmed.

E. Cut out and replace all un-bonded spots. Repair surface defects in new and existing stucco. Surfaces shall be within 1/32" to 1/16" of the plane.

3.4 PATCHING AND REPAIRING EXISTING STUCCO

A. Preparation

1. Sound all stucco to determine areas of delamination. Carefully remove all soft, broken, loose, flaking, delaminating and detaching stucco back to masonry or lath substrate, and to solid adjacent stucco, making clean and sharp edges, beveled inward.

2. Using a cold chisel, a hatchet a diamond blade saw, cut out deteriorated/damaged stucco on an angle to help insure a secure bond of new stucco.

3. Proceed with stucco repair work only after existing stucco surfaces have been thoroughly cleaned.

4. Rake out the masonry joints 1/4" to provide a key to secure the new stucco assembly. Clean masonry surfaces and joints free from debris prior to stuccoing.

5. Dampen masonry 24 hours prior to re-stuccoing, and dampen again immediately prior to re-stuccoing to prevent excessive suction and too rapid drying.

6. Repair all holes, cracks and imperfections in the surface.

B. Plaster/Stucco Application:

1. Scratch Coat: Apply with sufficient material and pressure to form full bond with masonry substrate. Scratch surface to form a bond for brown coat.

2. Surface Coat #1: Do not apply until scratch coat has hardened, and not less than 24 hours after application of base coat. Apply surface coat #1 to provide true surfaces ready for finish coat. All joints in stucco shall be lap joints. After coat has dried, cut out and fill all shrinkage cracks with stucco.

3. Finish Coat (Surface Coat #3): Apply finish coat to form true surfaces and to match existing adjacent surfaces. Allow finish to draw a few minutes and then trowel with water to a hard, smooth finish, free from blemishes. Final texture to match existing stucco.

3.5 FILLING CRACKS IN STUCCO

A. General: Repair cracks that are clearly visible or that are greater than 1/16" wide. Architect will make a final determination in all questionable cases. Multiple hairline cracks, random cracking, and checking shall also be repaired if combined effects in any way compromise integrity of the stucco.

B. Preparation: Cut out crack to a minimum of 1/8" wide. Splay sides of crack outward towards the bottom to provide a slight dovetail. Brush crack clean of all dust and dirt.

C. Filling: Fill crack with surface coat stucco. Repeat as necessary to provide surface matching plane of adjacent stucco surface.

D. Hairline Cracks: After paint removal and repair of any deep cracks and delaminated materials, repair hairline cracks using specified Stucco Patching Material (Jahn M-125) in accordance with manufacturer's instructions. Match existing adjacent stucco surface texture using proper application technique.

E. Surface: Surface shall show no signs of crack or crack repair after painting. Cut out work that does not meet requirements of these specifications and repeat patching to satisfaction of the Architect.

3.6 PAINTING

A. Prior to primer application, clean existing surface of all deleterious materials that will affect bonding of paint.

B. Scrape off all stucco nibs or other projections and sand sooth and finish to match adjoining surface texture. Cut out all scratches, cracks, holes, depressions and similar voids and fill with non-shrinking grout, patching stucco or other approved patching material.

C. Allow at least 28 days, from installation of final stucco coat, before starting work.

3.7 CLEANING AND PROTECTION

A. Promptly remove stucco from adjacent non-stucco surfaces. Repair any adjacent surfaces that have been stained, marred or otherwise damaged during the stuccoing work. When stucco work is complete, remove unused materials, containers and equipment.

END OF SECTION

SECTION 092900

GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the gypsum drywall as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Gypsum board work for partitions, ceilings, column enclosures, furring, and elsewhere where gypsum drywall work is shown on drawings.

2. Flush Corner Guards.

3. Gypsum board work for horizontal and vertical fire rated shafts.

4. Metal supports for gypsum drywall construction.

5. Acoustical insulation for gypsum drywall work.

6. Sealant for gypsum drywall work.

7. Concealed metal reinforcing for attachment of railings, toilet partitions and other items supported on drywall partitions and walls.

8. Taping and finishing of drywall joints.

9. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.

10. Gypsum wallboard cants at beams and other projections over 2" deep in elevator shafts where adjoining wall is of gypsum wallboard construction.

11. Gypsum shaftwall construction.

12. Bracing and connections.

1.3 RELATED SECTIONS

A. Hollow metal door frames - Section 081113.

B. Access doors - Section 083113.

C. Painting - Section 099000.

D. Rings for grilles, registers and light fixtures - Division 23 and 26.

1.4 QUALITY ASSURANCE

A. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:

1. The Gypsum Construction Handbook, latest edition, USG.

2. Construction Guide, latest edition, National Gypsum.

3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For"

4. ASTM C 475 "Standard Specification for Joint Treatment Materials for Gypsum Wallboard Construction"

5. ASTM C 645 "Standard Specification for Non-Structural Steel Framing Members"

6. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products"

7. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board"

8. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications"

9. ASTM C 954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness"

10. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Board"

11. ASTM C 1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"

12. ASTM C 1178 "Standard Specification for Glass Mat Water Resistant Gypsum Backing Board"

13. ASTM C 1278 "Standard Specification for Fiber-Reinforced Gypsum Panel"

14. ASTM C 1396 "Standard Specification for Gypsum Board"

15. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"

B. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.

C. System Design Load

1. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.

a. Drywall assemblies with tile finish shall have a deflection limit of L/360.
b. Drywall assemblies with stone slab finish shall have a deflection limit of L/720.

2. Provide drywall ceiling assemblies designed, fabricated and installed to have a deflection not to exceed L/360.

D. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for vertical deflection within framing details.

E. Installer: Firm with not less than 5 years of successful experience in the installation of specified materials.

F. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

1.5 SUBMITTALS

A. Submit shop drawing for each drywall partition, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work.

B. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.

C. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold resistant joint compound.

D. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

E. Evaluation Reports: Submit evaluation reports certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.

1.6 PRODUCT HANDLING AND PROTECTION

A. Deliver, store and handle drywall work materials to prevent damage. Deliver materials in their original, unopened containers or bundles, and store where protected from moisture, damage and from exposure to the elements. Store wallboard in flat stacks.

B. Protect wallboard from becoming wet.

C. Protect metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

1.7 ENVIRONMENTAL CONDITIONS

A. Provide and maintain minimum temperature of fifty-five (55) degrees F. and adequate ventilation to eliminate excessive moisture within the building in the area of the drywall work for at least twenty-four (24) hours, prior to, during and after installation of drywall work. Installation shall not start until windows are glazed and doors are installed, unless openings are temporarily closed. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up.

1.8 JOB MOCK-UP

A. At a suitable location, where directed by the Architect, lay up a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Architect to show stud spacing and attachments; after acceptance, complete assembly.

B. Adjust the finishing techniques as required to achieve the finish required by the Architect as described in this Section of these specifications.

C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.

D. All drywall work shall be equal in quality to approved mock-up.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: U.S. Gypsum Co., Georgia Pacific, CertainTeed Corporation, Certainteed, or National Gypsum Co. meeting specification requirements are acceptable.

1. All drywall products must be manufactured in North America.

B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by ClarkDietrich, Super Stud Building Products, Marino/Ware, or approved equal.

2.2 METAL SUPPORTS

A. Metal Floor and Ceiling Runners

1. Provide vinyl barrier track liner equal to ProTRAK liner or approved equal to minimize creaking.

2. Drywall Track: Formed from 0.0312 inch (20 U.S. Std. gauge) (minimum unless otherwise noted or required by performance requirements) cold formed steel, width to suit shaped metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.

3. Deflection track or head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical movement within connections. Minimum of 0.0312 (20 ga.) cold formed steel for clips, 25 ga. cold formed steel for deflection track.

a. Product: ClarkDietrich; [BlazeFrame DSL] [MaxTrak] Slotted Deflection Track As manufactured by the Steel Network, VertiClip or VertiTrack or equal made by Metal-Lite Inc.
b. FireTrak (including stud clips) by FireTrak Corp. or equal made by Metal-Lite Inc.

4. Shaft Wall "J" Type Runner: Formed from 0.0329 inch (20 U.S. Std. gauge) galvanized steel, 1" x 2-1/2" or 4" wide (to suit detail) x 2-1/4" (for shaft wall).

B. Metal Studs, Framing and Furring

1. C-Shaped Studs: Channel type with holes for passage of conduit formed from minimum 0.0312 inch (20 U.S. Std. gauge) (unless heavier gauge is required to meet deflection limits) cold formed steel, width as shown on drawings.

2. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.

   a. Product: ClarkDietrich; Furring Channel, or comparable product.

3. "C-H," "CT," or "I" Type Stud: 1-1/2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.

   a. Product: ClarkDietrich; CT Stud, or a comparable product.

4. Double "E" Type Stud or "J" Track with Holding Tabs: 1" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.

   a. Product: ClarkDietrich; J-Tabbed Track, or a comparable product.

5. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions and other items supported on drywall partitions and walls.

6. Half Height Wall Supports: Pony Wall Lite by Clark Dietrich or approved equal, 16 gauge framing with 3/8” base plate designed by contractor based on deflection specified above.

C. Suspended Ceiling and Fascia Supports

1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.

2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.

3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.

4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.

5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.

D. Protective Coating: All cold-formed steel members shall have coating conforming to AISI S220; ASTM A 653, G60 or coating with equivalent corrosion resistance of ASTM A653/A653M, G60. Galvannealed products are not acceptable

2.3 GYPSUM WALLBOARD TYPES

A. Gypsum Wallboard: 1/2" thick and 5/8" thick as indicated on drawings, "Sheetrock" by USG, "Gold Bond" by National Gypsum, or "Regular Gypsum" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

B. Fire-Rated Gypsum Wallboard: 1/2" thick and 5/8" thick as indicated on drawings, "1/2" Sheetrock Firecode C" or 5/8" Sheetrock Ecosmart Firecode X by USG, "Gold Bond Fireshield" by National Gypsum,

or "Type C" and "Type X" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

C. Water-Resistant Backing Board for Tile Finish: 5/8" thick, "DUROCK Glass Mat Tile Backerboard" by USG, "Dens-Shield Tile Backer Board" by Georgia Pacific, or "GlasRoc Tile Backer" by CertainTeed Corp. Cover joints with a pressure sensitive woven glass fiber tape equal to Durock Brand Tile Backer Tape.

D. Moisture/Mold-Resistant Gypsum Wallboard at locations listed below, unless otherwise shown on drawings: 1/2" thick and 5/8" thick as indicated on drawings, "Mold Tough Glass Mat" or "Mold Tough Glass Mat Firecode X" by U.S. Gypsum, "DensArmor Plus" by Georgia Pacific, "Mold Defense" and/or "GlasRoc Interior"or “GlasRoc Type X” by Certainteed, or "Gold Bond EXP Interior Extreme Gypsum Board" by National Gypsum, 48" wide, in maximum lengths available to minimize end-to-end butt joints. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C 1396, Section 6 or ASTM C 1658.

1. Areas in toilet rooms, lockers, janitor's closets not scheduled to receive ceramic tile, or where fire rating is required.

2. Walls and ceilings of spaces containing condensers, water tanks, water pumps and pressure reduction valves.

3. Portions of walls within 2 feet of kitchen sinks to a height of 4 feet above the floor.

4. Portions of walls within 2 feet of kitchen stoves to a height of 4 feet above the floor.

5. Walls of bathrooms that are not solely water closet compartments, other than walls specifically required to be cement board.

6. Walls and ceilings in service sink closets.

7. Portion of walls within 2 feet of mop sinks or service sinks to a height of 4 feet above the floor.

8. All perimeter walls and wet shafts.

E. Mold-Resistant Shaft Wall Liner: Solid gypsum board liner for shaft wall construction, 1" thick, 24" wide, as required to suit condition, by standard lengths as required, beveled edges. Provide "Sheetrock Brand Glass Mat Liner Panel Mold Tough" by USG, "DensGlass Shaftliner" by Georgia Pacific, "Gold Bond Brand EXP Extended Exposure Shaft Liner" by National Gypsum, or "GlasRoc Shaftliner" by CertainTeed Corp.

1. Liner board must have a rating 10 per ASTM D 3273 with a core that meets ASTM C 1396 Section 6.

F. Abuse-Resistant Wallboard: 5/8" thick "Sheetrock Brand Mold Tough AR" by USG, "Dens Armor Plus Abuse Resistant Panels" by Georgia-Pacific, "EXP Interior Extreme AR" or "Gold Bond Brand Hi-Abuse XP" by National Gypsum, or " Extreme Abuse" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

1. Board must achieve a Level 1 rating per ASTM C 1629.

G. Impact-Resistant Wallboard: 1/2" and 5/8" thick as indicated on drawings, "Sheetrock Brand Mold Tough VHI" by USG, "DensArmor Plus Impact-Resistant Panels" by Georgia-Pacific, "EXP Interior Extreme IR" or "Gold Bond Brand Hi-Impact XP" by National Gypsum, or " Extreme Impact" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

H. Cement Board (for tile backer board in shower areas and wherever else scheduled): ½" thick "Durock Tile Backer Board" by USG, "Wonder Board Lite" by Custom Building Products, or approved equal.

I. Impact-Resistant Gypsum Drywall: ASTM C 1396, ASTM C 1278, core types as required by fire-resistance-rated assembly indicated, and with tapered edges.

1. Products: Subject to compliance with requirements, provide USG "Sheetrock Brand Mold Tough VHI" 5/8" thickness, by United States Gypsum Company, or " Extreme Impact" by CertainTeed Corp.

J. Sustainable/Lightweight Gypsum Wallboard: ASTM C 1396, "Sheetrock Brand Ecosmart (Type ULIX)" or "Sheetrock Brand Ecosmart Mold Tough" by USG or “High Strength Fireshield Lite XP” by National Gypsum.

2.4 ACCESSORIES

A. Acoustical Insulation: Paper-less, non-combustible, semi-rigid mineral fiber mat, 2" thick, in walls (unless otherwise indicated), 3 lb./cu. ft. maximum density; Thermafiber "Thermafiber SAFB FF," Rockwool "Rockwool AFBevo" or approved equal.

B. Fasteners for Wallboard: USG Brand Screws; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wallboard. Lengths specified below under "Part 3 - Execution" Articles and as recommended by drywall manufacturer.

1. For Portland cement base boards, fasteners shall be equal to Durock Steel Screws by U.S. Gypsum.

C. Laminating Adhesive: "Sheetrock Brand Joint Compound."

D. Flush Corner Guards: **2” Winged WX5 by Wall Protex in White 11929, or approved equal.**

E. Metal Trim - Corner Beads: For 90 degree External Corners - ClarkDietrich; 103 Deluxe Cornerbead or "Dur-A-Bead" No. 103, 30 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4", for 90 degree external corners.

F. Metal Trim - Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim."

G. Partition/Concrete Ceiling Trim: Trim-Tex Super Seal Tear Away or approved equal.

H. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; Setting Type (Durabond 90) or Lightweight Setting Type Joint Compound for taping and topping; and Ready Mix Compound for finishing.

1. For mold-resistant drywall, water resistant drywall, and tile backer board, use alkali resistant glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Acceptable joint compound is "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or approved equal meeting standards noted herein.

I. Control Joints: ClarkDietrich; #093 Control Joint or No. 0.093, USG. Within fire rated partitions provide FAS-093X

J. Acoustical Sealant: USG "Acoustical Sealant" or "Tremco Acoustical Caulking" of Tremco Mfg. Co., Masterseal NP520 by BASF or approved equal.

K. Neoprene Gaskets: Conform to ASTM D 1056.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where gypsum drywall is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. General

1. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.

2. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.

3. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed reinforcement shall span between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.

a. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.

B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of authorities having jurisdiction, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.

C. Acoustical Assemblies: Install acoustically-rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.

D. Sealant

1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.

2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.

3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.

E. Wallboard Application

1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 081113, "Steel Doors and Frames."

2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use water-resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.

3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.

4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.

5. Provide "Thermafiber" safing insulation meeting standards of Section 078413 at flutes of metal deck where partitions carry up to bottom of metal deck.

6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.

7. Where wallboard is to be applied to curved surfaces, dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.

8. Screw fasten wallboard with power-driven electric screw driver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.

9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.

F. Cementitious Backer Board

1. General: Furnish cementitious backer board in maximum available lengths. Install horizontally, with end joints over framing members.

2. Fastening: Secure cementitious backer board to each framing member with screws spaced not more than 12 inches on center and not closer than 1/2" from the edge. Install screws with a conventional screw gun so that the screw heads are flush with the surface of the board.

3. Joint Treatment: Fill space between edge of backer and receptor with dry-set Portland cement or latex-Portland cement mortar. Fill all horizontal and vertical joints and corners with dry-set Portland cement or latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.

G. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.

1. Corner Beads: Install specified corner beads in single lengths at all external corners, unless corner lengths exceed standard stock lengths.

2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.

3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.

H. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:

1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.

2. Construction changes within the plane of the partition or ceiling.

3. Shown on approved shop drawings.

4. Ceiling dimensions exceed thirty (30) feet in either direction.

5. Wings of "L," "U," and "T" shaped ceiling areas are joined.

6. Expansion or control joints occur in the structural elements of the building.

7. Shaftwall runs exceed 30' without interruption.

8. Partition or furring abuts a structural element or dissimilar wall or ceiling.

9. Partition or furring runs exceed 30' without interruption.

10. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.

I. Joint Treatment and Spackling

1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between ceilings and walls or partitions shall be filled with joint compound.

2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.3 FURRED WALLS AND PARTITIONS

A. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.

B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

3.4 METAL STUD PARTITIONS

A. Unless otherwise noted, steel framing members shall be installed in accordance with ASTM C 754.

B. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.

C. Stud Installation

1. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.

2. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.

3. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.

4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.

5. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing to vertical studs with sheet metal screws.

6. At jambs of door frames and borrowed light frames, install doubled-up studs (not back to back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.

7. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to-length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.

8. At control joints, in field of partition, install double-up studs (back to back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.

D. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full

width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.

E. Wallboard Installation - Single Layer Application (Screw Attached)

1. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged so as to occur on different studs.

2. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.

3. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.

4. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.

5. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.

F. Wallboard Installation - Double-Layer Application

1. General: See drawings for wallboard partition types required.

2. First Layer (Screw Attached): Install as described above for single layer application.

3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty-two (32) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.

4. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.

G. Wallboard Installation - Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and maintain tolerances as specified for screw attached wallboard.

H. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.

I. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to

top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by Architect.

J. Control Joints

1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.

2. Back by double framing members.

3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.

4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.

3.5 DRYWALL FASCIAS AND CEILINGS

A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.

B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.

C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.

F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.

1. Provide special furring where ducts are over two (2) feet wide.

G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board at each furring channel; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

3.6 SHAFT WALLS

A. Runner Installation: Use "J" metal runners at floor and ceiling, with the short leg toward finish side of wall. Securely attach runners to structural supports with power-driven fasteners at both ends and twenty-four (24) inches o.c.

B. Shaft Wall Liner: Cut shaft wall liner panels one (1) inch less from floor to ceiling height and erect vertically between J-runners.

C. C-H Studs: Cut metal studs 3/8" to not more than 1/2" less than floor to ceiling height and install between shaft wall liner panels so that panels are fitted snugly into the one (1) inch wide "H," "T," or "I" portion of the stud. Space studs twenty-four (24) inches o.c., unless otherwise indicated on drawings. Install full-length steel E-Studs or J-runners vertically at T-intersections, corners, door jambs, and columns. Install full length E-Studs or J-runners over shaft wall liner both sides of closure panels. Frame openings cut within a liner panel with J-Runner around perimeter. For openings, frame with vertical E-Stud or J-runner at edges, horizontal runner at head and sill, and reinforcing as shown on the drawings. Suitably frame all openings to maintain structural support for wall. Install floor-to-ceiling steel E-Studs or J-runners each side of elevator door frames to act as strut-studs. Attach strut-stud to floor and ceiling runners with two (2) 3/8" Type S screws, space twelve (12) inches o.c. Over metal doors, install a cut to length section of runner and attach to strut-studs with clip angles and 3/8" Type S Screws space twelve (12) inches o.c.

D. Wallboard Installation - Double Layer Installation: Erect gypsum wallboard base layer vertically or horizontally to meet fire rating on one side of studs with end joints staggered. Fasten base layer panels to studs with one (1) inch Type S screws twenty-four (24) inches o.c. Caulk perimeter of base layer panels. Apply gypsum wallboard face layer vertically over base layer with joints staggered and attached with 1-5/8" Type S screws staggered from those in base, spaced eight (8) inches o.c. and driven into studs.

E. Wallboard Installation (Where Both Sides of Shaft Wall are Finished): Apply gypsum wallboard face layers vertically both sides of studs. Stagger joints on opposite partition sides. Fasten panels with one (1) inch or two (2) inches Type S screws spaced eight (8) inches o.c. in field and along edges into studs.

F. Cants: Provide one (1) inch thick shaft wall liner, cut to suit condition, at beams and other projections wider than two (2) inches in elevator shafts. Cants shall slope seventy-five (75) degrees from the horizontal. Screw attach shaft wall liner to the vertical metal studs.

G. Support elevator hoistway door frames independently of drywall shaft framing system, or reinforce system in accordance with system manufacturer's instructions.

H. Where handrails are indicated for direct attachment to drywall shaft system, provide not less than a sixteen (16) ga. x eight (8) inches wide galvanized steel reinforcement strip, accurately positioned and secured to studs and concealed behind not less than one 1/2" thick course of gypsum board in the system.

I. Integrate stair hanger rods with drywall shaft system by locating cavity of system as required to enclose rods.

J. Horizontal Shaftwall Duct and Ceiling Assemblies: Provide I-stud cavity shaftwall system for horizontal duct protection consisting of I-studs 24" o.c. with 1" fire-rated shaft liner panels inserted in the stud tabs, and three layers of 1/2" firecode C gypsum board attached to the stud flanges opposite the shaft liner panels.

3.7 ERECTION AT COLUMN ENCLOSURES

A. Metal furring supports shall be provided under work of this Section, and shall be cut to lengths as necessary for tight fit such that spacing is not more than sixteen (16) inches o.c.

B. Board shall be fastened securely to supports with screws as specified. Place boards in position with minimum number of joints. Where free ends occur between supports, back-blocking or furring shall be required. Center abutting ends over supports. Correct work as necessary so that faces of boards are flush, smooth and true. Provide clips or cross furring for attachment as required.

C. All layers shall be screw attached to furring.

D. When column finish called for on drawings to be in the same plane as drywall finish layer, maintain even, level plane.

3.8 FINISHING

A. Taping: A thin, uniform layer of compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.

B. Filling: After initial coat of compound has hardened, additional compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.

C. After compound has hardened, a finishing coat of compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.

D. Fastener Depressions: Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.

E. Finishing Beads and Trim: Compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.

F. Except as otherwise noted, level of finish for surface exposed to view shall conform to Level 4 of ASTM C 840 and GA-214 of the Gypsum Association.

G. Drywall construction with defects of such character which will mar appearance of finished work, or which is otherwise defective, will be rejected and shall be removed and replaced at no expense to the Owner.

3.9 CLEANING AND ADJUSTMENT

A. At the completion of installation of the work, all rubbish shall be removed from the building leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building.

B. Work shall be left in clean condition ready for painting or wall covering. All work shall be as approved by Architect.

C. Cutting and Repairing: Include all cutting, fitting and repairing of the work included herein in connection with all mechanical trades and all other trades which come in conjunction with any part of the work, and leave all work complete and perfect after all trades have completed their work.

3.10 PROTECTION OF WORK

A. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

END OF SECTION

SECTION 093000

CERAMIC TILE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the ceramic tile as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Ceramic mosaic floor tile.
2. Ceramic glazed wall tile and matching base.
3. Stone saddles.
4. Setting beds, grout and sealant.
5. Acoustic mat.
6. Waterproofing membrane.

1.3 RELATED SECTIONS

A. Gypsum drywall - Section 092900.

1.4 REFERENCES

A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.

B. ANSI A136.1 - American National Standards for Organic Adhesives for Installation of Ceramic Tile.

C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.

D. ASTM C 150 - Standard Specification for Portland Cement.

E. TCNA - Handbook for Ceramic, Glass and Stone Tile Installation; Tile Council of North America, latest 2021 Edition.

F. ISO 13007 - International Standards Organization; classification for Grout and Adhesives.

G. LFT Tile – Large Format Tile, tile 15” or larger in any one direction.

H. Stone Tile – Conform to requirements of MIA (Marble Institute of America) Dimension Stone Design Manual.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers: For cutting, installing and grouting of ceramic tile, use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards, and the installers are Certified Ceramic Tile Installer (CTI) through the Ceramic Tile Education Foundation (CTEF) or Tile Installer Thin Set Standards (ITS) verification through the University of Ceramic Tile and Stone.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the following:

1. Manufacture all tile in accordance with Standard Grade Requirements of ANSI A-137.1.

2. Glass tile must meet ANSI A137.2.

3. Install all ceramic tile in accordance with the recommendations contained in Handbook for Ceramic, Glass and Stone Tile Installation of the Tile Council of North America, Inc., latest edition noted herein and ANSI A108/A118/A136.

4. Stone tiles shall conform to the requirements of ASTM C1242.

C. Flooring surfaces shall have a minimum wet DCOF AcuTest value of 0.42 and tested per ANSI A326.3 Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

1. Flooring surfaces in pool decks, steam rooms and showers and locker areas shall have a minimum wet DCOF AcuTest value of 0.60 and tested per ANSI A326.3 Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

2. Ramps and inclines shall have a minimum wet DCOF AcuTest value of 0.65 and tested per ANSI A326.3 Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

D. Acoustical Isolation: Comply with applicable requirements of the Building Code of the City of New York, Section BC-1207 "Sound Transmission." Where indicated, provide tile and underlayment products with the following sound reduction characteristics, in combination with floor ceiling construction indicated, as determined by testing identical floor ceiling construction assemblies per test method indicated in the section of the New York City Building Code referenced.

1.6 SUBMITTALS

A. Samples

1. Before any ceramic tile is delivered to the job site, submit to the Architect sample panels, approx. 12" x 12", mounted on hardboard back-up with selected grout color for each color and pattern of ceramic tile and grout specified.

2. Submit 6" length of stone saddles.

3. Submit 12" x 12" samples of waterproofing membrane.

B. Shop Drawings: Show locations, plans, and elevations, of each type of tile and tile pattern. Show widths, details, and locations of movement joints in tile substrates and finished tile surfaces. Show thresholds.

C. Master Grade Certificates: Prior to opening ceramic tile containers, submit to the Architect a Master Grade Certificate, signed by an officer of the firm manufacturing the ceramic tile used, and issued when the shipment is made, stating the grade, kind of tile, identification marks for tile containers, and the name and location of the project.

D. Mock-ups

1. At an area on the site where approved by the Architect, provide a mock-up ceramic tile installation.

   a. Make the mock-up approximately 48 inch x 48 inch in dimension.
   b. Provide one mock-up for each type, class, and color of installation required under this Section.
   c. The mock-ups may be used as part of the Work, and may be included in the finished Work, when so approved by the Architect.
   d. Revise as necessary to secure the Architect's approval.

2. The mock-ups, when approved by the Architect, will be used as datum for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection.

3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the work of this Section.

1.7 PRODUCT HANDLING

A. Delivery and Storage

1. Deliver all materials of this Section to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store all materials under cover in a manner to prevent damage and contamination; store only the specified materials at the job site.

B. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 deg. F. in tiled areas during installation and for 7 days after completion.

1.9 EXTRA STOCK

A. Extra Stock: Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

1. Tile Units: Furnish quantity of full size units equal to 2.0% of amount installed.

1.10 WARRANTY

A. System Warranty: Manufacturer's non-prorated comprehensive warranty that agrees to repair and replace defective installation areas, material, and labor that fail under normal usage within specified warranty period.

1. Warranty Period: Five years from date of Product Purchase.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

2. Obtain waterproof/crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Stone thresholds.

2. Waterproof membrane.

3. Metal edge strips.

2.2 TILE

A. Provide Natural Hues™ Special Order Glazed Porcelain Tile 4” x 4” as manufactured by Dal-Tile Corp., or approved equal by American Olean, United States Ceramic Tile Co., Summitville Tiles Inc., or approved equal meeting these specifications. The Architect reserves the right to pick tile from any price group.

B. Color: as indicated in the finish schedule on the drawings.

2.3 WALL TILE AND BASE

A. Refer to finish schedule on the drawings.

B. Provide vitreous, cushion edge units, 4-1/4" x 4-1/4" x 1/4" thick, matte glazed, in colors as selected by the Architect. Provide sanitary cove base to match wall tile.

2.4 FLOOR TILE

A. Refer to finish schedule on the drawings.

B. Provide porcelain type ceramic mosaic floor tile with all-purpose edge in size, color and pattern as selected by the Architect. Tile to have water absorption not to exceed 0.5%.

C. Provide non-slip tile where scheduled, of same characteristics as ceramic mosaics specified herein with the addition of 7-1/2% abrasive grain by weight.

2.5 TRIM AND SPECIAL SHAPES

A. Provide external and internal corners, trim shapes at openings, and all other trim and special shapes to match the tile specified herein, as required by field conditions and drawing details.

2.6 STONE SADDLES

A. Provide sound stone saddles as selected by the Architect, minimum 3/4" thick, with an abrasive hardness of not less than 10.0, when tested in accordance with ASTM C 241. Cut saddle to fit jamb profile, honed finish.

2.7 HIGH PERFORMANCE GROUT

A. Grout complying with A118.7; and ISO 13007, CG2WAF: For grouting ceramic tile, provide a commercial Portland cement grout, Basis of Design: “Laticrete PermaColor Select” by Laticrete International, Inc., custom color as selected by the Architect, or comparable products by but not limited to: “Rapid Curing High Performance Grout” by Bosik, SikaTile 815 Secure Grout or “Ultracolor Plus FA” (additive not required) made by MAPEI; “Prism Ultimate Grout” made by Custom Building Products (additive not required), custom color as selected by the Architect.

2.8 SURFACE PREPARATION (PROPOSED ADDITION)

A. Self-Leveling Underlayment for rapid leveling of concrete, Portland cement mortar bed, plywood, and existing stone or ceramic tile floors to achieve flatness. Meeting minimum compressive strength of 4400 psi and application from feather edge to 1-1/2” or per manufacturer’s recommendation.

1. Laticrete NXT Level Plus and NXT Primer
2. Mapei UltraPlan 1 Plus and Primer
3. SikaLevel 325
4. Bostik SL-100 and Universal Primer Pro
5. Custom Tech T-150

2.9 MORTAR BED, BOND COAT AND GROUT

A. Portland Cement: ASTM C 150, Type I.

B. Hydrated Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144, clean and graded natural sand.

D. Reinforcing for Mud Set Systems: 2" x 2" x 16/16 ga. welded wire mesh.

E. Latex Modified Mortar Bed

1. Laticrete 3701 Fortified Mortar Bed
2. MAPEI, “4 to 1 Mud Bed Mix” with “Planicrete AC”
3. Pro Spec, Floor Mud with B-710 SBR Acrylic Additive.
4. SikaLevel 050 Rapid Slope
5. Bostik, Mud in a Bag with 425 latex admixture
6. Custom Building Products Thick Bed Mortar and Thin-set Mortar Admix

F. Latex – Portland Cement Bond Coat, complying with ANSI A118.15 and ISO 13007, C2ES1P1 with minimum compressive strength of 400 psi.

1. Laticrete, 254 Platinum
2. MAPEI, Keraflex Super.
3. Pro Spec – Permalastic System consisting of Permalastic Dryset Mortar and Permalastic Admixture
4. SikaTile 350 Flex Set
5. Custom Building Products Pro-Lite Premium Mortar.

G. Improved Modified Cement Mortars, complying with ANSI 118.15 and ISO 13007, CSES1P1.

(Also for use with LFT Tile and Stone Tile)

1. Laticrete, MultiMax Lite
2. Mapei; Keraflex Super.
3. SikaTile 475 LHT Premium Set or SikaTile 500 LHT Lite (above products are lightweight and non-lightweight)
4. Bostik, BAM
5. Custom Building Products Mega-Lite Ultimate LHT Mortar.

H. Wall and Base Tile

1. Over drywall use ANSI A136.1-1967 Organic Adhesive for installation of Ceramic Tile, Type I and ISO 13007 D2TE. Shear strength shall be 50 psi minimum. Adhesive primer as recommended by adhesive manufacturer. Manufacturer shall certify, in writing, that adhesive and primer used are proper types for the intended tile types and application. Conform to TCNA Detail W-242.

    a. Laticrete Premium 15 Adhesive.
    b. MAPEI Type 1 Mastic.
    c. ProSpec B-1000 Tile Adhesive
    d. ProSpec B-1000 Tile Adhesive
    e. Bostik Multi-Purpose Floor & Wall Mastic
    f. Custom Building Products Reliabond or T1-60 Tile Adhesive.

2. Over masonry and concrete use a mortar bed leveling coat conforming to ANSI A108.1A followed by a Latex Portland Cement Bond Coat, Laticrete TriLite, MAPEI, Keraflex Super or Ultralite Mortar, Customs Pro-Lite, SikaTile 475 LHT Premium Set and for non-LHT SikaTile 350 Flex Set or equal by Pro Spec, Bostik Big Tile & Stone conforming to ANSI A118.15, ISO 13007-C2ES1P1, and TCNA Detail W-211.

3. Over cement board use a Latex Portland cement mortar bond coat, Laticrete TriLite, MAPEI, Keraflex Super or Ultralite Mortar, Customs Pro-Lite, SikaTile 475 LHT Premium Set and for non-LHT SikaTile 350 Flex Set conforming to ANSI A118.15, ISO 13007-C2ES1P1, and TCNA Detail W-244; coat board with waterproof membrane as specified below.

4. Over glass mat water resistant gypsum backer board use a Latex Portland cement mortar bond coat, Laticrete TriLite, MAPEI, Keraflex Super or Ultralite Mortar, Customs Pro-Lite, SikaTile 475 LHT Premium Set and for non-LHT SikaTile 350 Flex Set or equal by Pro Spec, conforming to ANSI A118.15, ISO 13007-C2ES1P1, and TCNA Detail W-245.

I. Floor Tile and Stone Saddle - Mud Set: Set floor tile and stone saddle using Portland Cement mortar setting bed conforming to ANSI A108.1A and latex modified Portland cement bond coat, Basis of Design, Laticrete 254 Platinum, MAPEI, Keraflex Super, Customs Pro-Lite, SikaTile 350 Flex Set, conforming to ANSI A118.15, ISO 13007-C2ES1P1, and TCNA Detail F-112.

1. For installation of (LFT and Stone Tile), Improved Modified Cement Mortars and medium bed, Basis of Design, Laticrete MultiMax Lite, MAPEI, Ultraflex LFT, Customs Mega-Lite, SikaTile 475 LHT Premium Set, Bostik BAM conforming to ANSI 118.15, ISO 13007-C2ES1P1.

J. Floor Tile and Stone Saddle - Waterproof Setting Bed: Set floor tile and stone saddle using thin set latex Portland cement bond coat, Basis of Design, Laticrete 254 Platinum, MAPEI, Keraflex Super, Customs Pro-Lite, SikaTile 350 Flex Set, Bostik Big Tile & Stone conforming to ANSI A118.15, ISO 13007-C2ES1P1, and waterproofing membrane conforming to TCNA Detail F-122/122A.

1. For installation of (LFT and Stone Tile), Improved Modified Cement Mortars and medium bed, Basis of Design, Laticrete MultiMax Lite, MAPEI, Ultraflex LFT Customs Mega-Lite, SikaTile 475 LHT Premium Set, Bostik BAM, conforming to ANSI 118.15, ISO 13007-C2ES1P1.

K. Waterproofing Membrane complying with ANSI A118.10 and ANSI A118.12; and having IAPMO certification as a shower pan liner: “Hydro Ban” made by Laticrete International, “Mapelastic Aquadefense” by MAPEI with factory blended “Bio-Block Antimicrobial”, “Red Gard” made by Custom Building Products, SikaTile 100 Moisture Guard or ProSpec B6000. Bostik GoldPlus

1. Reinforce membrane with polyester fabric where recommended by manufacturer.

L. Water: Clean, fresh and suitable for drinking.

M. Sound Control Mat: "Geniemat RST-05," 1/4" thick as manufactured by Pliteq or "QT SCU Sound Control Mat," 1/4" thick, made by Ecore International or approved equal. Bond with adhesive and vapor retarder specified herein.

N. Grout complying with A118.7; and ISO 13007, CG2WAF: For grouting ceramic tile, provide a commercial Portland cement grout “Laticrete PermaColor or Laticrete PermaColor Select”, SikaTile 815 Secure Grout or “Ultracolor Plus FA” (additive not required) made by MAPEI; “Prism Ultimate Grout” made by Custom Building Products (additive not required), (addition not required) Bostik Hydroment Vivid; color as selected by the Architect.

O. Physical Properties: The setting beds and grouts must meet the following physical requirements:

1. Compressive Strength – 3000 psi min.

2. Shear Bond Strength – 500 psi min.

3. Service Rating (ASTM C 627) – Extra Heavy Duty.

P. Sealer: Seal all grout joints and all unglazed tile using “StoneTech Heavy Duty Sealer” by Laticrete, “Sealer’s Choice 15 Gold” by Aqua Mix Inc or “Ultracare Penetrating Plus Stone, Tile, and Grout Sealer” by MAPEI. Merkrete Grout Sealer

Q. Temporary Protective Coating: Either product indicated below that is applied in the tile manufacturer’s factory and formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, applied hot, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg. F. per ASTM D 87.

2. Grout release in form of manufacturer’s standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

R. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, equal to “StoneTech Stone & Tile Cleaner” by Laticrete, “Concentrated Stone & Tile Cleaner” made by Aqua-Mix, “Ultracare Concentrated Tile & Grout Cleaner” by MAPEI, Aqua Mix Heavy Duty Grout N Tile Cleaner, or approved equal, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.10 SEALANT

A. Joint Backing: Preformed, compressible, resilient, non-extruding, non-staining strips of foam neoprene, foam polyethylene, or other material recommended by sealant manufacturer.

B. Bond Breaker: Polyethylene tape, 3 mils thick or other material recommended by sealant manufacturer.

C. Sealant Primer: Colorless, non-staining, or type to suit substrate surface, as recommended by sealant manufacturer.

D. Sealant: One-part silicone based sanitary sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25. Sealant hardness upon full cure shall be between 20-30 Shore "A" Durometer. Color of sealant to blend with or match adjacent materials, and as selected by the Architect. Sealant shall be equivalent to 1700 Sanitary Sealant made by General Electric or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where ceramic tile is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels

1. Floors: + 1/8" in 10'-0" distance and 1/4" total max. variation from levels shown.

B. Grind or fill concrete and masonry substrates as required to comply with allowable variations.

C. Concrete substrates must meet ANSI A108.01 tolerances and surface textures in preparation for tile work; coordinate with concrete trades.

3.3 PREPARATION

A. Coordinate the following with Section 030130:

1. Steel trowel and fine broom finish concrete slabs that are to receive ceramic tile. Cure concrete slabs that are to receive tile before tile application. Do not use liquid curing compounds or other coatings that may prevent bonding of tile setting materials to slabs. Slab shall be dry at time of tile installation.

2. Tile floors with floor drains must have a slope to direction of 1/4” per foot; coordinate this with concrete trades.

B. Etch concrete substrate as may be required to remove curing compounds or other substances that would interfere with proper bond of setting bed. Rinse with water to remove all traces of treatment. Surface must meet finish requirements as noted in ANSI 108.01.

C. Blending: for tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at project site before installing.

D. Field Applied Temporary Protective Coating: Pre-coat tile with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.4 JOINTS IN TILE WORK

A. Joint Widths: 1/16" wide in ceramic tile.

B. Alignment: Wall, base and floor joints shall align through the field and trim. Direction and location of all joints as directed by Architect.

C. Movement Joints: Conform to TCNA Detail EJ171. Locate where movement joints are in back-up material. Provide movement joint at joints between mop receptors and ceramic tile. Provide movement joint at all vertical internal joints of wall tile. Movement joints 1/8" wide in ceramic tile. Fill all movement joints with specified backing and sealant. Use bond breaker where sufficient space for joint backing does not exist.

1. Provide sealant between ceramic tile and plumbing fixtures, mirrors, pipes, countertops and other dissimilar materials penetrating or adjacent to ceramic tile.

3.5 INSTALLATION

A. Comply with the following installation standards

1. Wall tile over drywall using organic adhesive - ANSI A136.1 and ISO 13007, D2TE.

2. Wall tile over cement board or glass mat backer board using dry set mortar with latex additive - ANSI A118.15 and ISO 13007, C2ES1P1.

3. Wall tile over masonry or concrete using dry set mortar with latex additive - ANSI A118.15 and ISO 13007, C2ES1P1.

4. Floor tile using full mud set mortar - ANSI A118.15, and ISO 13007, C2ES1P1.

5. Floor tile using dry set mortar with latex additive - ANSI A118.15, and ISO 13007, C2ES1P1.

6. Floor tile over waterproofing membrane.- A118.15, and ISO 13007, C2ES1P1.

B. Backs of tile must be cleaned before installation.

C. All setting beds and/or adhesives shall provide for an average contact area of not less than 95% coverage.

D. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignment shown.

1. Floors: 1/8" in 10'-0" run, any direction; +/- 1/8" at any location; 1/32" offset at any location.

2. Walls: 1/8" in 8'-0" run, any direction; 1/8" at any location; offset at any location, 1/32".

3. Joints: +/- 1/32" joint width variation of any location; 1/16" in 3'-0" run deviation from plumb and true.

E. Waterproofing Membrane

1. Install the membrane in strict accordance with manufacturer's written recommendations.

2. Upon completion of work, test horizontal membrane for leaks by flood testing per ASTM D 5957. Inspect for leakage. Make necessary adjustments to stop all leakage and retest until watertight. If membrane is not covered by another surface immediately, provide protection until membrane is covered.

F. Handle, store, mix and apply setting and grouting materials in compliance with the manufacturer's instructions.

G. Extend tile work into recesses and under equipment and fixtures, to form a complete covering without interruptions. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.

H. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping and fixtures so that plates, collars, or covers overlap tile.

I. Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are the same size. Lay out tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths.

3.6 INSTALLATION OF STONE SADDLES

A. Install stone saddles cut to profiles and sizes shown, accurately fitted to jambs, coped at stops, set in full bed of mortar herein specified, and with grouted edge joints as specified for floor tile.

3.7 CLEANING AND PROTECTION

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use cleaners only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning to insure removal of all cleaning material.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. Apply coat of sealer to all grout joints and all unglazed tile.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings from tile surfaces.

E. Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.

END OF SECTION

SECTION 095113

ACOUSTIC PANEL CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the acoustic panel ceilings as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Acoustical panel units.

2. Exposed "T" suspension system, including hangers and inserts.

3. Formations Square and rectangle cloud.

4. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.

5. Cutting, drilling, scribing and fitting as required for electro-mechanical penetrations.

6. Perimeter and column moldings, trim and accessories for acoustical ceilings.

1.3 RELATED SECTIONS

A. Drywall ceilings - Section 092900.

B. Diffusers, grilles and related frames - Division 23.

C. Lighting fixtures - Division 26.

1.4 QUALITY ASSURANCE

A. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Construction Association (CISCA).

B. Qualifications of Installers

1. The suspended ceiling subcontractor shall have a record of successful installation of similar ceilings acceptable to Architect and shall be currently approved by the manufacturer of the ceiling suspension system.

2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

C. The work is subject to the following standards:

1. ASTM C 635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings," American Society for Testing and Materials.

2. ASTM C 636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," American Society for Testing and Materials.

D. In addition to suspension system specified, provide seismic struts and seismic clips to meet seismic standards as required by prevailing Codes and Ordinances.

1.5 SUBMITTALS

A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where acoustical ceilings are required, showing:

1. Any deviations from Architect's reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into Architect's ceiling layout due to dimensional restrictions of field conditions.

2. Direction and spacing of suspension members and location of hangers for carrying suspension members.

3. Direction, sizes and types of acoustical units, showing suspension grid members, and starting point for each individual ceiling area.

4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.

5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.

6. Details of construction and installation at all conditions.

7. Materials, gauges, thickness and finishes.

B. Samples and Product Literature: Submit the following samples and related manufacturer's descriptive literature.

1. Twelve (12) inch long sample of each components of suspension systems, including moldings.

2. Acoustical units — full size.

3. Axiom Trim for formation acoustical cloud – 12 inch long sample.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Do not install acoustical ceilings until wet-work in space is completed and nominally dry, work above ceilings has been completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition system.

1.9 EXTRA STOCK

A. Extra Stock: Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

A. Provide 3/4" thick, 24" x 24" mineral fiber panels equal to "Ultima," with square edge, as manufactured by Armstrong World Industries, or equal made by Roxul Rockfon or USG Interiors, Inc. Panels shall have factory applied white finish with light reflectance value of 0.83. Panels shall meet ASTM E 1264, Type III, Form 1, Pattern E I, Class A, with a UL flame spread rating of 0-25.

2.2 AXIOM TRIM

A. Provide Formations Axiom Trim by Armstrong World Industries.

1. Height: 4 inch.

2. Color: as indicated on drawings.

3. Type: Axiom Vector for Formations unless otherwise noted on drawings.

2.3 SUSPENSION SYSTEM

A. Provide exposed "T" suspension system, steel, with low sheen white baked enamel finish equal to "Prelude," 15/16" exposed tee 2-way grid system made by Armstrong World Industries, or equal made by USG Interiors, Inc. or Chicago Metallic Corp.

B. The suspension system shall support the ceiling assembly shown on the drawings and specified herein, with a maximum deflection of 1/360 of the span, in accordance with ASTM C 635.

C. Hanger for suspension system shall be 1" x 3/16", galvanized steel flats or 1/4" diameter galvanized pencil rods spaced 4'-0" o.c. conforming to New York City Code requirements.

D. Main carrying channels, to which suspension systems shall be fastened, shall be 1-1/2" cold rolled galvanized steel channel; spaced 4'-0" o.c., conforming to New York City Code requirements.

E. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.

F. Suspension systems shall conform to ASTM C 635, intermediate duty.

G. Provide manufacturer's standard wall moldings with off-white baked enamel finish to match suspension systems. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

H. Acoustical Clouds: Provide Formations with Axiom Trim by Armstrong World Industries.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas where acoustic panel ceilings are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the layout.

3.2 PREPARATION

A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

A. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations and industry standards.

B. Install suspension systems to comply with ASTM C 636, with wire hangers supported only from building structural members. Locate hangers not more than 6" from each end and spaced 4'-0" along direct-hung runner, leveling to tolerance of 1/8" in 12'-0".

C. Space rod or flat iron (New York City) hangers not more than 4'-0" o.c. along main carrying channels; attach by clips or wire ties to building structure. Locate hangers not more than 6" from each end. Space main carrying channels 4'-0" o.c. Attach suspension system to carrying channels using clips or ties, leveling to a tolerance of 1/8" in 12'-0".

D. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.

E. Install edge moldings at edges of each acoustical ceiling area, and at locations where edge of acoustical units would otherwise be exposed after completion of the work.

1. Secure moldings to building construction by fastening through vertical leg. Space holes not more than 3" from each end and not more than sixteen (16) inches o.c. between end holes. Fasten tight against vertical surfaces.

2. Level moldings with ceiling suspension system, to a level tolerance of 1/8" in 12'-0".

F. Install acoustical units in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

G. Install hold-down clips in toilet areas, and in areas where required by governing regulations; space 2'-0" o.c. on all cross tees.

H. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplemental hangers furnished and installed by this Section of work.

I. Where fixture or ceiling apparatus installation causes eccentric loading on runners, provide stabilizer bars to prevent rotation.

3.4 ADJUST AND CLEAN

A. Clean exposed surfaces of acoustical ceilings, including trim, edge molding, and suspension members; comply with manufacturer’s instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 095133

ACOUSTIC METAL CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the metal acoustic ceilings as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Perforated metal ceilings.

2. Concealed suspension system, including hangers and inserts.

3. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.

4. Cutting, drilling, scribing and fitting as required, including for all electro/mechanical penetrations.

5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

1.3 RELATED SECTIONS

A. Structural deck - Existing

B. Drywall ceilings - Section 092900.

C. Diffusers, grilles and related frames - Division 23.

D. Lighting - Division 26.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers

1. The suspended ceiling subcontractor shall have a record of successful installations of similar ceilings acceptable to the Architect and shall be currently approved by the manufacturer of the ceiling suspension system.

2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Construction Association (CISCA).

C. The work is subject to applicable portions of the following standards:

1. ASTM C635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings", American Society for Testing and Materials.

2. ASTM C636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels", American Society for Testing and Materials.

1.5 SUBMITTALS

A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where metal acoustical tile ceilings are required, showing:

1. Any deviations from Architect’s reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into Architect’s ceiling layout due to dimensional restrictions of field conditions.

2. Direction and spacing of suspension members and location of hangers for carrying suspension members.

3. Direction, sizes and types of metal acoustical units, showing suspension grid members, and starting point for each individual ceiling area.

4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.

5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.

6. Details of construction and installation at all conditions.

7. Materials, gauges, thickness and finishes.

B. Samples: Submit samples, including manufacturer's descriptive literature for:

1. All components of suspension systems, including moldings.

2. Metal acoustical tile - full size.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Handle metal acoustical ceiling units carefully to avoid damaging units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition system.

PART 2 PRODUCTS

2.1 METAL CEILING PANELS

A. Provide “Illusions” aluminum acoustic panels, 0.040" thick, manufactured by USG/Ceilings Plus, or approved equal by the Architect.

1. Finish: as indicated in the finish schedule on the drawings.

B. The ceiling panels are to be brake die formed from a single sheet and formed with a minimum 1 1/4" integral return edge on all panel sides. No indentations, marks or defacing of the exposed surface of the metal ceiling panel will be allowed.

C. No fasteners of any kind shall be visible on exposed face surfaces of ceiling panels or support tees. Down light openings and sprinkler holes shall be factory precision cut as required.

D. The plenum shall be 100% accessible. Every panel must be removable. Progressive panel access is not acceptable. Heavy duty torsion springs and clip assemblies to be mounted to every panel for downward access, without potential for damage to panel face or hinge assembly. Hinge assembly shall be attached to panel with minimum 2 flush fasteners. Attaching torsion spring directly to panel with fastener will not be accepted.

2.2 SUSPENSION SYSTEM

A. Provide 1-3/8" semi-concealed and fully concealed face main tee and cross tee with tightly butted reveal and matching recessed shadow line perimeter trim as shown on drawings. Provide system complete with sub-members, hangers, clips and accessories, of the sizes and strengths required to accommodate and support the ceiling units and other work supported by the ceiling system; with deflections limited to 1/360 of spans (between support points of members). Provide exposed perimeter shadow trim, 1/2" wide, finished to match “black” acoustic panels.

1. Tees shall be factory slotted to accept torsion spring; color to match ceiling panels.

B. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sized for pull-out resistance of not less than 5 times the hanger design load as indicated in ASTM C635, Table 1, Direct Hung.

C. Hanger for suspension system shall be 1" x 3/16", galvanized steel flats or 1/4" diameter galvanized pencil rods spaced 4'-0" o.c., unless greater required by Code.

D. Main carrying channels, to which suspension systems shall be fastened, shall be 1-1/2" cold rolled galvanized steel channel; spaced 4'-0" o.c., unless greater required by Code.

E. Suspension system shall conform to ASTM C635, heavy duty, with deflection limited to 1/360 of span.

F. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

G. Perimeter edge trim shall have finish to match panel.

H. Refer to drawings for details for additional requirements.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas where metal acoustic ceilings are to be installed and correct any of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

B. Measure each ceiling area and establish layout of metal acoustic units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

A. Codes and Standards: Install materials in accordance with manufacturer’s printed instructions, and to comply with governing regulations and industry standards.

B. Install suspension systems to comply with ASTM C 636, as applicable, with hangers supported only from building structural members. Locate hangers not less than 6" from each end, leveling to tolerance of 1/8" in 12'-0".

C. Space rod or flat iron hangers not more than 4'-0" o.c. along main carrying channels; attach by clips or wire ties to building structure. Locate hangers not more than 6” from each end. Space main carrying channels 4'-0" o.c. Attach suspension system to carrying channels using clips or ties, leveling to a tolerance of 1/8" in 12'-0". Provide supplemental framing to comply with wind uplift requirements and calculations.

D. Install edge moldings at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

1. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.

E. Scribe and cut metal acoustical units for accurate fit at borders and at interruptions and penetrations by other work through the ceilings. Stiffen edges of cut units as required to eliminate evidence of oil-canning or buckling.

F. Install snap-in acoustical units, complete with acoustical pads, in coordination with suspension system and exposed moldings.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions.

2. Fit adjoining tile to form flush, tight joints. Scribe and cut for accurate fit at borders and around work which penetrates ceiling.

G. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplementary hangers furnished and installed by this Section of work.

3.4 CLEANING AND PROTECTION

A. Clean exposed surfaces of metal acoustical units, and of trim, edge moldings and suspension members; comply with manufacturers' instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION

SECTION 095400

SEAMLESS ACOUSTICAL CEILING SYSTEM

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the monolithic ceiling system as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Seamless acoustical ceiling system.

2. Concealed accessible suspension system, including hangers and inserts, where indicated.

3. Provisions for the installation of lighting fixtures, diffusers, grilles, and similar items provided under other Sections.

4. Cutting, drilling, scribing, and fitting as required for electro-mechanical penetrations.

5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

1.3 RELATED SECTIONS

A. Drywall ceilings - Section 092900.

B. Acoustical Panel Ceilings – Section 095113.

C. HVAC - Division 23, for diffusers, grilles and related frames.

D. Electrical - Division 26, for lighting fixtures.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

4. ASTM C 645 Standard Specification for Metal Suspension Systems.

5. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

6. ASTM C754 AND C1858; all installations shall be in compliance with these tests.

7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

9. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint.

10. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

11. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation between Rooms Sharing a Common Ceiling Plenum.

12. ASTM E 1264 Classification for Acoustical Ceiling Products.

13. ASTM E3090 All references to suspension component property testing per this test method.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

C. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

D. Acoustical Panels: As with other architectural features located at the ceiling that may obstruct or skew the planned fire sprinkler pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

E. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers

F. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Contractor's Association.

G. Mockup: Build mockup of typical ceiling area as shown on Drawings to demonstrate layout, surface finish, lighting integration, air device integration, and workmanship quality.

1. Approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site before installing seamless acoustical ceiling systems. Review substrate conditions, suspension layout, ceiling penetrations, lighting conditions, access panel locations, control joints, finish application, protection, and sequencing.

I. Qualifications of Installers

1. The suspended ceiling subcontractor shall have a record of successful installation of similar ceilings acceptable to Architect and shall be currently approved by the manufacturer of the ceiling suspension system.

2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of ceiling unit and suspension system required.

B. Samples: Minimum 6 x 6 inch samples of specified panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of ceilings. Show locations of items that are to be coordinated with or supported by the ceilings.

D. Installation Instructions: Submit manufacturer's installation instructions as referenced in Part three, Installation.

E. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.8 PROJECT CONDITIONS

A. Do not install acoustical ceilings until wet-work in space is completed and nominally dry, work above ceilings has been completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

B. Space Enclosure: Building areas to receive ceilings shall be free of construction dust and debris. panels should be installed in areas where the building is enclosed and the HVAC is continuously functioning. This product is not recommended for exterior applications, where standing water is present, or where moisture will come into direct contact with the ceiling.

1. HVAC should be designed, installed, and operated in accordance with ASHRAE Standard 62.1. It is also necessary for the area to be enclosed, for the HVAC systems to be functioning, and in continuous operations for the life of the product. Product is not intended for use where natural ventilation is part of the ventilation strategy and not recommended in areas where a differential plenum pressure exists.

1.9 COORDINATION

A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition system.

1.10 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Manufacturer’s defects in material.

2. Grid System: Rusting and manufacturer's defects.

B. Warranty Period:

1. Acoustical Panels: Ten (10) years from date of substantial completion.

2. Suspension System: Ten (10) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 PRODUCTS

2.1 SEAMLESS ACOUSTICAL CEILING SYSTEM

A. Provide 7/8" thick, 48" x 72" wet-formed, mineral fiber panels equal to "ACOUSTIBuilt," No. 2604, as manufactured by Armstrong World Industries or approved equal by USG Interiors, LLC, or equal as approved by the Architect. Panels shall receive a spray-applied, fine-textured white finish with light reflectance value of 0.87. Panels shall meet ASTM E 1264, Type IV, Form 1, Pattern G, Class A, with minimum UL flame spread of 25 and smoke developed of 50 per ASTM E 84.

B. Finish:

1. Joint Compound:

a. Setting Compound: Lightweight setting-type drywall joint compound, ultra-lightweight, drying-type drywall joint compound.
b. Joint Tape: Self-adhesive mesh drywall joint tape.

2. Spray Applied Finish, Required Product: #2605WH Fine Texture Finish for ACOUSTIBuilt panels; white, as manufactured by Armstrong World Industries.

C. Suspension Systems and Washers: Armstrong Drywall Suspension Systems all main beams and cross tees shall be commercial quality hot-dipped galvanized steel.

1. Main beam: manufactured main beam- 1-1/2" knurled face with ScrewStop reverse hem by 1-11/16 inches high. Drywall Main Beams are factory punched with cross tee routs, hanger wire holes, and SuperLock main beam clip for a strong secure connection and fast accurate alignment. Both ShortSpan and Drywall Main Beams are Heavy-duty performance per ASTM C635; spaced 4'-0" o.c., conforming to New York City Code requirements.

   a. HD8906 – 12-ft. HD Drywall Main Beam 1-1/2 inches.

2. Cross Tees: manufactured cross tee- 1-1/2" knurled face with ScrewStop™ reverse hem by 1-1/2 inches high with factory punched cross tee routs and hanger wire holes and XL stake on clip for a strong secure connection.

   a. XL8945P – 4-ft. Drywall Cross Tee.
   b. XL8965 – 6-ft. Drywall Cross Tee.

3. Wall Molding: KAM12, 12-ft. Knurled Angle Molding, 1-1/4" face.

4. Hangers: Hanger for suspension system shall be 1" x 3/16", galvanized steel flats or 1/4" diameter galvanized pencil rods spaced 4' 0" o.c. conforming to New York City Code requirements.

5. Fasteners (for panel attachment):

   a. #6 x1-1/4" fine thread or sharp point self-drilling drywall screws.
   b. Grip-plate washer for ACOUSTIBuilt panels (1-1/4" diameter) - #2119.

6. Perimeter Systems:

   a. Commercial quality extruded aluminum alloy 6063 trim channel, factory finished in baked polyester paint. Commercial quality galvanized steel unfinished T-bar connection clips; galvanized steel splice plates.
      1). Color: White.
      2). Size: 120" x 4"
      3). Recycle Content: Post-Consumer - 50%; Pre-Consumer - 0%.
      4). Acceptable Product: AXIOM one-piece for drywall, 4 inches straight AX1PC4STR or curved AX1PC4CUR as manufactured by Armstrong World Industries.
   b. Axiom Trim Channel:
      1). AX4STR 4" Axiom Classic Straight.
      2). AX1PC4STR 4" one-piece Drywall Trim.
   c. Axiom Bottom Trim with Taping Flange: AXBTASTR bottom trim for ACOUSTIBuilt.
   d. Axiom Accessories: AXSPLICE Splice Plate.

2.2 SUSPENSION SYSTEMS, GENERAL

A. The suspension system shall support the ceiling assembly shown on the drawings and specified herein, with a maximum deflection of 1/360 of the span, in accordance with ASTM C 635.

B. Hanger for suspension system shall be 1" x 3/16", galvanized steel flats or 1/4" diameter galvanized pencil rods spaced 4'-0" o.c. conforming to New York City Code requirements.

C. Main carrying channels, to which suspension systems shall be fastened, shall be 1-1/2" cold rolled galvanized steel channel; spaced 4'-0" o.c., conforming to New York City Code requirements.

D. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.

E. Suspension systems shall conform to ASTM C 635, intermediate duty.

F. Provide manufacturer's standard wall moldings with off-white baked enamel finish unless otherwise noted, to match suspension systems. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas where acoustical panel ceilings are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the layout.

3.2 PREPARATION

A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

A. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations and industry standards.

B. Space rod or flat iron (New York City) hangers not more than 4'-0" o.c. along main carrying channels; attach by clips or wire ties to building structure. Locate hangers not more than 6" from each end. Space main carrying channels 4'-0" o.c. Attach suspension system to carrying channels using clips or ties, leveling to a tolerance of 1/8" in 12'-0".

C. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.

D. Comply with manufacturer's installation instructions for panels.

E. Controls joints are required following the standards used for gypsum board listed in ASTM C840, Section 20

1. Ceilings with perimeter relief cannot exceed 50 LF and 2500 SF between control joints.

2. Ceilings without perimeter relief cannot exceed 30 LF and 900 SF between control joints.

F. Panel joints and fasteners are finished with tape and compound to create a flat surface. While the materials used to finish panels are also used to finish drywall, the procedure has unique requirements.

G. Joint compound coverage shall be limited to preserve the acoustical performance of the panels. Compound at panel joints shall not exceed 8 inch widths. Compound applied to field fasteners shall not exceed 4 inch by 4-inch areas. All compound shall be smooth and free of tool marks and ridges. Panels are to be finished with taping knives. Production tools, including boxes, are not permitted.

H. Sanding and inspection: Throughout the sanding process, inspect the surface frequently for flatness. Direct a light across the ceiling to highlight unevenness that requires attention.

I. Fine Texture Finish shall be applied in 4-coat process (additional coat may be used to achieve the desired finish) as called out in the installation instructions. Fine Texture Finish for panels is applied in multiple coats, layered to achieve a uniform appearance and acoustical performance. It is strongly encouraged to practice spraying to ensure proper calibration and technique are achieved.

1. Must be applied with an air assist spray system (refer to manufacturers installation instructions for required equipment). Fine texture finish is not intended for use with airless spray or to be manually applied by rolling.

2. See manufacturer's installation instructions for correct pressure settings for spray system, finish preparation, spray calibration and spray procedure and technique.

3.4 ADJUST AND CLEAN

A. Clean exposed surfaces of acoustical ceilings, including trim, edge molding, and suspension members; comply with manufacturer’s instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 096513

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient accessories, as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Rubber base.

2. Transition strips.

3. Accessories.

1.3 RELATED SECTIONS

A. Gypsum Drywall - Section 092900.

B. Finished Concrete - Section 033510.

C. Architectural Woodwork – Section 064023.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.5 SUBMITTALS

A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient base.

B. Samples

1. Submit six (6) inch long samples of base.

2. Submit full-size sample of stair tread & riser.

1.6 DELIVERY AND STORAGE

A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.

B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F. for at least forty-eight (48) hours before start of installation.

1.7 JOB CONDITIONS

A. Continuously heat spaces to receive base to a temperature of seventy (70) degrees F. for at least forty-eight (48) hours prior to installation, whenever project conditions are such that heating is required. Maintain seventy (70) degrees F. temperature continuously during and after installation as recommended by the manufacturer, but for not less than forty-eight (48) hours. Maintain a temperature of not less than fifty-five (55) degrees F. in areas where work is completed.

PART 2 PRODUCTS

2.1 RUBBER BASE

A. Provide 4" high by 1/8" thick continuous vulcanized SBR rubber top set cove base with pre-formed internal and external corner pieces, color as scheduled. Base shall conform to ASTM F 1861, Type TS, Group 1 (solid). Provide "BaseWorks" as manufactured by Johnsonite, or comparable product of Armstrong, Roppe, Nora Systems, Inc., or approved equal. See finish schedule.

2.2 ACCESSORIES

A. Transitions: provide Roppe rubber adapter and transitions, refer to the finish schedule on the drawings for additional information.

B. Adhesives: Waterproof, stabilized type, as recommended by the manufacturer for the type of service indicated.

C. Concrete Slab Primer: Non-staining type recommended by the tile manufacturer.

D. Leveling Compound: Latex/Portland cement flash patching and leveling compound equal to No. DSP-520 made by H.B. Fuller or No. 226 with 3701 admixture made by Laticrete or equal made by Mapei, or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where resilient base and accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Bases: In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc., without gaps at top or bulges at bottom, with tight joints and flush edges, with molded corner pieces at internal and external corners. Provide end stops adjacent to flush type door frames and where base does not terminate against an adjacent surface. Keep base in full contact with walls until adhesive sets.

3.3 CLEANING AND PROTECTION

A. Remove any excess adhesive or other surface blemishes from base using neutral type cleaners as recommended by the manufacturer.

END OF SECTION

SECTION 099000

PAINTING AND FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Prime painting unprimed surfaces to be painted under this Section.
2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
3. Painting exposed ductwork.
4. Painting all ferrous metal (except stainless steel) exposed to view.
5. Painting all galvanized ferrous metals exposed to view.
6. Painting interior concrete block exposed to view.
7. Painting gypsum drywall exposed to view.
8. Painting plaster surfaces.
9. Painting concrete floor.
10. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
11. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
12. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
13. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
14. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

1.3 RELATED SECTIONS

A. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.

B. Shop Coat on Machinery and Equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished, including, but not necessarily limited to, the following Sections. All items of equipment furnished with prime coat finish shall be finish painted under this Section.

1. Plumbing - Division 22.

2. Heating, ventilation and air conditioning - Division 23.

C. Color Coding of Mechanical Piping and Electrical Conduits - Divisions 22 and 26.

1. This Color Coding consists of an adhesive tape system and is in addition to painting of piping and conduits under this Section, as specified above.

1.4 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.

B. Factory-finished toilet partitions.

C. Factory-finished acoustical tile.

D. Non-ferrous metals, except for items specified and/or indicated to be painted.

E. Finished hardware, excepting hardware that is factory primed.

F. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

1.5 QUALITY ASSURANCE

A. Job Mock-Up

1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Architect. Paint mock-ups to include door and frame assembly.

2. These applications when approved will establish the quality and workmanship for the work of this Section.

3. Repaint individual areas which are not approved, as determined by the Architect, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.

B. Qualification of Painters: Use only qualified painters for the mixing and application of paint on exposed surfaces.

C. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the

total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Architect in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing codes and ordinances.

1.6 SUBMITTALS

A. Materials List

1. Before any paint materials are delivered to the job site, submit to the Architect a complete list of all materials proposed to be furnished and installed under this portion of the work.

2. This shall in no way be construed as permitting substitution of materials for those specified or accepted for this work by the Architect.

B. Samples

1. Accompanying the materials list, submit to the Architect copies of the full range of colors available in each of the proposed products.

2. Upon direction of the Architect, prepare and deliver to the Architect two (2) identical sets of Samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.

C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.

D. Close out Submittal

1. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or plant manufacturer/supplier shall furnish a coating maintenance manual such as Sherwin Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, MSDS, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.7 PRODUCT HANDLING

A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

B. Protection

1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.

2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

3. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 EXTRA STOCK

A. Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling approximately ten (10) percent of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

1.9 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.1 PAINT MANUFACTURERS

A. Except as otherwise noted, provide the painting products listed for all required painting made by one of the manufacturers listed in the paint schedule (Section 2.4). These companies are Benjamin Moore, The Pittsburgh Paints Company (PITT), PPG Paints (PPG) distributed by The Pittsburgh Paints Company, and Sherwin Williams (S-W). Comply with number of coats and required minimum mil thicknesses as specified herein.

2.2 MATERIALS

A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only to recommended limits.

B. Colors and Glosses: All colors and glosses shall be as selected by the Architect. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Architect. Color schedule (with gloss) shall be furnished by the Architect.

C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.

D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.

E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.

F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.

G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.

H. Heat Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

A. The various surfaces shall be painted or finished as specified below in Article 2.4. However, the Architect reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the Owner.

B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.

C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.

D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.

E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.

F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.

G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Architect prior to application of the coating.

2.4 SCHEDULE OF FINISHES

A. High Performance Coating on Exterior Galvanized Ferrous Metals

First Coat:	PPG- Amerlock 600 Epoxy Series; "Series 1224 " by Tnemec; "Epoxy Mastic Coating V160" by Benjamin Moore Corotech; or "Low VOC Recoatable Epoxy Primer B67-W45" by Sherwin Williams.
Second Coat:	PITT-Pitthane Ultra 95-812 (Gloss)" or "High Build 95-8800 (Semi-Gloss).; "Series 1094 (gloss) " or "Series 1095 (semi-gloss) " by Tnemec; "Aliphatic Acrylic Urethane V500 (Gloss)" or "V510 (Semi-Gloss)" by Benjamin Moore Corotech; or "Hi-Solids Urethane B65-300/350" by Sherwin Williams.

B. High Performance Coating on Exterior Non-Galvanized Ferrous Metals

Prime Coat:	PPG- Amercoat 68HS Epoxy Zinc-Rich Primer; "Series 94-H_2O Hydro-Zinc" by Tnemec; “Epoxy Mastic Coating V160” by Benjamin Moore; or "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams.

Second Coat: PPG- Amerlock 600 Epoxy ; "Series 1224" by Tnemec; "Aliphatic Acrylic Urethane V500 (Gloss)" or "V510 (Semi-Gloss)" by Benjamin Moore Corotech; or "Macropoxy 646 Fast Cure Epoxy B58-600" by Sherwin Williams.

Third Coat: PITT- Pitthane Ultra 95-812 (Gloss)" or "High Build 95-8800 (Semi-Gloss); "Series 1094 (gloss) " or "Series 1095 (semi-gloss) Fluoronar" by Tnemec; "Aliphatic Acrylic Urethane V500 (Gloss)" or "V510 (Semi-Gloss)" by Benjamin Moore Corotech; or "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams.

C. Interior Ferrous Metal

Satin Finish/Latex

Primer: Benj. Moore Ultra Spec HP Acrylic Metal Primer (HP04)
PITT- Pitt Tech Plus DTM Acrylic Primer 90-1912
S-W Pro-Industrial Pro-Cryl Universal Primer B66-3100 Series

First Coat: Benj. Moore Ultra Spec-HP DTM Acrylic Low Luster (HP25)
PITT- Pitt-Tech WB EP DTM Acrylic Satin 90-1710
S-W Pro Industrial Acrylic Eg-Shel, B66-660 Series

Second Coat: Benj. Moore Ultra Spec-HP DTM Acrylic Low Luster (HP25)
PITT- Pitt-Tech WB EP DTM Acrylic Satin 90-1710
S-W Pro Industrial Acrylic Eg-Shel, B66-660 Series

a. Total DFT not less than: 3.9 mils

Semi-Gloss Finish/Latex

Primer: Benj. Moore Ultra Spec-HP Acrylic Metal Primer (HP04)
PITT- Pitt Tech Plus DTM Acrylic Primer 90-1912
S-W Pro-Industrial Pro-Cryl Universal Primer B66-3100 Series

First Coat: Benj. Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29)
PITT- Pitt-Tech WB EP DTM Acrylic Semi-Gloss 90-1610
S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series

Second Coat: Benj. Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29)
PITT- Pitt-Tech WB EP DTM Acrylic Semi-Gloss 90-1610
S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series

a. Total DFT not less than: 4.0 mils

D. Interior Concrete Block

Flat Finish/Vinyl Acrylic Latex over Filler

Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PITT-Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150

First Coat: Benj. Moore Ultra Spec 500 Flat, T535
PITT- Pure Performance Latex Flat, 9-1 series
S-W Super Paint Latex Flat, A86 series

Second Coat: Benj. Moore Ultra Spec 500 Flat, T535
PITT- Pure Performance Latex Flat, 9-1 series
S-W Super Paint Latex Flat, A86 series

a. Total DFT not less than: 10.7 mils

Eggshell Finish/Vinyl Acrylic Latex Over Filler

Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PITT- Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150

First Coat: Benj. Moore Ultra Spec 500 Latex Eggshell, T538
PITT- Pure Performance Latex Eggshell, 9-3 series
S-W Super Paint Latex Eg-Shel, A87 Series
Second Coat: Benj. Moore Ultra Spec 500 Latex Eggshell, T538
PITT- Pure Performance Latex Eggshell, 9-3 series
S-W Super Paint Latex Eg-Shel, A87 Series
a. Total DFT not less than: 10.9 mils

Semi-Gloss Finish/Vinyl Acrylic Latex over Filler
Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PITT- Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150
First Coat: Benj. Moore Ultra Spec 500 Latex Semi-Gloss, T546
PITT- Pure Performance Latex Semi-Gloss Latex, 9-5 series
S-W Super Paint Latex Semi-Gloss, A88 series
Second Coat: Benj. Moore Ultra Spec 500 Latex Semi-Gloss, T546
PITT- Pure Performance Latex Semi-Gloss, 9-5 series
S-W Super Paint Latex Semi-Gloss, A88 series
a. Total DFT not less than: 10.7 mils

E. Interior Drywall

Flat Finish/Vinyl Acrylic Latex
Primer: Benj. Moore Ultra Spec 500 Interior Latex Primer (N534)
PITT- Speedhide Zero Interior Latex Primer 6-4900XI
S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
First Coat: Benj. Benj. Moore Ultra Spec 500 Flat, T535
PITT- Pure Performance Latex Flat, 9-1 series
S-W Super Paint Latex Flat, A86 series
Second Coat: Benj. Benj. Moore Ultra Spec 500 Flat, T535
PITT- Pure Performance Latex Flat, 9-1 series
S-W Super Paint Latex Flat, A86 series
a. Total DFT not less than: 3.6 mils

Matte Finish / Scuff Resistant Latex
Primer: Benjamin Moore Ultra Spec 500 Interior Latex Primer (N534)
First Coat : Benjamin Moore Scuff X Latex Matte Finish (N484)
Second Coat : Benjamin Moore Scuff X Latex Matte Finish (N484)
a. Total DFT not less than 4.6 mils

Matte Finish/Scuff & Stain Resistant
Primer: Pitt Speedhide Zero Interior Latex Primer 6-4900XI
First Coat: Pitt-Ultralast Interior Latex Matte 13-210
Second Coat: Pitt-Ultralast Interior Latex Matte 13-210

Eggshell Finish/ Scuff Resistant Latex
Primer: Benjamin Moore Ultra Spec 500 Interior Latex Primer (N534)
First Coat: Benjamin Moore Scuff-X Latex Eggshell (485)
Second Coat: Benjamin Moore Scuff-X Latex Eggshell (485)
a. Total DFT not less than 4.6 mils

Eggshell Finish/Vinyl Acrylic Latex
Primer: Benj. Moore Ultra Spec 500 Interior Latex Primer (N534)
PITT- Speedhide Zero Interior Latex Primer 6-4900XI
S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
First Coat: Benj. Moore Ultra Spec 500 Latex Eggshell, T538
PITT- Pure Performance Latex Eggshell, 9-3 series
S-W Super Paint Latex Eg-Shel, A87 Series
Second Coat: Benj. Moore Ultra Spec 500 Latex Eggshell, T538
PITT- Pure Performance Latex Eggshell, 9-3 series
S-W Super Paint Latex Eg-Shel, A87 Series
b. Total DFT not less than: 3.8 mils

Eggshell Finish/Scuff and Stain Resistant Acrylic Latex
Primer: PITT Speedhide Zero Interior Latex Primer 6-4900XI
First Coat PITT- UltraLast Interior Latex Paint + Primer Eggshell 13-310
Second Coat PITT_ UltraLast Interior Latex Paint + Primer Eggshell 13-310

F. Interior Painted Wood

Satin Finish/Latex
Primer: Benj. Moore Ultra Spec 500 Latex Primer (N534)
S-W Multi-Purpose Latex Primer/Sealer B51 Series
First Coat: Benj. Moore Ultra Spec 500 Latex Satin (T545)
S-W Super Paint Latex Semi-Gloss, A88 Series
Second Coat: Ben. Moore Ultra Spec 500 (T545)
S-W Super Paint Latex Semi-Gloss, A88 Series
a. Total DFT not less than: 4.0 mils

Semi-Gloss Finish/Latex
Primer: Benj. Moore Ultra Spec 500 Latex Primer (N534)
PITT- Seal Grip Int./Ext. Acrylic Primer/Sealer 17-921XI
S-W Multi-Purpose Latex Primer/Sealer B51 Series
First Coat: Benj. Moore Ultra Spec 500 Semi-Gloss (T546)
PITT- Pure Performance Int Latex Semi-Gloss, 9-5 Series
S-W Super Paint Int Latex Semi-Gloss, A88 Series
Second Coat: Benj. Moore Ultra Spec 500 Latex Semi-Gloss (T546)
PITT- Pure Performance Latex Semi-Gloss, 9-5 Series
S-W Super Paint Latex Semi-Gloss, A88 Series
a. Total DFT not less than: 3.8 mils

G. Primer for Fiberglass Faced Drywall:

1 coat Benjamin Moore 046 Fresh Start Acrylic Superior Primer
1 coat PITT- Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer 17-921XI
1 coat Pratt & Lambert "Suprime" Interior Latex Enamel Undercoater Z1013/F1013
1 coat Sherwin Williams "Builders Solution."

H. Concrete Floor: Light Industrial Epoxy- (No trucks/forklifts)

Primer: Benj. Moore HP Concrete & Metal Epoxy Primer, HP1550
PPG Flooring 100% Solids 912 LV Epoxy Primer
First Coat: Benj. Moore HP Waterborne Epoxy, HP4400

PITT Aquapon WB EP Ultra Low VOC Water Based Semi-Gloss or Gloss Epoxy, 98-51E Series
Second Coat: Benj. Moore HP Waterborne Epoxy, HP4400
PITT Aquapon WB EP Ultra Low VOC Water Based Semi-Gloss or Gloss Epoxy, 98-51E Series
**Non-Slip Additives: broadcasted into the first coat of epoxy finish.
Non-Slip Aggregate: Corotech V630 Anti-Slip Aggregate
Non-Slip: Add PITT Amercoat 886 Anti-Slip Additive (pumice)

2.5 EXISTING SURFACES TO BE PAINTED

A. Existing surfaces shall be painted in accordance with schedule given in Article 2.4 herein except that first or prime coat may be eliminated where existing paint is sound. Where existing paint must be removed down to base material, provide first or prime coat as specified.

2.6 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW

A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.

B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.

C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.

D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.

E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.

F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.

G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.

H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Architect in writing.

B. The Contractor shall furnish the Architect a schedule showing when he expects to have completed the respective coats of paint for the various areas and surfaces. This schedule shall be kept current as the job progresses.

C. The Contractor shall protect his work at all times, and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.

D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.

E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.

H. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.

I. All suction spots or "hot spots" in plaster after the application of the first coat shall be touched up before applying the second coat.

J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.3 PREPARATION OF SURFACES

A. Existing Surfaces: Clean existing surfaces requiring paint or finishing, remove all loose and flaking paint or finish and sand surface smooth as required to receive new paint or finish. No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, Contractor shall be required to sand smooth and re-finish until surface meets with Architect's approval.

B. General

1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be perfectly dry, clean and smooth.

2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.

3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

C. Metal Surfaces

1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.

2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.

   a. Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to ensure that this cleaning method is followed.

3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.

4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.

5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.

D. Plaster Surfaces: Scrape off all plaster nibs or other projections and sand smooth or finish to match adjoining surface texture. Cut out all scratches, cracks, holes, depressions and similar voids and fill with non-shrinking grout, spackles, patching plaster or other approved patching material; allow to dry, refill if necessary, then sand smooth (or refinish) to provide a flush, smooth surface of the same texture as the adjacent plaster surface.

1. Allow at least 28 days, from installation of final plaster coat, before starting work.

E. Gypsum Drywall Surfaces: Scrape off all projections and splatters, spackles all holes or depressions, including taped and spackled joints, sand smooth. Conform to standards established in Section 092900, "Gypsum Drywall."

F. Wood Surfaces: Sand to remove all roughness, loose edges, slivers, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.

G. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids not filled under the "Masonry" Section, with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.

H. Testing for Moisture Content: Contractor shall test all plaster, masonry, and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.

I. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

A. Mix and prepare painting materials in strict accordance with the manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. General

1. Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.

2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper, or rub surfaces with pumice stone, where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.

3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.

   a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.

5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.

6. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.

7. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.

8. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.

9. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with

filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

B. Scheduling Painting

1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

E. “Touching-Up” of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To “touch-up,” the Contractor shall use the factory finished material manufacturer’s recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.7 CLEAN UP

A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.

B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

SECTION 101400

SIGNAGE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

B. Work of this Section shall comply with FIT standards.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the signage as shown on the drawings and/or specified herein, including the following:

1. Interior panel signs.

1.3 RELATED SECTIONS

A. Exit signs - Division 26.

1.4 QUALITY ASSURANCE

A. For actual installation of signage, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the required skills.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of signage required.

B. Samples: Submit samples of each type of signage showing finishes, colors, surface textures and qualities of manufacture and design of each sign component including graphics.

C. Shop Drawings: Submit shop drawings for fabrication and erection of signage. Include plans, elevations, and large scale details of sign wording and lettering layout. Show anchorage and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 INTERIOR PANEL SIGNS

A. Fire egress, floor, and other signs required by Code shall be as follows:

1. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, manufactured from manufacturer's standard acrylic sheet, unframed. Comply with requirements indicated for finishes, colors, designs, shapes, sizes, and details of construction (as selected by the Architect).

2. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth. Fill engraved copy with enamel.

3. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surfaces, in contrasting color.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where signage is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install units and components at the locations directed by the Architect, securely mounted with concealed theft-resistant fasteners. Attach to substrates in accordance with the manufacturer's instructions.

B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by the Architect.

END OF SECTION

SECTION 102600

WALL AND CORNER GUARDS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the wall and corner guards as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Gypsum drywall – Section 092900

1.4 QUALITY ASSURANCE

A. Cover materials shall be classified in accordance with ASTM E 84 as to flame spread and smoke development and shall be classified as self-extinguishing in accordance with ASTM D 635.

1.5 SUBMITTALS

A. Samples: Two (2) samples of wall guards and corner guards each 12” long shall be delivered to the Architect.

B. Shop Drawings: Submit shop drawings for wall and corner guards showing all anchorage devices.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wall guards shall be surface mounted, Model SCR-40N, as manufactured by C/S Group., size as indicated on the drawing. Guards shall have a 0.078” thick continuous extruded vinyl cover securely locked in place over the concealed retainer. Guards shall be provided with retainers having intermediate supports for the cover.

B. Corner guards shall be flush mounted, Model WX5 Series Flush Mount Corner Guard as manufactured by Wallprotex, with 0.080” thick continuous extruded vinyl cover, or equal by C/S Group.

1. Width: as indicated on the drawings.

2. Height: as indicated on the drawings.

3. Color: as indicated in the finish schedule.

C. Color of vinyl for wall and corner guards shall be as selected by the Architect.

D. Vinyl covers shall be rated Class “I” as to flame spread and smoke development.

E. Similar wall and corner guards as manufactured by Brown Manufacturing Co. or InPro. are acceptable.

F. Appropriate end caps, bolts, and other required fitting shall be provided.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where wall and corner guards are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Wall guards shall be installed by bolting with 1/4” toggle bolts through the retainer and the gypsum wallboard substrate. Bolts shall be 32” o.c. for wall guards and shall securely anchor wall guards. Corner guards shall be installed by self-tapping sheet metal screws through the retainer, the gypsum wallboard substrate and the metal wall stud. Screws shall be 20” o.c. for corner guards and shall securely anchor the corner guards.

B. Wall guards shall be set parallel to the floor at heights shown on the Drawings.

C. Corner guards shall be set in alignment with the corner bead of the gypsum wallboard substrate.

3.3 ADJUST AND CLEAN

A. Clean surfaces promptly after installation, exercise care to avoid damage to surfaces.

B. Protect wall and corner guards from damage until acceptance of work.

END OF SECTION

SECTION 102800

TOILET ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

B. Work of this Section shall comply with FIT standards.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the toilet accessories as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Mirrors.

2. Soap dispensers.

3. Combination towel dispenser and disposal units.

4. Sanitary napkin disposal units.

5. Grab bars.

6. Toilet tissue dispenser.

7. Shelf and hook strip for Janitor's Closets.

1.3 RELATED SECTIONS

A. Gypsum board partitions - Section 092900.

B. Ceramic tile - Section 093000.

1.4 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units. Accessories shall be installed at heights in compliance with prevailing Handicapped Code.

C. Products: Unless otherwise noted, provide products of same manufacturer for each type of unit and for units exposed in same areas.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, catalogue cuts and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work

C. Submit schedule of accessories indicating quantity and location of each item.

1.6 PRODUCT HANDLING

A. Deliver accessories to the site ready for use in the manufacturer’s original and unopened containers and packaging, bearing labels as to type or material, manufacturer’s name and brand name. Delivered materials shall be identical to approved samples.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Galvanized Steel Sheet: ASTM A 653, G60.

D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

E. Mirrors: ASTM C 1503, mirror glazing quality, clear glass mirrors, nominal 1/4" thick.

2.2 FASTENING DEVICES

A. Exposed Fasteners: Theftproof type, chrome plated, or stainless steel; match finishes on which they are being used.

B. Concealed Fasteners: Galvanized (ASTM A 123) or cadmium plated.

C. No exposed fastening devices permitted on exposed frames.

D. For metal stud drywall partitions, provide ten (10) gauge galvanized sheet concealed anchor plates for securing surface mounted accessories.

2.3 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Unobtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish two keys for each lock.

B. Surface-Mounted Toilet Accessories, General: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage.

C. Recessed Toilet Accessories, General: Fabricate units of all welded construction, without mitered corners. Hang doors of access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

2.4 MANUFACTURERS

A. Provide products manufactured by Bobrick Washroom Equipment Co., American Specialties, Inc., Bradley Corp., A & J Washroom Accessories or approved equal.

2.5 ACCESSORY SCHEDULE

A. Unless otherwise noted, model numbers used herein are those of Bobrick. Other manufacturers listed herein may substitute their products with the approval of the Architect.

B. Accessories

1. Refer to Accessory Schedule on drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where toilet accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Accessories which are to be partition mounted shall be closely coordinated with other trades, so that the necessary reinforcing is provided to receive the accessories.

B. Furnish templates and setting drawings and anchor plates required for the proper installation of the accessories at gypsum drywall and masonry partitions. Coordinate the work to assure that base plates and anchoring frames are in the proper position to secure the accessories.

C. Verify by measurements taken at the job site those dimensions affecting the work. Bring field dimensions which are at variance with those on the approved shop drawings to the attention of the Architect. Obtain decision regarding corrective measures before the start of fabrication of items affected.

D. Cooperate in the coordination and scheduling of the work of this Section with the work of other Sections so as not to delay job progress.

3.3 INSTALLATION

A. Install accessories at locations indicated on the drawings, using skilled mechanics, in a plumb, level and secure manner.

B. Concealed anchor assemblies for gypsum drywall partitions shall be securely anchored to metal studs to accommodate accessories. Assemblies shall consist of plates and/or angles tack welded to studs.

C. Secure accessories in place, at their designated locations by means of theftproof concealed set screws, so as to render removing of the accessory with a screwdriver impossible.

D. Unless otherwise indicated, accessories shall conform to heights from the finished floor as shown on the drawings. Where locations are not indicated, such locations shall be as directed by the Architect.

E. Installed accessories shall operate quietly and smoothly for use intended. Doors and operating hardware shall function without binding or unnecessary friction. Dispenser type accessories shall be keyed alike. Prior to final acceptance, master key and one duplicate key shall be given to Owner's authorized agent.

F. The Architect shall be the sole judge of workmanship. Workmanship shall be of the highest quality. Open joints, weld marks, poor connections, etc., will not be permitted. The Architect has the right to reject any accessory if he feels the workmanship is below the standards of this project.

G. Grab bars shall be installed so that they can support a three hundred (300) lb. load for thirty minutes per ANSI A117.1 and ADA US Department of Justice Guidelines.

3.4 CLEANING AND PROTECTION

A. Upon completion of the installation, clean accessories of dirt, paint and foreign matter.

B. During the installation of accessories and until finally installed and accepted, protect accessories with gummed canvas or other means in order to maintain the accessories in acceptable condition.

C. Replace and/or repair installed work which is damaged or defective to the Owner's satisfaction, at no additional cost.

END OF SECTION

SECTION 104416

FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the fire extinguishers and cabinets as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Gypsum drywall - Section 092900.

B. Fire suppression systems - Division 22.

C. Fire hose cabinets and valve cabinets - Division 22.

1.4 QUALITY ASSURANCE

A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.

B. Samples: Submit samples, 6" square, of each required finish. Prepare samples on metal of same gauge as metal to be used in the work. Where normal color variations are to be expected, include 2 or more units in each sample showing the limits of such variations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following:

1. J.L. Industries.

2. Larsen's Mfg. Co.

3. Potter Roemer.

2.2 EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

B. Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

C. Multi-Purpose Dry Chemical Type: UL rated 2A-10B:C, 5 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS

A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher specified, in manufacturer's standard enamel finish; color to match extinguisher.

2.4 CABINETS

A. Type and Style: Fire extinguisher cabinets shall be metal, semi recessed, with plexiglass panel, sized to fit within the partition or wall depth. Provide fire rated cabinets within fire rated partitions.

B. Color: Fire extinguisher cabinets shall be factory pre-finished with baked enamel or clear metal finish in the colors selected by the Architect from the standard range of colors of the selected manufacturer.

C. Design is based on "Model G-2409-5R" of Larsen's Mfg. Co. Other manufacturers noted herein may substitute their equivalent cabinet upon acceptance by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where fire extinguishers and cabinets are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install items included in this Section in locations indicated and at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

B. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by the Architect.

3.3 IDENTIFICATION

A. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk-screen process or die cut lettering. Provide lettering on door as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

B. Identify bracket-mounted extinguishers with red letter decals spelling 'FIRE EXTINGUISHER' applied to wall surface. Letter size, style and location as selected by the Architect.

3.4 SERVICE

A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

END OF SECTION

SECTION 105113

LOCKERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the lockers as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Steel wardrobe lockers.

2. Trim, closures, anchors and accessories.

1.3 RELATED SECTIONS

A. Polished Concrete Finishing - Section 033510.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: For installation of lockers, use only personnel who are thoroughly trained and experienced in the skills involved and who are completely familiar with the manufacturer's recommended methods of installation.

B. Uniformity: Provide each locker and bench as produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

1.5 SUBMITTALS

A. Shop Drawings: Before any materials of this Section are delivered to the job site, submit complete shop drawings, technical data and installation instructions to the Architect. Shop drawing must show method of installation, fillers, trim and accessories. Include locker sequencing information.

B. Samples: Submit 6" x 6" samples of manufacturer's standard finish.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Provide steel lockers, closed base, side and front covers, sloped top equal to "304 Stainless Steel Collection" manufactured by Hallowell, or equal made by Penco Products, ASI Storage Solutions, or approved equal meeting these specifications.

B. Locker Type:

1. Locker 1:

a. Grouping: 3-wide
b. Tier: Double Tier
c. Openings per group: 6
d. Assembled
e. Manufacturer number: USS3888-2A
f. Location: as noted on the drawings.

2. Locker 2:

a. Grouping: 1-wide
b. Tier: Double Tier
c. Openings per group: 2
d. Assembled
e. Manufacturer number: USS1888-2A
f. Location: as noted on the drawings.

2.2 MATERIALS

A. Sheet Steel: Mild cold-rolled and leveled steel, free from buckle, scale, and surface imperfections.

2.3 FABRICATION, GENERAL

A. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make all exposed metal edges safe to touch. Weld or rivet connections; bolted connections not permitted. Grind exposed welds flush. Do not expose rivet heads on fronts of locker doors or frames.

B. Finishing: Chemically pretreat metal with degreasing and phosphatizing process. Apply baked-on enamel finish to all surfaces, exposed and concealed, except plates and non-ferrous metal.

1. Color: Provide locker units in color(s) as selected by Architect from manufacturer's standards. Concealed parts may be manufacturer's standard neutral color.

C. Door Frames: Frames shall be 16 gauge formed in a channel shape. Vertical members shall have additional flange to provide a continuous door strike. Cross frame members shall also be 16 gauge channel shaped, including intermediate cross frames on double and triple tier lockers.

D. Doors: Doors shall be 16 gauge, with louvers for ventilation; channel shaped on both the lock and hinge side, with angle formations across the top and bottom.

E. Body: Bottoms shall be 16 gauge. Tops, sides, backs, and shelves shall be 24 gauge. Bolt spacing shall not exceed 9" o.c.

F. Hinges: Hinges shall be full length 16 gauge continuous piano type riveted to both door and frame.

G. Handles: Handles shall be one-piece 20 gauge deep drawn stainless steel cup designed to accommodate locks.

H. Latching: Lifting trigger shall be 14 gauge steel, attached to the latching channel. The trigger shall have a padlock eye for use with 9/32" diameter padlock shackle. Doors to have latch clip engaging frame at three points on doors over 42" high and two points on all other doors. Locking device to be positive automatic type, whereby locker door may be locked when open, then closed without unlocking. A rubber silencer shall be firmly secured to the frame at each latch hook.

2.4 LOCKER ACCESSORIES

A. Equipment: Furnish each locker with hat shelf, hang rod, and not less than 2 single-prong wall hooks.

B. Number Plates: Manufacturer's standard etched, embossed, or stamped, non-ferrous metal number plates with numerals not less than 3/8" high. Number lockers in sequence as directed by Architect. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

C. Continuous Sloping Tops: Not less than 20 ga. sheet steel, approx. 25 degree pitch, in lengths as long as practicable but not less than 4 lockers. Provide closures at ends. Finish to match lockers, unless otherwise indicated.

D. Filler Panels: Provide filler panels where required of not less than 16 ga. steel sheet, factory-fabricated and finished to match locker units.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where lockers are to be installed, and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid and flush installation.

B. Space fastenings 36" o.c. and apply through back-up reinforcing plates where necessary to avoid metal distortion; conceal all fasteners.

C. Install trim, sloping top units, and metal filler panels using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

D. Install benches to comply with manufacturer's instructions in such a manner that they resist a 200 lb. load applied laterally to benches.

3.3 ADJUST AND CLEAN

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Touch-up marred finishes, but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

SECTION 113100

APPLIANCES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the appliances as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Architectural Woodwork – Section 064023.

B. Sinks and related plumbing fixtures - Division 22.

C. Electrical - Division 26.

1.4 SUBMITTALS

A. Submit catalog cuts, product information and technical data for each appliance.

B. Submit shop drawings coordinated with millwork shop drawings and Section 064023.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.6 DELIVERY AND STORAGE

A. Deliver products to project site in manufacturer's undamaged protective containers.

B. Delay delivery until spaces to receive them have been fully enclosed and utility rough-ins are complete.

1.7 WARRANTY

A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 APPLIANCES

A. Refer to the Equipment and Furniture Schedule on the drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where appliances are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

C. Upon completion of installation and hookup to utilities, put each operating component of each appliance through at least five (5) complete operating cycles, adjusting as needed to secure optimum operation level.

D. Touch up scratches and abrasions to be completely invisible to the unaided eye from a distance of five (5) feet.

E. Promptly remove from the job site all cartons and packing material associated with the work of this Section.

END OF SECTION

SECTION 115313 - FUME HOODS AND LAB EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section, and specifications 018113 Sustainable Design Requirements and 017419 Construction Waste Management.

1.2 SUMMARY

A. Section includes:

1. Fume hoods
2. Drying racks
3. Refrigerators
4. Custom solvent storage cabinets

B. Related Requirements:

1. Division 05 Metals
2. Division 23 HVAC
3. Division 22 Plumbing
4. Division 26 Electrical
5. Division 06 Wood, Plastic and Composites
6. Electrical outlets, boxes, switches and lights, including wiring, within fume hood superstructures and for in-painting lights, and light boxes.
7. Cutting, filling, drilling of holes, reinforcing and other required work to enable the proper installation of mechanical equipment and service fixtures and other work to be done by other trades.

1.3 SUBMITTALS

A. General: Comply with Section 013300 Submittals

B. Product Data: Submit manufacturer's technical product data, installation instructions and general recommendations; include service connection requirements, performance criteria and standards, materials, manufacturer's model numbers, furnished accessories, power/fuel requirements, control diagrams, details and other similar and suitable information.

C. Shop Drawings: Submit complete shop drawings (at least 3/4"=1'-0" scale) showing all elements including fume hoods, top/side/filler panels, filter frames, custom solvent cabinets, drying racks, with all dimensions and also exact locations of all elements requiring coordination with other trades.

D. Samples: Provide the following samples:

1. Finish samples, all materials.

1.4 QUALITY ASSURANCE

A. All electrified equipment must be designed for use with - or provided with transformers for use with- 110-volt, 60 hertz, and carry the UL conformity marking.

B. Comply with all stipulated product approval requirements noted in section 013300.

C. Fume Hood Performance Requirements:

1. Fume hood shall be of special airfoil design to insure maximum operating efficiency and low-turbulence airflow. Foil sections at the front fascias of the hood shall minimize eddying of air currents at the hood face and the rear baffle system shall minimize turbulence in the upper portion of the hood interior.

2. The Fume Hoods shall be a bypass model with variable volume compatibility, controlled to maintain a consistent, OSHA-approved low face velocity across the sash, regardless of location.

3. The hoods shall be tested per the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 110-95 and by the Auxiliary Air Capture Test.

a. Hoods shall be tested with a face velocity of 80 FPM full open vertically. The hoods shall have a performance rating of 4.0 AM 0.01 or better wherein:
4.0 = tracer gas release in liters/minute
AM = as manufactured
0.01 = level of control of tracer gas in parts per million (ppm)

1.5 ENVIRONMENTAL QUALITY ASSURANCE

A. All proposed adhesives, sealants, caulking, woods and wood products, substrates, rubber products, coatings, fabrics and carpets shall be subject to Frick Collection-stipulated specifications and submittal review to ensure that no noxious chemicals deleterious to art are introduced into their spaces. Special consideration should be given to provide building and fit-out materials containing the minimum possible quantities of urea formaldehyde, sulfur ammonia and/ or chlorine.

1.6 GUARANTEE

A. The equipment furnished under this section of the specifications shall be guaranteed for a period of one year from the date at which acceptance of the entire Work is certified by the Architect against defective materials, design and workmanship. Upon receipt of notice from the Owner or the Architect of failure of any part of the guaranteed equipment during the guarantee period, the

affected part or parts shall be replaced promptly and at the expense of the contractor. This guarantee shall also include one year's free services for all work furnished under this section.

1.7 PRODUCT HANDLING

A. Coordinate delivery of all elements of this section with delivery of other laboratory furniture components and other related work.

B. Protect finish surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND MODELS

A. Fume Hoods: This specification is based on Kewaunee Corporation products. Other products are acceptable if they meet or exceed all specified requirements, accessories, and features of specified units, and are approved in advance by the Architect.

1. All hoods must pass ASHRAE 110-1995, with sash at 28" open, face velocity of 50 fpm, AM 0.01, AI/AU

   0.05. Hoods to carry the ETL Listed Mark for the following standards:

   - UL 3101-1/61010-1

   - CAN/CSA C22.2 No. 1010.1

   - UL 1805

2. Hoods must conform to the current editions of the following standards

   -SEFA-1

   -NFPA 45

   -ASTM E84

   -ASHRAE 110-95

   -ANSI Z9.5 (Lab ventilation)

3. Hoods must be designed for use with 110 volts, 60 hertz and carry the UL rating.

4. All hoods shall be designed as variable flow models, with velocities and flow levels optimized.

5. <u>All exterior surfaces of hoods, cabinets, panels etc. to be color determined by Architect.</u>

6. Provide fume hoods from Kewaunee Corporation (or approved equal): high performance low flow VAV Fume Hoods. Provide light fixtures, wiring & outlets. Provide solvent and acid storage cabinets as noted below. At each fume hood include three custom accessory closure panels (one front and two sides) extending up to 6" above the ceiling, or acoustic panels. Ac-

cessories at each fume hood shall be as follows (or approved equal):

a. Fume Hood EQ-01: **Wet Lab 48" Wide Fume Hood with acid storage**

- 1 high performance supreme air Venturi Fume Hood (48" wide **and 36" deep- exterior dimensions**) Include four duplex electrical receptacles, one on each side (gray with stainless steel plates) Model # V05F28**24**48GN-G1, SW-A1, V, P1, U, L, T
- 1 @ Sash Stop/Kit
- 1 @ Kemresin Work Surface Work Surface (60" wide by 36" deep- **or sized to interior work surface dimensions**) (Left Front Flush Vertical Cupsink + Two vent holes)

  Model # VBTR013660-BK,91,LF,V,F,VH101
- 1 @ Ceiling Hood Enclosure 48" wide by 42" high **or height required to meet ceiling panels**, color to match fume hood; readily removable 2 @ Side top panels, 36" deep by 42" high, color to match hood; Model # VCEM363660
- 1 @ Air Alert 600 Fume Hood Monitor Model # A1
- Fume Hood Gas Service Fittings Model # V0739G-RF-MN-AN-
- 2 @ with vent on center locking Acid storage cabinets with removable half depth shelf under the Fume Hood: Model # G80C352048-100 48"L - must carry the Factory Mutual (FM) Listing and be tested and approved by Factory Mutual to meet Factory Mutual Approval Standard 6050. Cabinets must conform to NFPA 30 Chapter 4.3.3 (a): *Storage Cabinets shall be designed and constructed to limit the internal temperature at the center, 1 inch (2.5 cm) from the top, to not more than 325 degrees F (162.8 degrees C) when subjected to a 10- minute fire test with burners simulating a room fire exposure using the standard time temperature curve as given in NFPA 251, Standard Methods of Fire Tests of Building Construction and Materials. All joints and seams shall remain tight and the door shall remain securely closed during the fire tests.*
- 2@ Vent Kit Model # F-9100-00-FIN
- 2@ Steel Rear Filters Model # BRSC3S0010-0000 10" D x 35 " H
- Provide UV sleeves and bulbs for T8 Fluorescent Light Fixtures. All duplex outlets to be GFI, color grey with brushed stainless-steel plates.

b. Fume Hood EQ-02: **Wet Lab 48" Wide ADA Fume Hood w/ acid storage**

- 1 high performance supreme air Venturi Fume Hood (48" wide **and 36" deep- exterior dimensions**) Include four duplex electrical receptacles, one on each side (gray with stainless steel plates)

  Model # V15F28**24**48GN-G1, SW-A1, V, P1, U, T, L
- 1 @ Sash Stop/Kit

- 1 @ Kemresin Work Surface Work Surface (48" wide by 36" deep **or sized to interior work surface dimensions**) (Left Front Flush Vertical Cupsink)

  Model # VBTR013648-BK,91,LF,V,F,VH101

- 1 @ Ceiling Hood Enclosure 48" wide by 60" high- **or height required to meet ceiling panels**, color to match fume hood; readily removable 2 @ Side top panels, 36" deep by 60" high, color to match hood; Model # VCEM603660
- 1 @ Air Alert 600 Fume Hood Monitor Model # A1
- Fume Hood Gas Service Fittings Model # V0739G-RF-MN-AN-
- 1 @ locking Solvent storage cabinets with removable half depth shelf under the Fume Hood Model # G08C322018-____ 18"L - must carry the Factory Mutual (FM) Listing and be tested and approved by Factory Mutual to meet Factory Mutual Approval Standard 6050. Cabinets must conform to NFPA 30 Chapter 4.3.3 (a): Storage Cabinets shall be designed and constructed to limit the internal temperature at the center, 1 inch (2.5 cm) from the top, to not more than 325 degrees F (162.8 degrees C) when subjected to a 10- minute fire test with burners simulating a room fire exposure using the standard time temperature curve as given in NFPA 251, Standard Methods of Fire Tests of Building Construction and Materials. All joints and seams shall remain tight and the door shall remain securely closed during the fire tests.
- 2@ Vent Kit Model # F-9100-00-FIN
- 2@ Steel Rear Filters Model # BRSC3S0010-0000 10" D x 35 " H
- Provide UV sleeves and bulbs for T8 Fluorescent Light Fixtures. All duplex outlets to be GFI, color grey with brushed stainless-steel plates.

c. **Fume Hood EQ-39: Biomaterials Research 72" Wide ADA Fume Hood w/ Base storage**

- 1 high performance supreme air Venturi Fume Hood (72" wide **and 36" deep-exterior dimensions**) Include four duplex electrical receptacles, one on each side (gray with stainless steel plates)

  Model # V15F28**24**72GN-G1, SW-A1, V, P1, U, T, L

- 1 @ Sash Stop/Kit
- 1 @ Kemresin Work Surface Work Surface (48" wide by 36" deep **or sized to interior work surface dimensions**) (Left Front Flush Vertical Cupsink)

  Model # VBTR013648-BK,91,LF,V,F,VH101

- 1 @ Ceiling Hood Enclosure 48" wide by 60" high- **or height required to meet ceiling panels**, color to match fume hood; readily removable 2 @ Side top panels, 36" deep by 60" high, color to match hood; Model # VCEM603660
- 1 @ Air Alert 600 Fume Hood Monitor Model # A1
- Fume Hood Water Service Fittings Model # V0739W-RF-MN-AN-

- 1 @ Cup Sink Model # 0951-RF, F round 316 stainless steel
- 1 @ locking Base storage cabinets with removable half depth shelf under the Fume Hood Model # G08C322042-____ 42"L

- must carry the Factory Mutual (FM) Listing and be tested and approved by Factory Mutual to meet Factory Mutual Approval Standard 6050. Cabinets must conform to NFPA 30 Chapter 4.3.3 (a): *Storage Cabinets shall be designed and constructed to limit the internal temperature at the center, 1 inch (2.5 cm) from the top, to not more than 325 degrees F (162.8 degrees C) when subjected to a 10- minute fire test with burners simulating a room fire exposure using the standard time temperature curve as given in NFPA 251, Standard Methods of Fire Tests of Building Construction and Materials. All joints and seams shall remain tight and the door shall remain securely closed during the fire tests.*

- 2@ Vent Kit Model # F-9100-00-FIN
- 2@ Steel Rear Filters Model # BRSC3S0010-0000 10" D x 35 " H
- Provide UV sleeves and bulbs for T8 Fluorescent Light Fixtures. All duplex outlets to be GFI, color grey with brushed stainless-steel plates.

B. Stainless Steel Drying Racks by Inter Dyne Systems (www.interdynesystems.com) , Model #V2436, "Mod-Rack" Stainless Steel Pegboard, or approved equal. Pegboard to be constructed from 20-gauge type 304 stainless steel, polished to a #4 finish. Each pegboard to include wall mount bracket and (32) 6" long polypropylene pegs. CM to provide blocking. See equipment schedule and elevations for all sizes and locations.

C. Under Counter Refrigerators (see equipment schedule and drawings for locations). Install in close coordination with millwork (and other trades as may be required). Refrigerators to be furnished by Owner. Coordinate closely for millwork and electrical.

D. Custom Solvent Storage Cabinets by Secureall or approved equal (www.securallproducts.com). Custom storage solvent cabinets shall be specifically designed for the storage of flammable and combustible liquids. Construction shall be based upon the requirements listed by UL, UFC, OSHA, and for NFPA No. 30 certification. The bottoms, top, sides and doors shall be fabricated of 18 gauge steel and shall be all double panel construction with a 1-1/2" air space between panels. All joints shall be electrical arc welds and seams should be held by resistance spot welds and continuous electric arc welds; any remaining joints to be screwed in order to provide a rigid enclosure. The liquid-tight self-closing, self-latching Safe-T-Doors shall have fusible links to hold them in the open position. At 165 degrees Fahrenheit, the fusible links shall melt, thus closing the doors. The doors shall swing on full-length 18-gauge galvanized steel piano hinges and shall be fully insulated. Seven (7) full-depth adjustable shelves, each with a 500 lbs. load capacity, and one removable, full size drip pan (3 inches deep) shall be provided at each of two cabinets. The shelves shall be perforated to allow free air circulation within the cabinets. Each cabinet will have a liquid tight door sill extending 2" above the bottom of the cabinet that is electrically arc welded. One (1) 6" dia. vent with spark screen shall be provided in the front of each door of each cabinet as well as a grounding screw. One (1) 8" dia. collar for duct connection shall be located at the top or back (see drawings for exact locations). Each cabinet shall measure and be configured as per the drawings and have adjustable steel leveling legs; 3/8" – 16 x 2" lg, zinc plated, 4 per cabinet. Each cabinet should be powder coated inside and out with two coats of high solids urethane. Color as per Architect. Any

warning labels and product information labels are to be according to code, and made of solvent-resistant, pressure-sensitive, vinyl with self- adhesive backing or painted on. Such signs will be red lettering. See equipment schedule, elevations, and floor plans for sizes, types, and locations. Colors TBD by Architect.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect existing conditions prior to delivery and notify Owner and Architect immediately of any condition detrimental to the satisfactory installation of work of this section.

3.2 INSTALLATION

A. General: Install all elements plumb, level, rigid, securely anchored to building or adjacent furniture in proper location, in accordance with manufacturer's instructions. Install closures neatly. Securely attach access panels but provide for easy removal and secure re-attachment. Provide grounding from the fume hoods and solvent cabinets to the building's plumbing system. Coordinate fully with miscellaneous metals, millwork, mechanical and controls trades.

3.3 FIELD QUALITY CONTROL

A. Field Test: Field test each fume hood and snorkel after completion of installation to verify proper operation in accordance with specified requirements. Perform fume hood tests in accordance with Section 7 of Scientific Apparatus Makers Association Standard LF-10.

3.4 ADJUST AND CLEAN

A. Moving Parts: Carefully check to insure smooth, near-silent, and accurate operation; sash operation with one hand with uniform contact of rubber bumpers; counterbalances operate without interference. Adjust all snorkel linkages to ensure that snorkels stay in intended positions without drifting. Installer shall make required adjustments on all snorkels prior to substantial completion and shall return at Final Completion for any required re-adjustment at no additional cost.

B. Clean all surfaces.

C. Damaged Work: Repair equal to new undamaged work, or replace with new units, as acceptable to Architect.

D. Protection: During the installation and until the acceptance by the Architect of all work of this Section, adequately protect all items from damage.

3.5 CONSTRUCTION WASTE MANAGEMENT

A. General: Comply with the requirements of Section 01 74 19 Construction Waste Management for removal and disposal of construction debris and waste.

B. Separate and recycle waste materials to the maximum extent possible.

END OF SECTION

SECTION 119000

MISCELLANEOUS SCIENCE EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. Work Included:

1. Equipment as scheduled.
2. Appliances as scheduled.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain each type of equipment from a single manufacturer for entire Project.

B. References: Applicable trade association names and titles of general standards are referred to by accepted abbreviations.

D. Comply with Building Code and other authorities having jurisdiction at project location and Owners Standards.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data with complete product description and installation instructions for each item and related component parts for specialty items. Include operating instructions.

B. Samples: Submit samples of finishes and other items as requested.

C. Shop drawings from manufacturers for each type of equipment assembly indicating layout details individual unit dimensions required clearances component parts method of field assembly and anchorage to surrounding construction. Shop drawings shall be coordinated with Architectural Woodwork section 064023.

1.5 PRODUCT HANDLING

A. Deliver store and handle miscellaneous specialties in accordance with the manufacturer's recommendations to prevent damage, deterioration or soiling of the items.

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufacturer: Specified products establish standards of design and quality. Equipment manufactured by others will be considered provided they meet the design and quality of the specified items.

1 Products: As indicated in the Equipment Schedule on the drawings.
2 Special assemblies and mounting assemblies.

a. Coordinate and provide required power and mounting accessories where required.

2.2 GENERAL PRODUCTS

1. General: Provide manufacturers standard devices
2. Provide units with finish as scheduled or approved.
3. Manufacturer: Subject to compliance with requirements provide laboratory equipment as scheduled.

a. Selected Product: Provide assemblies complete with supports fasteners and accessories as selected by Architect materials and finishes to match approved samples.
b. Size: Sizes as indicated if not as selected by Architect provide coordination with requirements and unit quantity required

PART 3 - EXECUTION

3.1 PREPARATION

A. Examination: Examine adjoining construction and the conditions under which the Work is to be installed. Proceed with the Work after unsuitable conditions have been corrected.

B. Coordination: Provide information and service as necessary for the proper coordination of this Work with the work of other trades.

3.2 INSTALLATION

A. Provide all supporting or attaching devices required for complete installation. Comply with manufacturer's installation instructions and final shop drawings.

B. Install specialties were shown plumb level and in line with adjacent materials. Provide fastenings as required for a rigid secure installation.

C. At the completion of the Work test operating devices and demonstrate acceptable operation. Adjust and lubricate devices as necessary.

D. Protect finished surfaces against damage during subsequent construction operations. Touch-up marred and abraded surfaces.

3.3 ADJUSTMENT AND CLEANING

A. Upon completion of installation, including work of other trades lubricate test and adjust operable equipment to operate easily and in compliance with manufacturer's specifications.

B. Clean installed equipment on exposed and semi-exposed surfaces. Touch-up shop applied finishes restoring damaged or soiled areas.

END OF SECTION 119000

SECTION 122413

WINDOW SHADES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the window shades as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Manually-operated window shades.

2. Field measurements of as-built conditions.

3. Accessories and hardware required for complete installation and operation.

1.3 RELATED SECTIONS

A. Electrical - Division 26.

1.4 QUALITY ASSURANCE

A. Provide assemblies which are complete assemblies produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.

B. Provide materials in colors as selected by the Architect from manufacturer's standard colors.

C. Comply with all federal mandates.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

B. Shop Drawings: Submit floor layout and elevations, indicating location of all window treatments, mechanism details, type and size of each unit, type and location of controls. Shop drawings must also show seaming of shade fabric. Submit shop drawings showing details of installation and relation to adjoining construction and conditions.

C. Samples: Submit full size sample of each shade type for Architect's acceptance.

D. Mock-Up

1. Install each type of shade assembly on one complete column bay for Architect's acceptance of installation details, workmanship, and operation.

2. Approved mock-up shall be used as the standard for installation of work under this Section, and no further installation work shall proceed before Architect's acceptance of the mock-up.

1.6 WARRANTY

A. Manufacturer’s standard non-depreciating 25-year limited warranty covering all hardware, motors, motor control system and shade cloth.

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect shades from damage, soiling and deterioration during transit, storage, and handling until Owner's acceptance.

PART 2 PRODUCTS

2.1 MANUALLY OPERATED SHADES

A. Provide manually operated shade system equal to "Mecho 7 System," Manufacturer: Mecho, which is located at: 42-03 35th St.; Long Island City, NY 11101; ASD Tel: 718-729-2020; Fax: 718-729-2941; Email: deborah.wilhelmus@mechoshade.com; Web: http://www.mechoshade.com, or equal made by WT Shade, Sol -R-Veil, Inc., Draper, Rollease Acmeda Contract Series I or approved equal conforming to standards specified herein.

B. Shade system shall be pre-engineered overrunning clutch design that disengages to 90% during the raising and lowering of the shade. The brake can stand a pull force of 50 lbs. in the stop position, or sized as required for shade weight, requiring no adjustment, Self-lubricating hub on to which the brake system is mounted includes an articulated brake assembly and bumpers which assures smooth, non-jerky operation in raising and lowering the shades. System shall include the following components:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing mounting hardware from opening and without requiring end or center supports to be removed.

2. Provide shade hardware that allows for removal and remounting of shade roller tube from brackets without removing mounting hardware from opening and without requiring end or center supports to be removed.

3. Provide for universal, regular, and offset drive capacity, allowing drive chain to fall at front, rear, or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.

4. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.

5. Provide shade hardware system that allow for operation of multiple shade bands (multi-band shades) by a single chain operator. Connectors shall be offset to assure alignment from the first to the last shade band.

6. Provide shade hardware constructed of minimum 1/8" thick plated steel or heavier as required to support 150% of the full weight of each shade.

C. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.

1. Heavy-duty, 1/8" steel mounting bracket and integrated steel brake, clutch and sprocket assembly rigidly affix the shade support and user control to the building structure fully independent of the roller tube components.

2. Permanently lubricated maintenance-free brake assembly employs an oil-impregnated steel hub with wrapped spring clutch.

3. Brake must withstand minimum pull force of 50 pounds (22.7 kg) in the stopped position.

4. Direct drive clutch requires no interstitial gear stages or plastic parts between the building structure and clutch ensuring reliable operation across the full range of shade sizes.

5. Urethane dampened clutch protects bead chain and clutch from failure due to high shock loads during shade operation minimizing down time.

6. Maximum shade hanging weight of 50 pounds (22.7 kg).

7. Clutch shall be upgradable to motorized drive on compatible tubes without requiring change in mounting attachment method/location, roller tube or fabric band.

8. Motorized drive options available require no additional wiring to be added for power or communication capability for switch or automated operation.

D. Drive Chain: Continuous loop Type 304 stainless steel beaded ball chain, 100 pound (45 kg) minimum breaking strength warranted from breaking for the life of the shade system hardware under prescribed operation. Provide upper and lower limit stops.

1. Chain Retainer: Chain tensioning device complying with WCMA A100.1.

2. Limit Stops: Bead stops affixed to the chain to maintain consistent shade band alignment at the top and bottom of shade travel across multiple shades and to help prevent shade damage resulting from unmanaged user control.

3. Provide shroud as required by Code.

E. Mecho/7, Managed Lift Force, Hardware: Lifts, single band or multiband shade assemblies:

1. Lifting Force: 3 to 8.5 pounds (1.4 to 3.9 kg) max pull force to lift shade assemblies with a shade band hanging weight, not including mounting hardware, of up to 50 pounds (22.7 kg).

2. Direct drive clutch with Managed Lift Force provides the best user experience by managing the user pull force while using the fewest number of chain pulls to position a shade.

3. Backward compatible to Mecho/5 components including fascia, regular and reverse roll, pockets, and wall-mounting accessories.

4. Includes offset drive capability, left/right, front, or back to allow for utilization of blackout channels.

5. Allows for ease of operation when obstructions do not allow for direct drive chain access.

6. Offset chain drive shall not cause an increase of friction or pull force when operated up to a 26-degree angle from vertical.

F. Chain Retainer:

1. Chain tensioning device as required and complying with ANSI/WCMA A 100.1. Chain tensioning device shall include spring and plunger that does not allow bead chain to operate if chain hold down is not fastened under proper tension. WCMA A 100.1compliant chain hold downs are not acceptable.

G. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

1. Hem Pockets and Hem Weights: Fabric hem pocket with RF welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be the same, for all shades within one room.

2. Shade Band and Shade Roller Attachment:

a. Provide extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without deflection. Provide for positive mechanical engagement with drive/ brake mechanism.
b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable/ replaceable with a snap-on/snap-off spline mounting, without having to remove shade roller from shade brackets.
c. Mounting spline shall not require use of adhesives, adhesive tapes, staples and/or rivets.

H. Side Channels: Provide standard "blackout" side channels where black-out shades are required. Channels shall be extruded aluminum, with a black anodized finish, color selected by the Architect.

2.2 SHADE CLOTH

A. Shade cloth: Refer to Finish Schedule and specifications on drawing A-51.3.

B. Where black-out shades are indicated, shade cloth shall be "Equinox 0100 Series" opaque acrylic black-out shade cloth made by MechoShade, or Rollease Acmeda Contract Shade Cloth Sierra Sol Mesa, or equal by other manufacturers noted herein; color selected by the Architect.

2.3 FABRICATION

A. The shade and the fabric shall hang flat without buckling or distortion. The edge, when trimmed, shall hang straight without curling or raveling. An unguided roller shade cloth shall roll true and straight, without tracking sideways more than +/- 1/8" in either direction due to warp distortion or weave design. Shades shall fill window openings from head to sill and jamb to jamb.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where window treatments are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION: GENERAL

A. Coordinate with the work of other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the indicated design and the installation recommendations of the manufacturer as approved by the Architect.

C. Upon completion of the installation, put all components through at least ten (10) complete cycles of operation, adjusting as necessary to achieve optimum operation.

3.3 INSTALLATION OF MANUAL ROLLER SHADES

A. Install roller shades level, plumb, square, and true according to manufacturer’s written instructions and located so shade band is not closer than 2" to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

3.4 PROTECTION AND CLEANING

A. Protect installed units to ensure proper operating condition, without damage or blemishes. Repair or replace damaged units as directed by the Architect.

END OF SECTION

SECTION 123661

ENGINEERED QUARTZ COUNTERTOPS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the engineered quartz countertops as shown on the drawings and/or specified herein including, but not limited to, the following:

1. Quartz-based fabricated stone countertops.

2. Stainless steel anchoring and fastening devices.

1.3 RELATED SECTIONS

A. Architectural Woodwork - Section 064023.

B. Plumbing - Division 22, for lavatories.

1.4 QUALITY ASSURANCE

A. Fire Test Response Characteristics: Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E 84) or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame Spread Index: 25 or less.

2. Smoke Developed Index: 450 or less.

1.5 SUBMITTALS

A. Shop Drawings: Submit the following shop drawings for Architect's approval.

1. For Stone: Submit complete cutting and setting drawings to Architect for approval. Show sizes, shapes, thicknesses, jointing, anchoring, connection with other work, seams, finish sealant typical and special anchoring details, supports, dimensions, setting numbers, and color range for stone. Clearly indicate dimensions for locating cutouts in stone. Do not fabricate any stone tops (except for samples) until shop drawings have been approved by the Architect.

B. Samples

1. Stone: Submit 3 sets of 12" x 12" samples of engineered stone. Include full range of color and texture to be expected. Architect will review for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

2. Anchoring and Fastening Devices: Submit 3 samples of each type of anchoring and fastening device.

C. Product Data

1. Stone: Submit manufacturer's product data, fabrication and installation instructions.

2. Accessories: Submit manufacturer's product data and installation instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect stone during storage and construction against wetting, soiling, staining and damage.

B. Handle stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of stone with wood or other rigid materials.

C. Store stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.

PART 2 PRODUCTS

2.1 QUARTZ STONE

A. Provide "Silestone" low-silica or silica-free quartz stone surfacing as manufactured by Cosentino or comparable product by Granitex Corp., CaesarStone, or approved equal; color and thickness per finish schedule. Finish to be polished on all exposed surfaces.

1. Color: See Finish Schedule

2. Finish: Polished on all exposed surfaces unless otherwise indicated.

B. Exposed Edges and Corners:

1. Countertops:

a. Edges: Square. Miter joint with 1/8" diameter eased edge profile at countertop fascia.
b. Outside Corners: Square.

2. Backsplash:

a. Edges: Square, miter joint with 1/8" diameter eased edge profile.
b. Outside Corners: Square butt joints.

2.2 ACCESSORIES

A. Mounting Adhesives: Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.

1. Acceptable Silicone Manufacturers:

a. Dow Corning.
b. GE Sealants and Adhesives.

2. Acceptable Epoxy Manufacturers:

    a. Akemi North America.
    b. Bonstone Material Corporation.
    c. Tenax USA.

3. Provide spacers, if required, of type recommended by adhesive manufacturer.

4. Color: Adhesive or sealant which will be visible in finished work shall be tinted to match quartz surfacing.

B. Fasteners: Type 304, stainless steel meeting ASTM A 666.

C. Joint Sealants: Provide anti-bacterial type.

1. Acceptable Manufacturers:

    a. Dow Corning.
    b. GE Sealants and Adhesives.

D. Solvent: Product recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives and sealants.

E. Cleaning Agents: Non-abrasive, soft-scrub type kitchen cleansers.

F. Sealer: "S-32" by HMK, or equal.

2.3 FABRICATION

A. Fabricator: Firm shall have five years' experience fabricating simulated stone and shall have water-cooled cutting tools.

B. Shop Assembly: Observe proper safety procedures and comply with manufacturer's instructions.

C. Layout: Layout joints to minimize joints and to avoid L-shaped pieces of quartz surfacing.

D. Inspection: Inspect material for defects prior to fabrication.

1. Color Match: Materials throughout Project shall be from the same batch and shall bear labels with same batch number. Visually inspect materials to be used for adjacent pieces to assure acceptable color match. Inspect in lighting conditions similar to those on Project.

2. Variation in distribution of aggregates in quartz surfacing which are within manufacturer’s tolerances is not a defect.

E. Tools: Cut and polish with water-cooled power tools.

F. Cutouts

1. Cutouts shall have 3/8" minimum inside corner radius. Inside corners shall be reinforced in an acceptable manner to prevent cracking.

2. Exposed edges of cutout shall be polished.

3. If the remaining material outside a cutout is less than three inches wide, reinforce area by laminating it with a strip of stone.

PART 3 EXECUTION

3.1 SETTING STONE COUNTERTOPS AND COUNTER FASCIAS

A. Cut-outs and Drilling: Provide countertops with cut-outs for sinks, faucets, etc. Cut-outs shall be carefully made in accordance with templates furnished under the Plumbing Section. Stone shall be drilled as required to receive anchoring and fastening devices.

B. Setting: Set countertops in required pattern over steel supports using stainless steel anchors and mounting adhesive. Set countertops level, plumb and square.

C. Stone shall be set so that adjacent sections of stone are sequence matched for veining.

D. Joints: Maintain an even joint between units, 1/16" max. Point joints with approved elastic non-staining mastic pointing compound, color to match stone. Tool joints flush. Clean exposed surfaces carefully.

3.2 REPAIR, CLEANING, AND SEALING

A. Remove and replace stone units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining stonework. Patching or hiding chips or cracks in stone will not be permitted. Provide new matching units, install as specified and reseal joints to eliminate evidence of replacement. Reseal defective and unsatisfactory joints to provide a neat, uniform appearance.

B. Clean stonework after completion using cleaning agent specified herein and as recommended by stone manufacturer; follow manufacturer’s instructions.

3.3 PROTECTION

A. After installation and cleaning, protect stone work from damage during subsequent construction activities.

B. Provide protection for finished work such as exposed edges, corners, and all other stone liable to physical injury or staining. Protection shall include, but is not limited to, non-staining approved coverings.

END OF SECTION

SECTION 123671

PAPER-COMPOSITE COUNTERTOPS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the paper-composite panels as shown on the drawings and/or specified herein including, but not limited to, the following:

1. Paper composite material countertops where scheduled.

2. Anchoring and fastening devices.

1.3 RELATED SECTIONS

A. Architectural Woodwork - Section 064023.

1.4 SUBMITTALS

A. Shop Drawings for Paper-Composite Material: Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures. Clearly indicate dimensions for locating cutouts in countertops. Do not fabricate any countertops (except for samples) until shop drawings have been approved by the Architect.

B. Samples

1. Countertop Material: Submit 3 sets of 12" x 12" samples. Include full range of color and texture to be expected. Architect will review for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

2. Anchoring and Fastening Devices: Submit 3 samples of each type of anchoring and fastening device.

1.5 PROJECT CONDITIONS

A. Protect countertop material during storage and construction against soiling, staining and damage.

B. Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

C. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 PRODUCTS

2.1 PAPER-COMPOSITE PANELS

A. General: Provide paper-composite panels fabricated of FSC-certified recycled paper, bonded with water-based phenolic resin, manufactured under heat and pressure to form a solid, durable surface material.

B. Paper Composite Panel for Countertops

1. Basis of Design: Richlite Leathered Slate or approved equal by the Architect..
2. Thickness: Per architectural details.
3. Finish: Leathered finish using Richlite Hard Wax finish as basis of design.
4. Edge: Factory-finished edges.
5. Fire Test Results (ASTM E84): Class A.
6. Color: As indicated in the finish schedule on the drawings.
7. Location: As indicated on drawings.
8. Installation Method: Mechanically fastened or adhered as indicated.

C. Accessories:

1. Adhesives: Low-VOC two-part epoxy adhesive formulated for paper-composite panels.
2. Sealers: Use factory-recommended penetrating sealer; maintain specified sheen level.
3. Joint Sealant: Mildew-resistant clear silicone for seams and perimeter conditions. Use only per architectural details, shop drawings, and as specified.
4. Fasteners: Provide concealed mechanical fasteners compatible with substrate.

D. Sustainability Requirements:

1. Paper content shall be FSC-certified and have post-consumer recycled content of 100%.
2. VOC Emissions: Greenguard Gold.
3. Resins shall be water-based phenolic or cashew-nut shell binder as applicable.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where paper-composite countertops are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces in accordance with manufacturer's recommendations.

C. Protect job site and surfaces against dust and water.

3.3 INSTALLATION

A. Position materials to verify correct dimensions and layout and make necessary adjustments.

B. Securely attach countertops to cabinets/support structure using concealed fasteners.

C. Ensure surfaces are level; use of shims may be necessary.

D. Seal joints between backsplashes and/or side splashes with recommended sealant.

E. Apply appropriate sealer/finish (see 2.2,D).

3.4 CLEANING AND PROTECTION

A. Clean countertop surfaces thoroughly.

B. Ensure that countertops are sufficiently protected until completion of the project.

C. Touch-up, repair, or replace damaged materials in a satisfactory manner.

D. Apply maintenance product (see 2.2,D) and polish.

END OF SECTION

FIT SCIENCE LAB RENOVATION

THE FASHION INSTITUTE OF TECHNOLOGY

100% CONSTRUCTION DOCUMENTS SPECIFICATIONS VOLUME II

AUGUST 19, 2026

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SECTION 013146
SPECIAL REQUIREMENTS FOR MECHANICAL AND ELECTRICAL WORK

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. This Section is to be coordinated with and complementary to the General Conditions, _____, wherever applicable to Mechanical and Electrical Work.

B. Where items of the General Conditions are repeated in this Section of the Specifications, it is intended to qualify or to call particular attention to them; it is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated herein.

C. This Section applies equally and specifically to all Contractors and Subcontractors supplying labor and/or equipment and/or materials as required under the Heating, Ventilating and Air Conditioning, Plumbing, Sprinkler and Electrical Sections of the Specifications.

1.02 DEFINITIONS

A. "The Contractor" or "Each Contractor" means specifically, the Contractor or Subcontractor working under his respective Section (Heating, Ventilating and Air Conditioning, Plumbing, Sprinkler or Electrical) of this Specification.

B. "Provide" means to supply, erect, install, and connect up in complete readiness for regular operation, the particular work referred to.

C. "Furnish" means to supply and deliver to the job.

D. "Piping" includes, in addition to pipe, all fittings, valves, hangers, and other accessories related to such piping.

E. "Concealed" means hidden from sight as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.

F. "Exposed" means "not concealed" as defined above. Work in trenches, crawl spaces, and tunnels shall be considered "exposed" unless otherwise specifically noted. Work located in mechanical rooms, accessible attics, open storage rooms, janitor’s closets, on the roof or anywhere outdoors shall be considered “exposed”.

G. "Approved equal" means any equipment or material which, in the opinion of the Architect, is equal in quality, durability, appearance, strength, design, performance, physical dimensions, and arrangement to the equipment or material specified, and will function adequately in accordance with the general design.

H. "Governmental" means all municipal, state and federal governmental agencies.

I. Where any device or part of equipment is herein referred to in the singular number (such as "the pump"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the Drawings.

J. "HVAC" means Heating, Ventilating and Air Conditioning.

K. "Plumbing Contractor" means the Contractor doing Plumbing and Fire Protection Work including Sprinkler Work.

1.03 CODES AND STANDARDS

A. NY State Building Code, Fire Code, Mechanical Code, Plumbing Code, Fuel Gas Code, Energy Conservation Construction Code

B. NYC Building Code, Fire Code, Mechanical CodePlumbing Code, Fuel Gas Code, Energy Conservation Construction Code

C. NFPA National Fire Protection Association

D. ASME American Society of Mechanical Engineers

E. ANSI American National Standards Institute

F. ASTM American Society for Testing Materials

G. AWWA American Water Works Association

H. IBR Institute of Boiler and Radiator Manufacturers

I. NEMA National Electrical Manufacturers Association

J. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers

K. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.

L. ARI Air Conditioning and Refrigeration Institute

M. UL Underwriters' Laboratories

N. AMCA Air Movement Control Association

O. AABC Associated Air Balance Council

P. Local Water Company Rules and Regulations

Q. National Electric Code

1.04 INTENT

A. It is the intention of the Specifications and Drawings to call for finished work, tested, and ready for operation. All materials, equipment, and apparatus shall be new and of first-class quality.

B. Any apparatus, appliance, material, or work not shown on Drawings, but mentioned in the Specifications, or vice versa, or any incidental accessories, or minor details not shown but necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense to the Owner.

1.05 DRAWINGS

A. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement of equipment, ducts, conduits, piping, and fixtures.

B. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the Architect before being installed. Do not scale Drawings.

C. Follow Drawings in laying out work and check Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom and space conditions appear inadequate, Architect shall be notified before proceeding with installation.

D. If directed by the Architect, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

E. Piping or ductwork connected to equipment may require different size connection than indicated on the Drawings. The Contractor shall provide transition pieces as required at the equipment.

1.06 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. Any questions or disagreements arising as to the true intent of this Specification or the Drawings or the kind and quality of work required thereby shall be decided by the Architect, whose interpretations thereof shall be final, conclusive, and binding on all parties.

B. **In case of disagreement between Drawings and Specifications, or within either document itself, the better quality, greater quantity or more costly work shall be included in the Bid Price and the matter referred to the Architect's attention for decision and/or adjustment prior to the Contractor's submission of their Bid. If such ambiguity is identified by the Contractor during construction (after bid period), then the Architect shall be consulted merely to decide on the proper technical approach; the more costly work's value shall be included**.

C. Maintain an awareness to avoid space conflict with other trades.

D. Purchase the equipment and material required in accordance with field measurements taken at the proper time during the construction progress.

1.07 VISITING THE SITE

A. Before submitting the final proposal, examine the site of the proposed work to determine the existing conditions that may affect the work, as this Section will be held responsible for any assumptions in regard.

1.08 SEPARATION OF WORK BETWEEN THE TRADES

A. The specifications and drawings describe in detail the work included for each trade. The following summary is an outline of the work to be "Provided," "Furnished" or "Installed" by each of the trades included in the contract, i.e., General Contractor, Plumbing, Sprinkler, HVAC and Electrical.

B. In the absence of more detailed information, consider the list as specific instructions to include such work in the named contract.

C. Abbreviations are as follows:
1. "Oth" - Other than Electrical or Mechanical
2. "Plb" - Plumbing
3. "Spr" - Sprinkler
4. "Htg" - Heating, Ventilating and Air Conditioning
5. "Elec" - Electrical

6. "f" - Furnished
7. "I" - Installed
8. "p" - Provided (Furnished and Installed)

Item	Oth	Plb	Spr	Htg	Elec	Remarks
Motors for HVAC, Plumbing, Fire Protection Equipment		p	p	p		
Motor Controls for HVAC, Plumbing, Fire Protection Equipment		f	f	f	I	Specs and Drawings Delineate Detailed Exceptions
Power Wiring for HVAC, Plumbing, Fire Protection Equipment Motor Controls Alarms					p	Specs and Drawings Delineate Detailed Exceptions
Motor Controls Wiring and Alarms Wiring for Mechanical Equipment		p	p	p	p	Specs and Drawings Delineate in Detail the Work to Be Performed by Each Trade.
Temporary Light and Power	p					
Temporary Heat	p					
Temporary Water	p					
Temporary Toilets	p					
Temporary Fire Protection	p					
Hoisting	p	p	p	p	p	
Rigging	p	p	p	p	p	
Bracing of Building for Safe Rigging	p	p	p	p	p	
Cutting, Chasing and Patching	p	p	p	p	p	Cost Where Due to Late Installation or Improper Coordination of Work Is Responsibility of the Delinquent Trade
Framed Slots and Openings in Walls, Decks and Slabs	p					Includes Drilling of Holes When Required
Sleeves		p	p	p	p	
Waterproof Sealing of Sleeves Through Waterproof Slabs, Decks and Walls		p	p	p	p	
Fireproof Sealing of Excess Openings in Slabs, Decks and Fire Rated Walls		p	p	p	p	
Excavation and Backfill Inside Buildings	p	p	p	p	p	

Item	Oth	Plb	Spr	Htg	Elec	Remarks
Excavation and Backfill Outside Buildings	p					Coordinate with Site Contractor
Keep Site and Excavation Free from Surface Water During Construction	p	p	p	p	p	
Fastenings		p	p	p	p	
Supports	p	p	p	p	p	
Concrete Encasement of Conduits					p	
Below Grade Drainage Inside Building	p	p				
Base Flashing of Electric Conduits Through Roof (Pitch Pockets)	p					Cap Flashing by Trade
Drain and Vent Through Roof Flashing		p				
Roof Vent Pipe Cap Flashing		p				
Finish Painting	p					Red Painting of Exposed Fire Protection Alarm System Circuitry Included in Electrical
Finished Walls and Ceiling Access Doors, Panels and Supporting Frames	I	f	f	f	f	Each Trade Supplies Access Doors for Installation by General Contractor
Plaster Rings and Frames	I				f	Plaster Rings and Frame Furnished in Electric Only for Fixtures Which Are So Equipped
Rubbish Removal	p	p	p	p	p	Where One Trade Furnishes and Another Installs, the Installing Trade Removes the Shipping and Packing Materials Which Accumulate
Special Tools for Equipment Maintenance	f	f	f	f	f	
Electric Heaters with Integral Fans				f	I	Line and Control Connections, Control Device Mounting Included in Electric

Item	Oth	Plb	Spr	Htg	Elec	Remarks
Electric Water Heating Equipment		p				Line and Control Connections, Control Device Mounting Included in Division 26. Piping and Unit Mounting by Division 23. Division 26 to provide power and wiring.
Electric Power Consuming Items and Controls for Other than Mechanical Equipment, e.g. Motorized Doors					p	
Electric Heating Cables for Freeze Protection					p	Division 26 Includes Feeders, Power Panels and Back Boxes
Concrete Foundations, Pads, Pits, Curbs and Bases Inside Buildings	p					Furnishing Exact Dimensions of Anchors, Vibration Mounts and in Each Trade Providing the Associated Equipment
Masonry Pits	p					Furnishing of Covers and Associated Frames Included in Each Trade
Sump Pits	p					Furnishing of Covers and Associated Frames Included in Each Trade
Concrete Lined Trenches Inside Building Foundation	p					
Prime Coat Painting		p	p	p	p	
Field Touch up Painting of Damaged Shop Coats		p	p	p	p	
Rustproofing Field Cut and Assembled Iron Supporting Frames and Racks		p	p	p	p	
Grating and Exterior Wall Louvers	p					
Duct Connections to Louvers				p		
Roof Curb Cap Flashing		p		p		
Roof Curb Base Flashing	p					
Fireproof Duct Covering				p		

Item	Oth	Plb	Spr	Htg	Elec	Remarks
Equipment Delivered and Set in Place	p					Except Mechanical and Electrical Equipment by Divisions 23 and 26
Vinyl Tape or Painted Color Coding, Banding, Arrows and Similar Identification for Mechanical and Electrical Work	p	p	p	p	p	
Lighting Fixtures					p	See Drawings
Elevators, Escalators and Dumbwaiters	p					Power Connection to Disconnect Switch Included in Electric Section
Convector Enclosures				p		If Manufactured Standard; Otherwise by GC
Catwalks and Ladders to Mechanical Equipment	p					
Roughing to Equipment Furnished by Others		p	p	p	p	
Domestic Makeup Water for HVAC		p				Final Connection in HVAC
Fire Extinguishers	p					
Extinguisher Cabinets	p					

D. Each Division is required to supply all necessary supervision and coordination information to any other Division supplying work to accommodate that Division.

E. For items which are to be installed but not purchased as part of this Division, the electrical work includes:
1. Coordination of their delivery.
2. Unloading from delivery trucks driven into any point on the property line at grade level.
3. Safe handling and field storage up to the time of permanent placement in the project.
4. Correction of any damage, defacement, or corrosion to which they may have been subjected.
5. Field make-up and internal wiring as indicated for their proper operation.
6. Mounting in place.
7. Connection to building wiring, including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring.

1.09 EQUIPMENT AND MATERIALS

A. *The proposal and bid must cover all items on the Drawings and in the Specifications exactly as drawn and specified.

B. All pipe, fittings and valves shall be manufactured in the United States of America.

C. All proposed substitutions of equipment of other manufacturers than those specified shall be attached to the base bid in an itemized list. Directly opposite each item indicate the amount to be added to or deducted from the base bid if the proposal is accepted. Failure to furnish such an itemized list will be interpreted to mean that it is agreed to provide all items exactly as drawn and specified. The information given in the above itemized list will in no way affect the determination of low bidder.

D. Substitutions of material and equipment of makes other than specifically named on the Drawings and in the Specifications and as provided for in the above paragraph will be approved for the following reasons only:

E. The material or equipment proposed for substitution is equal to or superior to that specified; and that the material or equipment called for on the Drawings or in the Specifications cannot be delivered to the job in time to complete the work in proper sequence to the work of other trades, due to conditions beyond control.

F. To receive consideration, requests for substitutions must be accompanied by documentary proof of equality and difference in price and delivery, if any, in the form of certified quotations from suppliers of both specified and proposed equipment. In case of a difference in price, the Owner shall receive $_____ in the form of a credit and all benefits of the difference in cost involved in any substitutions.

G. The words "or approved equal" shall be understood to apply only to those items of equipment and material listed under the paragraph "List of Approved Manufacturers" or as otherwise indicated on the Drawings or in the Specifications.

H. Within twenty (20) working days after the acceptance of the proposal, and prior to the submission of any shop drawings for review, a complete list of manufacturers shall be submitted to the Architect of all equipment and materials proposed for the work. No reviews will be rendered on shop drawings submitted before the complete list of manufacturers is reviewed.

I. If material or equipment is installed before the Contractor obtained "No Objections" comment from Architect, and/or in the opinion of the Architect the material or equipment does not meet the intent of the Drawings and Specifications, the removal and replacement shall be made at no extra cost to the Owner.

J. The materials, workmanship, design, and arrangement of all work installed under the Contract shall be subject to the approval of the Architect.

K. If material or equipment is installed before the Contractor obtained "No Objections" comment from the Architect, trade installing same shall be liable for the removal and replacement at no extra charge to the Owner if, in the opinion of the Architect, the material or equipment does not meet the intent of the Drawings and Specifications.

L. The words "or approved equal" are understood to follow:
1. The name of any manufacturer, vendor, equipment or materials.
2. Any trade name, plate number, or catalog number.
3. Any detailed description used to define equipment or material; except where otherwise indicated on the Drawings or in the Specifications.
4. It is the intent of these Specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "or approved equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claim that the substituted item meets the performance requirements with lesser construction (such as lesser heat exchange

surface, etc.) Performance as delineated in schedules and in the Specifications shall be interpreted as minimum performance.

M. All equipment and materials required for installation under these Specifications shall be new and without blemish or defect. All electrical equipment shall bear labels attesting to Underwriters' Laboratories approval. Where no specific indication as to the type or quality of the material or equipment is indicated, a first class standard article shall be furnished.

N. Where it is proposed to use an item of equipment other than that specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring, or of any other part of the mechanical, electrical, or architectural layout, all such redesign, and all new drawings and detailing required therefore shall, with the review of the Architect and subsequent comments by the Architect "No Exception" or "Exception as Noted" on the shop drawings, be prepared at no additional cost to the Owner.

O. Where such deviation from contract documents requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the Drawings, furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring, and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

P. All equipment of one type (such as fan, coils, etc.) shall be the product of the same manufacturer.

Q. Note that the comments "No Exception" or "Exception as Noted" marked on the shop drawings or other information submitted in accordance with the requirements herein before specified does not assure that the Engineer, Architect, or any other Owner's representative attests to the dimensional accuracy or dimensional suitability of the material or equipment involved or the mechanical performance of equipment. Comments on the shop drawings does not invalidate the Plans and Specifications if the shop drawings are in conflict with the Plans and Specifications.

1.10 SHOP DRAWINGS AND SUBMITTALS

A. Prior to delivery to job site, but sufficiently in advance of requirements necessary to allow Architect ample time for review, submit copies (as stated in "General Conditions") of shop drawings of all equipment, materials, piping, sleeves, conduit, ductwork, and wiring diagrams, and further obtain written comments "No Exception" or "Exception as Noted" for same from the Architect, before installing any of these items.

B. All shop drawings shall be prepared using AutoCAD. Manually drafted shop drawings are prohibited. If a Contractor is incapable of developing CAD drawings in-house, then they shall engage the services of an external drafting service in order to do so. The cost for such service shall be borne by the Contractor and included as part of their bid. Shop drawing submittals shall be on paper as described herein. While shop drawings are being developed and revised throughout the construction process, the Contractor shall continually update the CAD files. As construction approaches completion, these shop drawing CAD files shall be developed by the Contractor(s) into “As-Built” drawings. As part of standard project close-out documents, in addition to providing conventional paper copies of As-Built Shop Drawings, the Contractor must also provide CD’s containing electronic AutoCAD versions of same.

C. Shop drawings shall consist of manufacturer's certified scale drawings, cuts, or catalogs, including descriptive literature and complete certified characteristics of equipment, showing dimensions, capacity, code requirements, motor and drive testing, as indicated on the Drawings or Specifications.

D. Certified performance curves for all pumping and fan equipment shall be submitted for review.

E. Shop drawings submitted with insufficient information shall be rejected without review.

F. All shop drawings and submittals shall be sent electronically in PDF format. Other electronic file formats will be rejected without review.

G. Samples of materials or equipment, when requested by the Architect, shall be submitted for review.

H. Provide a detailed Transmittal with all shop drawings, via email. Any Transmittal, Shop drawing, sample, specification, etc. which is not labeled with all of the following information shall be rejected without review:
1. Project name
2. Project location
3. Contractor's name and address, Subcontractor's name and address
4. Applicable section and article number of specifications
5. Contractor's approval stamp and signature
6. Submission number
7. Specific service for which material is to be used.

I. Catalogs, pamphlets, or other documents submitted to describe items on which review is being requested, shall be specific and shall include clear identification in such catalog, pamphlet, etc., of item submitted, with identification clearly made in ink and highlighted. Data of a general nature such as tabulated charts will not be accepted and will be rejected without review.

J. Shop drawings indicating an unsuitable manufacturer shall be rejected without review.

K. The HVAC Subcontractor shall prepare ductwork shop drawings at ⅜"=1'-0" scale and submit to the Architect for their approval to prepare the coordination drawings as called for in paragraph 1.14. Ductwork shop drawings shall be drawn with double line ductwork and shall indicate the elevation above finished floor of all ducts, location and height of building structure (beams, etc.), lengths of fabrication pieces and fittings. Show new and existing work. Shop drawings submitted shall be ready for sheet metal fabrication.

L. The comments "No Exception" or "Exceptions as Noted" rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not in any way relieve responsibility, or necessity, of furnishing material or performing work as required by the Contract Drawings and Specifications.

M. "EXCEPTIONS, AS NOTED" means, unless otherwise noted on the drawings to approved for construction, fabrication and/or manufacture subject the provision that the work shall be carried out in compliance with all annotations and/or corrections indicated on the shop drawings and in accordance with the requirements of the Contract Documents. If also marked "RESUBMIT", "EXCEPTIONS AS NOTED" is invalid and a corrected submittal of the drawing is required.

N. If a shop drawing is resubmitted and does not comply with all of the comments indicated on the previous submission(s), and does not reflect specific reasons for such non-compliance, it shall be rejected without review.

O. Label resubmitted shop drawings with a stamp indicating the submittal number, for example: SECOND SUBMISSION; THIRD SUBMISSION, etc. and send separate transmittals for each item being submitted so that one transmittal does not cover more than one specific item or group of items from one manufacturer.

P. Failure to submit shop drawings in ample time for checking shall not entitle an extension of Contract time, and no claim for extension by reason of such default will be allowed.

Q. Prior to submission of shop drawings, thoroughly check each shop drawing, reject those not conforming to the Specifications, and indicate (by signature) that the shop drawings submitted meet Contract requirements. Deviations and/or exceptions to the contract documents should be clearly noted as being deviations and/or exceptions. The Contractor will later be required to correct such deviation and/or exceptions at his own expense, if they have not been noted and approved on the shop drawing.

R. All shop drawings showing routing of ductwork, piping and conduit, shall be not less than ⅜" = 1'-0" scale.

S. Incorporate a numbering system to help keep track of shop drawing submittals as follows:
1. H or M ..... HVAC shop drawings
2. P ..... Plumbing shop drawings
3. FP..... Sprinkler / Standpipe shop drawings
4. E ..... Electrical and Fire Alarm shop drawings

T. Concurrent numbers shall follow the prefix letter. Example: H-1, H-2, etc. In addition, shop drawings requiring resubmission should bear the number of the original submission and bear a suffix as follows: H-1A (second submission), H-1B (third submission), etc.

U. Before request for acceptance and final payment for the work, write a letter to the Architect stating that all shop drawings are brought to a condition "No Exception" or "Exception as Noted". Any outstanding shop drawings must be cleared with the Engineer.

1.11 RECORD DRAWINGS

A. The Contractor shall furnish, coordinate, produce and distribute record drawings as stated within the General Conditions of the Contract.

B. During construction keep an accurate record of all deviations between the work as shown on the Drawings and that which is actually installed.

C. On certain projects where Record Drawings must be on Mylar, secure from the Architect, a complete set of Drawings and note thereon all changes. Make a complete record of all changes and revisions in the original design which exist in the complete work. Furnishing of these transparencies and preparing these Record Drawings shall be at no additional cost to the Owner. When all revisions showing the work as finally installed are made, the corrected Mylar transparencies shall be submitted for review by the Architect. After review of the Record Drawings by the Architect, provide the Owner with one set of black-line prints and Mylar transparencies, at no additional cost to the Owner.

D. Where record drawings are CAD type, provide CD’s containing AutoCAD files of these drawings to the Architect, the Engineer and the Owner.

1.12 LAWS, ORDINANCES, PERMITS AND FEES

A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees, and other costs in connection with the work; file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required Certificates of Inspection for the work and deliver to the Architect before request for acceptance and final payment for the work. File for and obtain all required equipment use permits, Special Inspections, submission of fire alarm as-built drawings, backflow prevention device (BFP) sign-offs, boiler and domestic hot water heater filings with DEP and all other required filings.

B. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings, (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on Drawings and/or specified.

C. All materials furnished and all work installed shall comply with the rules and recommendations of the National Fire Protection Association, with all requirements of local utility companies, with the recommendations of the fire insurance rating organization having jurisdiction, and with the requirements of all governmental departments having jurisdiction.

D. Include in the bid, without extra cost to the Owner, retaining the service of a licensed professional engineer to obtain equipment use permits, filing of sprinkler drawings with hydraulic calculations, DEP BFP sign-off, all DEP chimney and boiler submissions, preparation of fire alarm as-built drawings, testing of all fire and fire smoke dampers, and approvals and all other required filings **(NYC)**.

1.13 INDEMNIFICATION

A. Pay all royalties and defend all suits or claims for infringement of any patent rights and save the Owner harmless from loss on account thereof.

B. If process or article specified is an infringement of a patent, promptly notify the Architect in writing, and any necessary changes shall be as provided in the Contract for changes in the work. If the Contractor performs any work specified knowing it to be an infringement of patent, he shall bear all costs arising therefrom.

C. Take out all necessary insurance, free of extra charge, and agree to indemnify and save harmless the party contracting for services against loss or expense, by reason of the liability imposed by law upon such party for damages because of bodily injuries, including death at any time resulting therefrom, accidentally sustained by any person or persons or on account of damage to property arising out of or in consequence of the performance of this Contract, whether such injuries to persons or damage to property are due or claimed to be due to any negligence in the performance of the Contract, the party contracting for services, employees or agents, or any other person.

1.14 ORGANIZATION OF WORK

A. The work throughout shall be executed in the best and most thorough manner under the direction of and to the satisfaction of the Engineers, Owners and Architects, who will jointly interpret the meaning of the Drawings and Specifications, and shall have the power to reject any work and materials which, in their judgment, are not in full accordance therewith.

B. The work called for under this Contract shall be carried on simultaneously with the work of other trades in a manner such as not to delay the overall progress of the work. Furnish promptly to other trades involved at the project, all information and measurements relating to the work which they may require. Cooperate with them in order to secure the harmony necessary in the interest of the project as a whole.

C. Furnish and install all work as expeditiously as possible in order to meet all construction schedules.

D. Keep a competent superintendent in charge of the work at all times. Such superintendent shall be replaced if deemed unsatisfactory to the Owner.

E. Upon award of contract, consult with the Architect and negotiate with subcontractors and manufacturers, and within thirty (30) days submit a preliminary list of major equipment for approval, complete with name of manufacturer, dates of purchase orders, and delivery dates to the site. Also submit within thirty (30) days, a preliminary schedule of installation of the various systems. This list shall be revised monthly and

resubmitted. The second submittal shall contain the names of manufacturers of scheduled equipment (with names, addresses, and telephone numbers of local representatives).

F. Maintain a complete file of shop drawings at all times available to the Owner's representative.

G. Every facility shall be provided to permit inspection of the work by the Owner's representative during the course of construction.

H. Where items of equipment and/or materials are indicated in the Specifications as being furnished by other trades for installation, assume responsibility for the unloading of such equipment and/or materials from the delivery trucks, and for providing safe storage for same as required pending installation.

I. Where the work is to be installed in close proximity to work of other trades, or where there is evidence that the work is to interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment.

J. If so directed by the Architect, prepare composite working drawings and sections at a suitable scale not less than ⅜" = 1'-0" clearly showing how the work is to be installed in relation to the work of other trades. If the installation is made before coordinating with other trades, make all necessary changes in the work without extra charge to the Owner.

K. Before submitting shop drawings for sleeves, piping and ductwork, the Heating, Ventilating and Air Conditioning Subcontractor shall prepare a combined ⅜" = 1'-0" scale shop drawing for piping and ductwork indicating location of piping and ductwork with dimensions for each floor and Mechanical Rooms. A digital version of these shop drawings shall be given to the Electrical Contractor. The Electrical Contractor shall indicate the location of all lighting fixtures and conduit runs on these shop drawings. The Electrical Contractor shall provide a digital version of the updated shop drawings, with lighting fixtures and conduit runs indicated to the Plumbing Contractor. The Plumbing and Sprinkler Contractor shall indicate his piping on these digital shop drawings.

L. The Heating, Ventilating and Air Conditioning Contractor shall arrange a Coordination Meeting for each floor and Mechanical Equipment Room with Plumbing and Electrical Contractors under the supervision of the General Contractor. After coordination, each Contractor shall digitally sign the a copy. The Heating, Ventilating and Air Conditioning Contractor shall submit these drawings to the Architect for review and he shall call any conflicts that could not be resolved in the coordination meetings, and/or deviation from original design, to the Architect's attention. After receiving written review from the Architect, each Contractor shall prepare the shop drawings as required under the paragraph "Shop Drawings" in the Specifications.

1.15 PROTECTION OF WORK AND PROPERTY

A. Maintain and protect all equipment, materials and tools from loss or damage from all causes until final acceptance by the Owner.

B. Assume responsibility for the protection of any finished work or other trades from damage or defacement by the operations and remedy any such injury or damages.

1.16 TEMPORARY OPENINGS

A. Ascertain from examination of the Architectural Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under the Contract and notify the

Architect accordingly. In the event of failure to give sufficient notice to the Architect in time to arrange for these openings during construction, assume all costs of providing such openings thereafter.

1.17 SHUTDOWNS

A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such regular time or at overtime when designated by the Owner at no additional cost to the Owner.

B. The Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

C. Work shall be arranged for continuous performance, including overtime, when approved by the Owner, if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.18 ACCESS DOORS IN FINISHED CONSTRUCTION

A. Install all work so that all parts required are readily accessible for inspection, operation, maintenance and repair. Minor deviations from the Drawings may be made to accomplish this, but changes of magnitude shall not be made without prior written review from the Architect.

B. Wherever mechanisms requiring access for maintenance, reading of instruments, or for operation are concealed in the structure and wherever else indicated on the Drawings, supply access doors of sizes necessary to provide ready access to the concealed items. Group together valves, controls, dampers, traps, expansion joints, cleanouts, gauges, switches, and other equipment requiring access in walls and furred spaces to reduce the number of access doors.

C. Access doors shall be Milcor Style A, B or K, L or M, as manufactured by Inland Steel Products Co. or approved equal. Minimum access door shall be 12" x 12". For installation in plastered wall or ceiling, provide Style "K" or "L" as required. For installation in masonry walls, provide Style "M". For installation in acoustical tile surfaces, provide Style "AT". For installation in acoustical plaster surfaces provide Style "AP". Fire resistive access doors for suspended dry wall ceiling shall be Style ATC's. Provide fire rated access doors at fire rated shafts, stairwells, corridors and at all other walls with Fire Rating.

D. Provide 24" x 24" access door for each duct or pipe shaft. Provide at least one (1) per floor, or as indicated on the drawings. Provide 18” x 24” access door in each outside air and exhaust air plenum.

E. *Access doors shall be installed in building structure under a separate Section.

F. All plumbing, electric and heating and ventilating access doors etc., shall be provided with Corbin #2722-1/2 master keyed cylinder locks. These locks shall be supplied and installed by the respective Contractor. These cylinder locks shall be purchased through the General Contractor's subcontractor for hardware after submission and review of the panel schedule as hereinafter specified.

G. Prepare a schedule showing location of all panels, cabinets, etc. to receive the Corbin lock. This schedule shall designate, by building and room number, the panel or cabinet location and shall be submitted to the Architect. This schedule is required for use in preparation of keying information. Locks shall not be purchased prior to review of this schedule.

H. Access doors for fire and smoke dampers shall be permanently identified on the exterior by a label having letters not less than 0.5 inch in height and reading: **SMOKE DAMPER or FIRE DAMPER or FIRE/SMOKE DAMPER**. This shall include ceiling tiles which provide access to these dampers.

1.19 PIPE EXPANSION

A. All pipe connections shall be installed to allow for freedom of movement of the pipe during the expansion and contraction without undergoing damage due to excessive stress. Proper anchors and guides shall be provided where necessary and/or when shown on the Drawings. Anchors and guides shall be subject to the review of the Architect. Refer to Section 23 20 00 and provide pipe support and expansion calculations by an independent Professional Engineer, using the project's piping shop drawings.

1.20 SCAFFOLDING, RIGGING, HOISTING

A. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of all equipment and materials furnished under this Section of the Specifications, and remove same from premises when no longer required.

B. In the event that supplementary bracing of the basic building structure is required to assure a secure rigging procedure and a secure route for the equipment being handled, assume full responsibility for such supplementary bracing.

1.21 BASES AND SUPPORTS

A. Provide all bases and supports not part of the building structure of required size, type and strength, as approved by the Architect, for all equipment and materials furnished by him. All equipment, bases, and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

1.22 SLEEVES, PIPE AND CONDUIT INSERTS AND ANCHOR BOLTS

A. Provide and assume responsibility for the location and maintenance in proper position of all sleeves, inserts, and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done without additional cost to the Owner.

B. All pipes and conduits passing through all walls or partitions shall be provided with sleeves having an internal diameter larger than the outside diameter of the pipe or insulation enclosing the pipe or conduit. Sleeves through masonry walls and partitions shall be Schedule 40 black steel pipe. Sleeves through non-masonry partitions may be 22 gauge galvanized steel sheet metal, set flush with finished surfaces of partitions.

C. Sleeves through concrete floors shall be Schedule 40 black steel pipe and extending 1" above finished floors. The open sleeve space shall be packed with non-combustible materials.

D. Inserts shall be preset concrete inserts with steel reinforced rods through the insert and both ends hooked over the reinforced mesh. Inserts shall be of individual type of malleable iron construction with accommodation for removable nuts and threaded rods up to ¾" diameter, permitting lateral adjustment, except as otherwise noted. Individual inserts shall be Grinnell Fig. 279 up to 5" pipe and conduit, Fig. 282, 6" and up to 8" pipe and conduit, Fig. 152 above 8" and up to 12" pipe and conduit. For figures 282 and 152, they shall come with an opening at the tip to allow reinforcing rods up to ½" diameter to be passed through the insert body. Rods shall extend a minimum of 4" on either side of the insert. Pipes larger than 12" shall be suspended from steel members only.

E. In general, all piping and conduit shall be supported from structural steel building members only or approved malleable steel inserts imbedded in concrete pours. Concentrated loads up to 200 lbs. may use inserts in concrete in buildings having poured concrete floors whose thickness is 6” or more. All other loads shall be supported from steel building members. Inserts shall not be located in any corrugated deck flute as ceiling tabs nor within 2 feet in any direction from ceiling tabs. Inserts shall not be spaced closer than 4 feet on center in all directions.

F. Where layout revisions are required, and are approved after concrete deck is poured, piping conduit 3" and smaller may be supported at Intermediate Points by Phillips' ¾" expansion bolts with lead shields, provided main supports are welded to structural steel and are not more than twenty feet on centers.

G. Piping and conduit 3" and smaller shall be supported from existing slab by "Phillips" ¾ expansion bolts with lead shields. Piping 4" and larger shall be supported by means of 4" x 4" x ⅜" clip knee angle with ¾" expansion bolt in shear and supporting rod at 90° from another bolt or using two expansion bolts per hanging post - pipes 8” and larger shall be supported from steel building members. In concrete buildings, add supplementary steel tied into the concrete structural members. Support such piping, conduits and ductwork from the supplementary steel.

H. Provide sleeves for pipes passing through roofs. Sleeves passing through roofs shall be as detailed on drawings extending min. 12" above finished roof. All pipes passing through roof shall be minimum of 10" from walls or other construction to permit proper flashing. Provide counter flashing.

I. Where sleeves pass through waterproofed floors, they shall be IPS brass pipe sleeves of the required diameter, brazed at the bottom to 18" x 18", 16-ounce copper flashing for bond with waterproofing. The tops of the sleeves shall extend 1" above finished floor.

J. No ductwork, piping, conduit or equipment shall be supported from corrugated decking construction. For this area provide supplementary steel to support ductwork, piping, conduit or equipment. Supplemental steel members shall be welded to building structural steel.

K. All hangers, rods and supports shall be installed prior to construction fireproofing.

L. The required fire resistance rating of floor or floor/ceiling assemblies and walls shall be maintained where a penetration is made for electrical, mechanical, plumbing pipes, conduits, ducts and systems. Fire stopping shall be provided at openings around vents, pipes, ducts, conduits at floor levels and walls with non-combustible materials. For openings around pipes and conduits and/or sleeves, 3M product Caulk CP 25 and Putty 303 or approved equal shall be provided.

1.23 ESCUTCHEONS

A. Provide escutcheons on pipes wherever they pass through ceilings, walls, or partitions.

B. Escutcheons or pipes passing through outside walls shall be Ritter Pattern and Casting Co., № 1, solid, cast brass, flat type secured to pipe with set screw.

C. Escutcheons for pipes passing through floors shall be Ritter Pattern and Casting Co., № 36A, split-hinged, cast brass type, designed to fit pipe on one end and cover sleeve projecting through floor on the other end.

D. Escutcheons for pipes passing through interior walls, partitions, and ceilings shall be Ritter Pattern and Casting Co., № 3A, split-hinged, cast brass chromium plated type.

1.24 MANUFACTURERS' IDENTIFICATION

A. Manufacturer's nameplate, name or trademark, shall be permanently affixed to all equipment and material furnished under this Specification. Where such equipment is in a finished occupied space, the nameplate shall be in a concealed but accessible location. The nameplate of a Subcontractor or Distributor will not be acceptable.

1.25 EQUIPMENT NAMEPLATES

A. Provide for each item of equipment, including panelboards, disconnects, breakers, starters, switches, and all control devices, pumps, fans, compressors, boilers, etc., a permanently attached nameplate made of black surface, white core laminated plastic with incised letters. Subcontractor furnishing equipment shall provide nameplate. Pneumatic, electric and mechanically actuated gauges shall have a brief, but complete description of their function. Stating the air pressure or voltage range alone is not acceptable. Nameplates shall be a minimum of 3" long by 1½" wide and shall bear the equipment name and item number (tag number) in ½" high white letters as designated in the equipment schedule. Nameplates shall be attached to their respective equipment by screws or rivets.

1.26 TAGS AND CHARTS

A. Furnish and attach to each valve as hereinafter specified, a 1½" diameter brass tag with ½" indented numerals filled with durable black compound. Tags shall be securely attached to stems of valves with chain and "S" hooks.

B. Valve charts shall consist of schematic drawings of piping layouts, showing and identifying each valve and describing the function. Upon completion of the work, one (1) copy of each chart, sealed to rigid backboard with clear lacquer placed under glass and framed, shall be hung in a conspicuous location in the main equipment room, unless otherwise directed by the Architect. Two (2) additional unmounted copies in 8½" x 11" leather ring binders shall be delivered to the Architect. Also furnish three (3) copies of schematic flow chart with corresponding valve numbers noted on chart.

C. Provide tags for the following valves:
1. Zone control, bypass, shut-off, check and balancing valves.
2. Building and area shut-off and balancing valves.
3. Control, by-pass, shut-off, balancing and drain valves for major pieces of equipment such as boilers, domestic hot water heaters, heat exchangers, refrigeration machines, pumps, heating, ventilating and air conditioning units, cooling towers, etc.
4. System drain valves, safety and relief valves. Vacuum breakers.

D. Tags on control valves shall bear the valve tag numbers shown on the ATC shop drawings. These shall be brass 1¼” diameter tags, with ½” indented numerals filled with durable black compound. Tags shall be securely attached to steams of valves with chain and “S” hooks.

1.27 IDENTIFICATION

A. Identification shall be in accordance with "Scheme for Identification of Piping System ANSI A13.1" and OSHA safety color regulation.

B. For uninsulated piping up to 3” diameter or insulated piping where OD of insulation is up to 3”, markers shall be snap-on type as manufactured by Craftmark, Fort Worth, TX or Seton Nameplate Corp., New

Haven, CT (Setmark System), or Bunting Stamp Co. Inc., Pittsburgh, PA or approved equal. Markers shall completely encircle the pipe with a substantial overlap and shall be tight to the OD with no gaps. No adhesive shall be used. They shall be manufactured of U.L. approved, self-extinguishing plastic. When the pipe, including insulation (if any), is 4 inches diameter and larger, markers shall be strap-on type and shall be installed using stainless steel bands. For piping located outdoors, all markers shall be strap-on type for all pipe diameters, and straps shall be of stainless steel. Markers for medical gas piping shall be snap-on type, with Nylon band ties installed as a further measure to prevent loss.

C. In addition to the pipe marker, for insulated piping, the pipe **size** shall be stenciled onto the insulation just before the marker.

D. All pipe and duct markers must include flow direction arrows.

E. Provide identification for piping, ductwork and electrical conduits.

F. All piping and ductwork shall be labeled, whether concealed above ceilings or exposed. Labels shall be installed at intervals no greater than 15 feet (unless noted otherwise) and shall be installed after every turn or elbow, and in every room. Where concealed above ceilings, a minimum of one (1) label shall occur above each room. Due to various above ceiling visual obstructions, the Engineer reserves the right to request additional labels in order to ensure visibility, at no additional cost to the Owner.

G. Pipe shall be lettered and valves tagged in accordance with the schedule below. Lettering shall be located near each valve and branch connection and at intervals of not over 20 feet (10 feet on fire lines, and at least once in each room and in each story traversed for medical gas piping*) on straight runs of pipe. Provide flow arrows on all piping and ductwork labels. Adjacent to the legend, stencil the size of the pipe, conduit or ductwork. Letter Colors are as follows: Yellow with black letters, green with white letters, blue with white letters and red with white letters.

LABEL AND VALVE TAG SCHEDULE			
Service	Label Designation	Color	Tag Designation
Cold Water	Cold Water	Green	C.W.
Hot Water (Plumbing)	Hot Water-Deg. F	Yellow	H.W.-Deg. F
Hot Water Circulating (Plumbing)	Hot Water Cir.	Yellow	H.W.C.
Fire Standpipe	Fire Standpipe	Red	FSP
Sprinkler	Sprinkler	Red	SP
Drinking Water Supply	Drinking Water	Green	D.W.
Drinking Water Return	Chilled Water Ret.	Green	D.W.R.
Condenser Water Supply	Condenser Water	Green	C.W.S.
Condenser Water Return	Condenser Water Ret.	Green	C.W.R.
Chilled Water Supply	Chilled Water	Green	CHWS
Chilled Water Ret.	Chilled Water Return	Green	CHWR
Dual Temperature	Dual Temp. Water Supply	Green	CHS

LABEL AND VALVE TAG SCHEDULE			
Service	Label Designation	Color	Tag Designation
Water Supply	Dual Temp. Water Ret.	Green	CHR
Refrigerant Suction	Refrigerant Suction	Green	RS
Refrigerant Liquid	Refrigerant Liquid	Green	RL
Refrigerant Hot Gas	Refrigerant Hot Gas	Green	RHG
Gas	Gas	Yellow	G
Compressed air ___ psi (except for temperature control)	Air ___ p.s.i.	Yellow above 90 psi Black below 90 psi A. ___ psi	
Oxygen	Oxygen	Yellow	Oxy.
Vacuum	Vacuum	Yellow	Vac.
Nitrous Oxide	Nit. Oxide	Yellow	N.O.
Sanitary Sewer	San. Sewer	Green	----
Storm Sewer	Storm Sewer	Green	----
Combined Sewer	Comb. Sewer	Green	----
Storm Water Piping	St. W.	Green	----
Soil Piping	Soil	Green	----
Waste Piping	Waste	Green	----
Vent Piping	Vent	Green	----
Air Conditioning Drain	Air Conditioning Drain	Green	----
Safety Valve Discharge	Safety V. Disch.	Yellow	S.V.D.
Relief Vent	Relief V.	Yellow	----
High Pressure Steam	H.P. Steam----psi	Yellow	H.P.S.___psi
Medium Pressure Steam	M.P. Steam----psi	Yellow	M.P.S.___psi
Low Pressure Steam	L.P. Steam----psi	Yellow	L.P.S.___psi
High Pressure Condensate Ret.	H.P.Cond. Ret.	Yellow	H.P.C.R.
Medium Pressure Condensate Ret.	M.P.Cond. Ret	Yellow	M.P.C.R.
Low Pressure Condensate Return	L.P.Cond. Ret.	Yellow	L.P.C.R.
Pumped Condensate Return	Pumped Cond. Ret.	Green	P.C.R.
Heating Water Supply	Heat. Water Sup.	Green	H.W.S.
Heating Water Return	Heat. Water Ret.	Green	H.W.R.

LABEL AND VALVE TAG SCHEDULE			
Service	Label Designation	Color	Tag Designation
High Temperature Water Supply	H.T. Water Sup.	Yellow	H.T.W.S.
High Temperature Water Return	H.T. Water Ret.	Yellow	H.T.W.R.
Medium Temperature Water Supply	M.T. Water Sup.	Yellow	M.T.W.S.
Medium Temperature Water Return	M.T. Water Ret.	Yellow	M.T.W.R.
Chemical Water Treatment	Chemical W.T.	Green	C.W.T.
Boiler Feedwater	Blr. F.W.	Green	B.F.W.
Fuel Oil Supply	Fuel Oil S.	Yellow	F.O.S.
Fuel Oil Return	Fuel Oil R.	Yellow	F.O.R.
Fuel Oil Vent	Fuel Oil V.	Yellow	F.O.V.
Fuel Oil Fill	Fuel Oil F	Yellow	F.O.F.
Fuel Oil Gauge	Fuel Oil G.	Conduit	F.O.G.
Air Conditioned Supply Air	A.C. Supply Air	Green	----
Return Air	R.A.	Green	----
General Exhaust Air	General E.A.	Yellow	----
Toilet Exhaust Air	Toilet E.A.	Yellow	----
Lab Exhaust Air	Lab E.A.	Yellow	----
Fume Hood Exhaust Air	Fume Hood E.A.	Yellow	----
Outside Air	O.A.	Green	----
Mixed Air	M.A.	Green	----
Dual Temperature Water Supply	Dual Temp Water Sup.	Green	D.T.W.S.
Dual Temperature Water Return	Dual Temp Water Ret.	Green	D.T.W.R.
Reheat Hot Water Supply	Reheat HW Sup.	Green	RH.H.W.S.
Reheat Hot Water Return	Reheat HW Ret.	Green	RH.H.W.R.

H. Tanks, pumps, fans and other equipment shall be labeled to show the number, if any, and service.

I. Exposed conduits for alarm and communication systems shall be banded at intervals of not over 10 feet. Bands shall be of the following colors:

1. Fire Alarm System ..... Red
2. Waterflow and Sprinkler Supervisory System..... Red & Yellow
3. Combined Fire Alarm and Watchmen's Report System.....Red & Blue

4. Watchmen's Report System.....Blue
5. Security System..... Blue & Yellow
6. Civil Defense System .....Yellow
7. Clock System .....Green
8. Mechanical & Electrical Supervisory System ..... Green & Blue
9. Telephone System.....Green & Yellow

J. HIGH VOLTAGE" in black letters two inches high, stenciled at 10-foot intervals over a continuous painted orange background.

K. Except where other means of identification are specified, electric cabinets, switchboards, motor control centers, transformers, system control boards, disconnecting switches, remote control switches, individual motor starters and motor control pushbutton stations shall be stenciled to show the service and number, if any, of the equipment controlled, as appropriate. Panelboards and other electrical equipment located in finished areas, such as offices, shall have the identification placed on the inside of the cabinet doors.

L. Cabinets housing 460Y/265 Volt panelboards shall have "460/265 volt" stenciled in 2-inch high yellow letters on the inside of the cabinet doors.

M. Cabinet housing emergency lighting panelboards shall have the word "EMERGENCY" stenciled in 2-inch high red letters on the outside of the cabinet, in addition to other lettering required above.

N. The bolted covers of housings for disconnecting switches or links in bus ducts between network transformers and switchboards shall be lettered to identify the equipment within.

O. Serial numbers shall be stenciled on the tanks and covers of transformers having their nameplates attached to the high voltage switch chamber covers.

P. Signs for Equipment Controlled through the BAS: For all fans, pumps and other motor driven equipment with start/stop control through the BAS provide a red surface, white core laminated plastic sign with incised letters, permanently mounted on the equipment indicating, “**Warning. This Equipment Is Started and Stopped Automatically from the Building Automation System**.”

1.28 COORDINATION OF MECHANICAL AND ELECTRICAL EQUIPMENT LOCATIONS

A. The space equal to the width and depth plus 6” on either side of the electrical equipment and extending to a height of 6 feet above the equipment or the structural ceiling, whichever is lower, shall be dedicated to the electrical installation and shall not contain piping ducts or other equipment foreign to the electrical installation. Electrical equipment shall include switchboards, panelboards and motor control centers.

B. Examine the drawings, and in cooperation with the Electrical Work confirm the final location of all electrical equipment to be installed in the vicinity of piping and ductwork. Plan and arrange all overhead piping no closer than three feet, and ductwork no closer than one foot from a vertical line to electric switchboards, panelboards, motor control centers or similar equipment.

C. Where the installation of piping or ductwork does not comply with the requirements of foregoing paragraphs, where feasible, the piping and ductwork shall be relocated. Installation of a barrier between piping and ductwork and electrical equipment below will be considered if located more than six feet above the electrical equipment. Refer to NEC Article 110. If piping ductwork and foreign equipment cannot be located outside of the space dedicated to electrical installation, a drip pan as described below can be considered to protect the electrical equipment from condensation, leaks or breaks, but shall be approved by the Engineer after the Contractor has demonstrated that piping, ductwork and/or equipment cannot be installed to avoid this space.

D. Provide galvanized steel gutters as follows:
   1. Provide a gutter of 18 gauge galvanized steel under every pipe and roof drain which is within 2'-0" (two feet) of being vertically over any motor, transformer, electrical controllers, switchboards, panelboards, generator or the like.
   2. Also provide drip pans below any drain piping located above the ceiling in food preparation or storage areas. In such areas, if piping also runs vertical through the floor slab above, then fully enclose the vertical portion with an extension of said drip pan and fully seal this enclosure to the underside of the floor slab above.
   3. Each gutter shall be made watertight, properly suspended; and carefully pitched to a convenient point for draining. Provide a ¾ inch drain, to nearest floor drain or slopsink.
   4. In lieu of such separate gutters, a continuous protecting sheet of similar construction, adequately supported and braced, properly rimmed, pitched and drained, may be provided over any such motor, and extending 3'-0" in all directions beyond the motor, over which such piping has to run.

1.29 TOOLS

A. All special tools for proper operation and maintenance of the equipment shall be delivered to the Owner's representative and a receipt requested for same at no additional cost to the Owner.

1.30 QUIET OPERATION

A. All equipment and material shall operate under all conditions of load without any sound or vibration which in the opinion of the Architect is objectionable. Where sound or vibration conditions arise which are considered objectionable by the Architect, eliminate same in a manner reviewed by the Architect.

1.31 RUBBISH REMOVAL

A. See to it that the project is at all times maintained free of all rubbish, rubble, waste material, packaging materials, etc. accumulating as a result of his work. Assume responsibility for the cleaning up of packaging removed from materials and equipment furnished by other trades for the installation. Note that final acceptance of the work is contingent upon the project being free of all excess and waste materials resulting from the work.

B. Clean all parts of the building exterior spaces and adjacent roads, sidewalks, and pavement, free from material and debris resulting from the execution of the work. Debris resulting from interior construction shall be neatly stacked on each floor near elevators, material hoists and rubbish chutes, as directed by the Architect or his representative. Debris resulting from exterior construction shall be similarly stacked. All debris so stacked will be removed under other Sections. Excess material will not be permitted to accumulate either on the interior, exterior or on sidewalk.

1.32 CLEANING, PIPING, DUCTS AND EQUIPMENT

A. Clean all piping, ducts, and equipment of all foreign substances inside and out before being placed in operation.

B. If any part of a system should be stopped by foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired when the system is reconnected at no additional cost to the Owner.

C. During construction, properly cap all pipes and equipment nozzles so as to prevent the entrance of sand, dirt, etc.

1.33 DELIVERY OF MATERIAL

A. Deliver the material and store same in spaces indicated by the Architect and assume full responsibility for damage to structure caused by any overloading of the material.

1.34 CUTTING AND PATCHING (IN EXISTING CONSTRUCTION)

A. All cutting and patching shall be done under another Section. Furnish the sizes and locations of all chases and openings required for the installation for his work before the walls, floors and partitions are built.

B. As a general rule, chases, shafts and wall openings as shown on the Drawings will be provided for most of the ducts and piping, but promptly arrange with the Construction Supervisor for additional openings should any be required for the work.

C. Provide the labor and materials for all work included under the Contract or Subcontract in ample time and sufficient quantities so that all of the work of the Contract or Subcontract may be installed in proper sequence to avoid unnecessary cutting of the floors and walls.

D. Any cutting and patching required due to the failure to comply with the above provisions, shall be done at no extra cost to Owner. Such cutting and patching shall be done under Division One, as approved by the Architect.

E. Where existing piping or ductwork insulation are damaged by the requirements of the work, replace all damaged insulation to match existing.

F. Refer to Paragraph: "Sleeves, Inserts and Anchor Bolts" for additional requirements.

G. Prior to performing any core drilling or cutting of existing floor or roof slabs, Contractor shall perform a scan of the slab using ground penetrating radar (GPR) to confirm that there are no existing conduits or pipes in area of core drill or cutting of slab.

1.35 ALTERATIONS

A. When new work and alterations render equipment, piping and ductwork useless, such equipment, piping and ductwork when exposed to view, shall be removed and connections thereof to lines or ducts remaining shall be properly capped or plugged and left in construction. If construction, such as hung ceiling, furred beam, chase, etc., is opened up and removed during the course of the construction, the useless pipe and ducts therein shall be treated as though exposed to view. When required to accommodate new work, useless piping and ductwork concealed in construction shall be treated as though exposed to view.

B. When existing piping and duct systems, at points of connection to new work or in rerouting are found defective, such defective portions shall be removed and replaced with new materials without cost to the Owner.

C. Provide temporary supports where required.

D. Where alterations reveal piping, ductwork, conduit circuits, wiring, and accessories that must necessarily remain in service, same shall be rerouted, replaced or altered as required to make same completely concealed in the new work at no additional cost to the Owner.

E. Where existing piping or ductwork insulation is damaged by the requirements of the work, replace all damaged insulation to match existing.

F. Cutting in existing building shall be done by each Contractor as reviewed by the Architect. Rough patching shall be done by each Contractor. Finish patching, ceiling construction removal, new ceiling in existing building will be done under another Section.

1.36 PAINTING

A. All finish painting of MEP/FP work shall be provided as specified below.

B. Painting Schedule
1. No on-site painting is required on the following items unless specifically indicated otherwise:
   a. Stainless steel or aluminum sheet metal.
   b. Stainless steel piping.
   c. Piping or ductwork to be insulated.
   d. Insulation on piping or ductwork in unfinished spaces or concealed.
   e. Insulated piping covered with stainless steel, aluminum or all service jacketing, unless otherwise specified.
   f. Insulated piping in walk-in and non-walk-in tunnels.
   g. Mechanical equipment with a factory applied baked-on enamel finish, not specified to be insulated or provided with an enameled steel insulated jacket.
   h. Insulated equipment or smokestacks specified or noted on the Drawings to be covered with stainless steel or aluminum sheet metal jacketing.
   i. Factory fabricated multi-wall metal smoke flue piping.
   j. Concealed piping.
2. Paint the following:
   a. Uninsulated Black Steel Piping:
      1) Exposed in Finished Rooms or Finished Spaces: 1 coat of primer and 2 coats of latex semi-gloss enamel.
      2) Exposed in Unfinished Rooms, or Unfinished Spaces, or in Pipe Shafts: 1 coat of primer and 2 coats of finish.
      3) Exposed Exterior to a Building: 1 coat of primer and 2 coats of exterior acrylic latex gloss enamel.
   b. Uninsulated Galvanized, Cast Iron, Brass or Copper Piping:
      1) Exposed in Finished Rooms or Finished Spaces: 1 coat of primer and 2 coats of latex semi-gloss enamel.
      2) Exposed Exterior to a Building: 1 coat of primer and 2 coats of exterior acrylic latex gloss enamel.
      3) Exposed in Unfinished Rooms or Unfinished Spaces: 1 coat of primer and 2 coats of finish.
   c. Uninsulated Mechanical Equipment:
      1) Furnished with a Factory Applied Prime Coat Finish: 2 coats of acrylic latex semi-gloss enamel. No primer required.
   d. Hangers, Supports and Accessories:
      1) Exposed: Paint to match adjacent piping, pipe insulation or ductwork insulation.
      2) All black steel or iron pipe hangers, rods, inserts, brackets and accessories for supporting piping systems and duct systems: 1 coat of primer and 2 coats of latex semi-gloss enamel. Paint black steel hanger rods, threaded on the job site, with a primer immediately after installation.
      3) Metal Fabrications in Finished Spaces: Paint over shop coat with 2 coats of alkyd gloss enamel.
   e. Sheet Metal Work:

1) Exposed Black Iron, Galvanized Iron, and Aluminum, including Hangers for Insulated and Uninsulated Ductwork, in Finished Rooms, Finished Spaces or Exterior to a Building: 1 coat of primer and 2 coats of latex semi-gloss enamel.
2) Jacketing on Exposed Insulated Ductwork in Finished Rooms and Finished Spaces: 2 coats of latex semi-gloss enamel. No primer required.

f. Uninsulated Exposed Valves, Flanges, Unions and Irregular Surfaces in Piping Systems Installed in Finished Rooms or Finished Spaces: 1 coat of primer and 1 coat of black heat resistant enamel.

g. Convector enclosures shall be painted at the factory as specified in Section 15835: Convectors.

C. Color Coding:

1. Apply finish paints of colors indicated opposite the various items listed below where such items are installed in Mechanical Equipment Rooms, Machine Rooms, Boiler Rooms, Penthouse Mechanical Equipment Rooms:
2. Piping, Exposed - Bare and Insulated on Unfinished Spaces and Rooms:
   a. Fuel Oils, Natural Gas .....Yellow
   b. Pneumatic Tube Systems..... Green
   c. Steam Supply (all pressures).....Yellow
   d. Steam Condensate Returns ..... Orange
   e. High Temperature Hot Water..... Orange
   f. Water - Boiler Make Up .....Light Green
   g. Water - Boiler Feed..... Orange
   h. Water - Blow Off..... Orange
3. Piping Not Listed Above: Color code by classification as follows:
   a. Fire Protection .....Red
   b. Dangerous Materials ..... Yellow or Orange
   c. Safe Materials..... Green
   d. Valuable Materials.....Purple
4. Ductwork: Grey.
5. Equipment - Bare and Insulated (Except Factory Painted): Grey.

D. The inside of all ductwork where visible through openings shall be painted with two prime coats of flat black paint.

E. Nameplates on all equipment shall be cleaned and left free of paint. Where equipment is to be painted, the Contractor shall carefully mask of all equipment nameplates and data tags prior to application of paint. Such masking shall be removed after paint has dried.

F. All flashing shall be painted with two coats of waterproof black asphaltum varnish.

1.37 LUBRICATION

A. Assume responsibility that all rotating equipment is properly lubricated as soon as it is connected by the Electrical Subcontractor before operation of this equipment is started. Assume responsibility for any damage to any equipment that is turned on without previously having been oiled or greased when connected up.

1.38 TESTS

A. All piping, wiring, and equipment shall be tested as specified under the various sections of the work. Labor, materials, instruments and power required for testing shall be furnished under the particular Section of the Specifications.

B. Tests shall be performed satisfaction of the Architect. The Architect will be present at such test, when he deems necessary and such other parties as may have legal jurisdiction.

C. Pressure tests shall be applied to piping only before connection of equipment and installation of insulation. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their rating.

D. All defective work shall be promptly repaired or replaced, and the tests shall be repeated until the particular system and component parts thereof receive the review of the Architect.

E. Any damages resulting from tests shall be repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the Architect.

F. The duration of tests shall be as determined by all authorities having jurisdiction, but in no case less than the time prescribed in each Section of the Specifications.

G. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated with and depends upon the operation of other equipment, systems and controls for proper operation, functioning, and performance, the latter shall be operated simultaneously with the equipment or system being tested.

H. The electrical work shall include providing any assistance (such as removal of switchboard and panelboard trims and covers, pull and junction box covers, etc.) deemed necessary by the Architect to check compliance with the Drawings and Specifications.

1.39 OPERATING INSTRUCTIONS

A. Two months prior to the completion of all work and the final inspection of the installation by the Owner, five (5) copies of a complete Instruction Manual, bound in booklet form and suitably indexed, shall be submitted to the Architect for review. All written material contained in the manual shall be typewritten or printed.

B. The Manual shall contain the following items:

Table of Contents (Plumbing, HVAC and Electrical)

I. Introduction - Explanation of Manual and its use.

II. Description of Systems

1. Complete schematic drawings of all systems.
2. Functional and sequential description of all systems.
3. Relationship of system where applicable to the supervisory data system.

III. Systems Operation

1. Start-up procedures.
2. Shut-down procedures.
3. Reset and adjustment and balancing procedures.
4. Seasonal operation.
5. All posted instruction charts.

IV. Maintenance

1. Cleaning and replacement - lines, components, filters, strainers, ducts, fans, etc.
2. Lubrication.
3. Charging and filling.
4. Purging and draining.
5. Systems trouble shooting charts.
6. Instruments checking and calibration.
7. Procedures for checking out functions with remote (Supervisory Data Console) indication and control.
8. Recommended list of spare parts.

V. Listing of Manufacturers

VI. Manufacturer's Data (Where multiple model, type and size listings are included, clearly and conspicuously indicate those that are pertinent to this installation).

1. Description - Literature, drawings, illustrations, certified performance charts, technical data, etc.
2. Operation.
3. Maintenance - including complete trouble-shooting charts.
4. Parts List.
5. Names, addresses and telephone numbers of local recommended repair and service companies.
6. Guarantee data.
7. Model No. and Serial No. of all equipment.

1.40 INSTRUCTION OF OWNER'S PERSONNEL

A. After completion of all work and all tests and at such time as designated by the Architect, provide the necessary skilled personnel to operate the entire installation for a period of 2 consecutive days eight (8) hours each.

B. During the operating period, fully instruct the Owner's representative in the complete operation, adjustment, and maintenance of the entire installation.

C. Provide training on the operation and maintenance for equipment, as indicated within the equipment specification. If not indicated within the equipment specification section, provide the following training:
1. Automatic Temperature Controls: Four (4) non-consecutive days within one (1) year of the Owner's acceptance.
2. Lab exhaust system: One (1) day.
   a. All training shall be by factory authorized representatives, fully trained in the systems and the equipment operation and maintenance.

1.41 GUARANTEE

A. The Contractor guarantees by his acceptance of the Contract that all work installed will be free from any and all defects and that all apparatus will develop capacities and characteristics specified, and that if during a period of one year from date of completion and acceptance of work, one (1) entire heating and

cooling season or eighteen (18) months from date of shipment, whichever is **later**, any such defects in workmanship, material or performance. He shall immediately replace, repair, or otherwise correct the defect or deficiency, including parts, labor and travel time, without cost to the Owner within a reasonable time. Notify the Architect in writing of the time required to do work. For heating systems, the guarantee period must include one continuous heating season from November 1st to April 1st. For cooling systems, the guarantee period must include one continuous cooling season from May 1st to October 1st.

B. Replace or repair to the satisfaction of the Owner any and all damage done to the building or its contents or to the work of other trades in consequence of work performed in fulfilling guarantee.

C. This Article is general in nature and will not waive stipulations of other claims which specify guarantee periods in excess of one (1) year.

D. In the event default on this Guarantee, the Owner may have such work done as required and charge the cost to the Contractor.

E. The date of acceptance shall be the date of final payment by the Owner or notice of acceptance by the Owner, whichever is later.

1.42 OPERATION PRIOR TO COMPLETION

A. The Owner may require operation of parts or all of the installation for the beneficial occupancy prior to final completion and acceptance of the building.

B. The operation shall not be construed to mean acceptance of the work by the Engineer for the Owner. The Owner will furnish supervisory personnel to direct operation of the entire system and the Contractor shall continue to assume this responsibility until final acceptance.

1.43 INSTALLATION OF MOTORS AND CONTROL EQUIPMENT

A. The Electrical Contractor shall furnish and install power wiring for all electrical devices, individual motor starters furnished to him at the job site by other trades.

B. The HVAC Contractor shall provide all wiring for the Automatic Temperature Controls, Combustion Control, Burner and Boiler Control, and condenser water treatment controls, except as otherwise specified herein. This shall include low voltage wiring and 120 VAC power wiring unless electrical drawings show 120 VAC feed for the ATC panels.

C. The Electrical Contractor shall, except where otherwise noted, provide wiring for all Plumbing and Sprinkler Control and Alarm Systems. The Plumbing Contractor shall provide all devices in connection with same.

D. The Electrical Contractor shall provide all low voltage wiring and 120 VAC power to all auto smoke and combination fire/smoke dampers, which shall be controlled from the Fire Alarm Panel.

E. For single phase motors which are not interlocked with other motors and which have temperature control or motor control devices in the power circuit, furnishing of control devices, installation and wiring shall be by the Electrical Contractor.

F. For all HVAC 3-phase motors or HVAC equipment, temperature control wiring, motor control wiring and associated interlocks shall be provided by the HVAC Contractor, including the installation of all control devices. For all plumbing and sprinkler 3-phase motors, equipment control wiring, motor control wiring and associated interlocks shall be provided by the electrical Contractor, including the installation of all control devices.

G. Electrically operated equipment supplied by other trades, which are to be installed and wired by the Electrical Contractor, shall be delivered with detailed instructions for their installation and wiring in sufficient time and proper sequence to meet the work schedule.

H. Each contractor shall furnish all electrical motors, starters and other motor control devices for motor driven equipment required for the work. In his work, the Electrical Contractor shall provide the code required disconnect switches for all motors, except where otherwise noted. The setting of all motors, required for mechanical equipment, including unmounted motors, shall be done as part of the mechanical work.

I. If a motor is replaced (even with the same horsepower) a new starter shall be provided for that motor.

J. Equipment which includes a group of electrical control devices mounted in a single enclosure or on a common base with equipment, shall be supplied completely wired as a unit with terminal boxes or leads ready for external wiring.

K. All electrical items furnished and/or installed as part of the mechanical work shall conform to NEMA Standards, to the requirements of the National Fire Protection Association, and to the requirements of any local authority having jurisdiction. Any field modifications required to insure such conformance shall be included as part of the mechanical work.

L. The furnishing of floor mounted motor starting equipment shall include the purchase and delivery of channel sills for mounting.

M. Whether or not shown on the drawings, the Electrical Contractor shall furnish and install a local disconnect switch at each motor which is not in sight from the controller location.

N. The supplying of any and all "field instruction" diagrams deemed necessary by the Architect for the complete delineation of electrical wiring for mechanical equipment shall be included as part of the mechanical work.

O. The drawings describing the electrical or the mechanical work may include explanatory wiring diagrams indicating the function intended for the motor control circuits of certain motors. The "field instructions" wiring diagrams required as part of the mechanical work shall conform to these intended functions.

P. Electric power required for control circuits shall be taken by the HVAC Contractor (Subcontractor) from the electric circuits in the junction boxes left by the Electrical Contractor (Subcontractor) for ATC use as indicated on the electrical drawings. Where junction boxes are not indicated on the electrical drawings, the HVAC Contractor (Subcontractor) shall run power wiring to the nearest electrical panel with spare circuits and provide required circuit breaker. The ATC Contractor (Subcontractor) shall provide and wire all required transformers for the ATC system.

Q. The HVAC Contractor (Subcontractor) shall coordinate the control systems with unit ventilator and VAV terminal box manufacturers. The HVAC Contractor (Subcontractor) shall provide all necessary control

equipment which is not provided by the unit manufacturer to complete the sequence of operation as specified herein. The HVAC Contractor (Subcontractor) shall provide all field wiring.

1.44 ELECTRIC MOTORS

A. Each Contractor shall provide all electric motors required for driving all motor driven equipment required to be furnished under his Section of the Specification.

B. All motors shall be designed for 3-phase, 60 cycle alternating current operation with 208 volts across the motor terminals, except that, unless otherwise specified herein, all motors ⅓ HP and smaller shall be designed for single phase, 60 cycle alternating current at 120 volts across the terminals. Before ordering motors, ascertain the actual voltages and other current characteristics that will be available and permissible for each motor. Report the same in writing to the Architect and obtain approval before ordering motors. The designation of current characteristics in these Specifications does not relieve the responsibility for ascertaining the actual conditions of electric service available for each motor or for the proper operation of all motors under the actual conditions.

C. The speed, horsepower, type and other essential data for each motor, if not given under paragraphs describing the various motor driven apparatus, or in schedules on the drawings shall be obtained from the manufacturer of the respective apparatus and shall be submitted to the Architect for his review. All two speed motors shall be single winding type.

D. Provide oversized motor junction box for 2 speed motors.

E. All motors shall be built in accordance with the latest rules of NEMA, of the Institute of Electrical and Electronic Engineers and also as hereinafter specified.

F. Motors ½ HP and larger shall have Class B insulation. All motors shall be rated for continuous duty and shall be designed for temperature rises not to exceed 55°C for fully enclosed type, 55°C for splashproof types and 40°C for all other motors excepting as otherwise specified herein. Motors shall be capable of withstanding momentary overloads of fifty (50%) without injurious heating. They shall operate without excessive heating, flashing or sparking under any conditions within the specified capacity of load and speed. All motors shall operate quietly and shall be replaced if, in the Architect's opinion, they do not do so. All motors which are in the airstream of air conditioning units, shall be totally enclosed type.

G. Motors ½ HP and larger shall have ball or roller bearings with pressure grease lubrication, except where otherwise noted.

H. Direct connected motors shall be furnished without an adjustable base. All motors connected to driven equipment by belt shall be furnished with adjustable sliding bases, except fractional motors with slotted mounting holes.

I. All motor leads shall be permanently identified and supplied with connectors.

J. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed, voltage, phase and current characteristics.

K. The insulation resistance between stator conductors and frames of motors at the time of final inspection shall be not less than one-half megohm.

L. All motors shall be of the proper type for the duty and shall have sufficient torque to start and run the equipment to which they are connected and starting currents and running currents shall not exceed the limits imposed by the laws or rules and regulations of the public authorities having jurisdiction or of the electrical utility company. All motors shall have sufficient horsepower capacity and rated duty to operate the apparatus to which they are connected so as to give the speeds and performances specified, but the horsepower shall be in no case less than that stated herein or shown on the drawings. A schedule giving the characteristics of the motors proposed for each type of service shall be submitted to the Architect for approval.

M. The maximum full load speed of each direct connected motor shall be suitable for the equipment it drives.

N. Except where V-belt drive is specified, the fan wheels for ventilating fans shall be mounted on the motor shafts, which shall be designed for this duty.

O. All motors except motors furnished as an integral part of equipment and factory installed on the equipment, shall be of same manufacture.

P. Polyphase motors shall be squirrel cage induction high efficiency energy saver type, suitable for the starting torque and current requirements.

Q. Single phase motors shall be of the capacitor start induction run or split phase type as required for proper operation of the driven equipment.

R. Where used with VFD equipment, motor shall be rated for inverter service without excessive noise, vibration, hum or damage.

S. All motors operated on variable frequency drives (VFD) shall be equipped with a maintenance-free, conductive microfiber, shaft grounding ring with a minimum of two rows of circumferential microfibers to discharge electric shaft currents within the motor and/or its bearings. Motors up to 100 HP shall be provided with a minimum of one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided by the motor manufacturer or Contractor and shall be installed in accordance with the manufacturer's recommendations.

T. The efficiency of energy efficient motors shall be verified in accordance with NEMA standard MG1-12.53a. Submittals and shop drawings for all equipment shall state the motor efficiency and shall meet or exceed that listed in the table below. Minimum acceptable efficiency shall be as follows:

Minimum Electric Motor Efficiencies							
Open Drip-Proof (ODP)				Totally Enclosed Fan Cooled (TEFC)			
Motor Size (hp)	Speed (rpm)			Motor Size (hp)	Speed (rpm)		
	1200	1800	3600		1200	1800	3600
1	82.5%	85.5%	77.0%	1	82.5%	85.5%	77.0%
1.5	86.5%	86.5%	84.0%	1.5	87.5%	86.5%	84.0%
2	87.5%	86.5%	85.5%	2	88.5%	86.5%	85.5%
3	88.5%	89.5%	85.5%	3	89.5%	89.5%	86.5%
5	89.5%	89.5%	86.5%	5	89.5%	89.5%	88.5%
7.5	90.2%	91.0%	88.5%	7.5	91.0%	91.7%	89.5%

Minimum Electric Motor Efficiencies							
Open Drip-Proof (ODP)				Totally Enclosed Fan Cooled (TEFC)			
Motor Size (hp)	Speed (rpm)			Motor Size (hp)	Speed (rpm)		
	1200	1800	3600		1200	1800	3600
10	91.7%	91.7%	89.5%	10	91.0%	91.7%	90.2%
15	91.7%	93.0%	90.2%	15	91.7%	92.4%	91.0%
20	92.4%	93.0%	91.0%	20	91.7%	93.0%	91.0%
25	93.0%	93.6%	91.7%	25	93.0%	93.6%	91.7%
30	93.6%	94.1%	91.7%	30	93.0%	93.6%	91.7%
40	94.1%	94.1%	92.4%	40	94.1%	94.1%	92.4%
50	94.1%	94.5%	93.0%	50	94.1%	94.5%	93.0%
60	94.5%	95.0%	93.6%	60	94.5%	95.0%	93.6%
75	94.5%	95.0%	93.6%	75	94.5%	95.4%	93.6%
100	95.0%	95.4%	93.6%	100	95.0%	95.4%	94.1%
125	95.0%	95.4%	94.1%	125	95.0%	95.4%	95.0%
150	95.4%	95.8%	94.1%	150	95.8%	95.8%	95.0%
200	95.4%	95.8%	95.0%	200	95.8%	96.2%	95.4%

1.45 INDIVIDUAL MOTOR STARTERS

A. For single-phase motors ⅓ HP or smaller, starters shall be manual, 120 volts, single-pole or 240 volts, 2-pole with thermal overload protection and pilot light. Where interlocking or automatic control (other than for unit and cabinet heaters) is required, starters shall be combination circuit breaker and magnetic starter with pilot light.

B. For 3-phase motors ½ HP and over, starters shall be full-voltage combination circuit breaker and magnetic across-the-line contactor, rated 208 or 480 volts, 3-pole. All magnetic starters shall have three thermal overloads.

C. Unless otherwise specified, motors 25 HP and over, rated 200 volts and motors 50 HP and over, rated 460 volts shall be furnished with reduced voltage starters of the autotransformer closed transition type.

D. For motors requiring electric interlocks, or automatic control features, starters shall be equipped with the necessary auxiliary relays and contacts to provide the control features desired. All starters shall be provided with "hand-off-auto" twist type switches mounted in cover. For two-speed motors, provide "high-low-off-auto" four position selector switch. Furnish adjustable 20-second time delay between high and low speeds for motors 10 HP and above.

E. Electrical Control Devices
   1. Allen-Bradley® Electrical Control Devices are the basis of design,
   2. The electrical control devices shall include:
      a. Pilot Devices
      b. Relays and Timers

c. Miniature Circuit Breakers
d. Terminal Blocks and Fuse Blocks
e. Alarms and Signals
f. Power Supplies
g. Panel-mounted disconnect switches.

3. The electrical control devices shall be interoperable with standard electrical equipment.

F. Pilot Devices
1. 30.5 MM Push Buttons, Selector Switches and Pilot Lights
a. 30.5 mm push buttons, selector switches and pilot lights shall be Allen-Bradley heavy industrial Type 4/13 watertight/oiltight metal [Bulletin 800T].
b. 30.5 mm push buttons, selector switches and pilot lights shall provide EN/IEC 60529 IP66/65 degree of protection.
c. 30.5 mm push buttons, selector switches and pilot lights shall have electrical ratings of:
1) Dielectric strength – 2200V for 1 minute [or 300V for 1 minute (Logic Reed)]
2) Electrical design life cycles – 10,000,000 at max. rated load [200,000 at max rated load (Logic Reed)]
d. 30.5 mm push buttons, selector switches and pilot lights shall have an operating range of -40 to 131°F (-40 to 55°C).
e. Illuminated devices shall offer universal LED that accepts 12 to 130 VAC/VDC voltage input.
f. 30.5 mm push buttons shall have a diaphragm seal for protection from liquids, particles, and corrosive agents.
g. 30.5 mm selector switches shall incorporate a positive detent to prevent the switch from hanging up between positions.
2. Potentiometer Devices
a. 30.5 mm potentiometer devices shall be Allen-Bradley heavy industrial Type 4/13 watertight/oiltight metal [Bulletin 800T].
b. Potentiometer devices shall be rated for 300 VAC/VDC, 2 W maximum (6 VDC minimum):
1) Mechanical design life – Min. 25,000 cycles
2) Rotational torque – 3 to 12 in-oz
3) Stopping torque – Min. 12 in-lb
c. Potentiometer devices shall have single-turn operation, 312 degree rotation.
d. Potentiometer devices shall be finger safe.
3. Control Stations
a. Control stations shall provide Allen-Bradley heavy industrial 30.5 mm push button(s) or selector switch with appropriate contact action, button/lever type and color/legend marking. Devices shall be Type 4/13 watertight/oiltight metal [Bulletin 800T].
b. Control stations shall be constructed of diecast aluminum.

G. Relays And Timers
1. Relays – Time Delay
a. Allen-Bradley time delay relays [Bulletin 700-HT] shall mount on tube-type bases with pin-style socket mounting.
b. Time delay relays shall have 10A, B300, DPDT contact ratings and coil voltages as shown on drawings.
c. Time delay relays shall have adjustable timing ranges [or fixed timing ranges to avoid tampering]. Timing ranges shall be as shown on drawings.
2. Relays – General Purpose
a. Allen-Bradley general purpose relays [Bulletin 700-HA] shall have tube-base/Octal 8-pin [or 11-pin] terminals and ON/OFF flag indicators.

b. General purpose relay contacts shall be silver nickel [or silver nickel bifurcated or gold-plated bifurcated] and have 10A, B300, DPDT [or 3PDT] ratings. Coil voltages shall be as shown on drawings.
c. General purpose relays shall have an electrical schematic on the faceplate, a clear cover for visual inspection and snap-in marker ability.
d. General purpose relays shall have LED status indicators, push-to-test and manual override.

3. Relays – Miniature
   a. Allen-Bradley miniature relays [Bulletin 700-HC] shall be square-base, 4-pole, plug-in type with blade-style terminals and ON/OFF flag indicators.
   b. Miniature relay contacts shall be silver nickel [or gold-plated silver nickel] and have 7A [or 10A], DPDT [or 4PDT] ratings. Coil voltages shall be as shown on drawings.
   c. Miniature relays shall have an electrical schematic on the faceplate and a clear cover for visual inspection.
   d. Miniature relays shall have LED status indicators and push-to-test button with incorporated manual override lever.
4. Relays – Industrial-Type
   a. Allen-Bradley industrial-type relays [Bulletin 700-P] shall be ruggedly constructed (10 million operation mechanical life), 2-pole [or 4-pole, 8-pole, 12-pole], configured N.O./N.C. as shown on drawings, and panel- [or strip-, DIN rail-] mounted.
   b. Industrial-type relays shall be finger-safe.
   c. Industrial-type relay contacts shall be silver nickel with a double-break and bifurcated design and 10A, A600 rating for AC [5A, P600 rating for DC].
   d. Accessories shall include adder decks, time delay, latching, surge suppressors and/or mounting strip.
5. Timers – Solid-State
   a. Allen-Bradley solid-state timers [Bulletin 700-FS] shall be DIN rail-mounted.
   b. The solid-state timer contacts shall be available as SPDT or DPDT, 8A.
   c. Solid-state timers shall be available with On-Delay, Off-Delay, On- and Off-Delay, One-Shot and Flasher operating modes as required on the drawings.
   d. Solid-state timers shall have coil surge protection and adjustable timing ranges of 0.05 seconds to 60 hours as shown on drawings.
6. Timers – Programmable
   a. Allen-Bradley programmable timers [Bulletin 700-HX] shall be digital timing relays with LCD display and shall be socket- [or panel-] mounted.
   b. Programmable timer contacts shall be SPDT, rated 5A, B300.
   c. Programmable timer panel surface shall offer Type 4X/IP66 protection.
   d. Programmable timers shall be configurable for Signal On-Delay, Power On-Delay, Off-Delay, Repeat Cycle, One-Shot and Cumulative operating modes as required on the drawings.
   e. Programmable timers shall have timing ranges of 0.000 seconds to 9999 hours, depending on selected mode and as shown on drawings.

H. Miniature Circuit Breakers
1. Miniature circuit breakers shall be Allen-Bradley Circuit Breakers [Bulletin 1489-M].
2. Miniature circuit breakers shall be thermal-magnetic, current-limiting type, sized as specified on the drawings:
   a. 0.5A to 63A current rating
   b. 1-, 2- or 3-pole
   c. Type C or Type D tripping characteristic
3. Miniature circuit breakers shall be UL Listed (E197878), CSA Certified (259391), CE Marked, VDE and CCC Certified and RoHS Compliant. Standards compliances shall include:
   a. UL 489
   b. CSA C22.2, No. 5.1

c. EN 60947-2
d. GB 14048.2

4. Miniature circuit breakers shall be rated for:
   a. Voltage – Max. 480Y/277 VAC (UL/CSA); U_e 230/400 VAC (IEC)
   b. Interrupting capacity – 10 kA (UL/CSA); 15 kA (IEC)
5. Housing shall satisfy Insulation Group II/RAL 7035, shall have IP20 finger-safe design, shall be suitable for DIN rail mounting and shall include status indicator window and scratch- and solvent-resistant printing.
6. Miniature circuit breakers shall support reversible line and load connections and shall have dual terminals that:
   a. Connect up to 4 wires, or 2 wires and a bus bar.
   b. Clamp from both sides.
   c. Have a unique design that directs wires into openings to prevent wiring misses.
7. Miniature circuit breakers shall be compatible with UL 508 Listed bus bars, auxiliary contacts, signal contacts, shunt trips and toggle-mount lockout attachments.

I. Terminal Blocks And Fuse Blocks
1. Terminal Blocks – Control, #22 to #8 AWG
   a. Control terminal blocks shall be Allen-Bradley screw-type, feed-through [Bulletin 1492-J].
   b. Control terminal blocks shall be certified:
      1) UR/CSA – #22 to #8 AWG wire range, 50A maximum current, 600 VAC/VDC voltage rating
      2) IEC – 6 mm^2 wire range, 41A maximum current, 800 VAC/VDC voltage rating
      3) ATEX – 6 mm^2 (#20 to #10 AWG) wire range, 36A maximum current, 550 VAC/VDC voltage rating
   c. Control terminal blocks shall have a snap-in card marking system.
2. Terminal Blocks – Power
   a. Power terminal blocks shall be Allen-Bradley [Bulletin 1492-PD]:
      1) Open-style power distribution block with aluminum or copper connectors – 3-pole [or 1-pole], rated at 600 VAC/VDC, 175 to 760A
   b. Power terminal blocks shall be certified by UR, CSA and CE.
   c. Wire ranges and tightening torques shall be labeled on the block.
   d. Power terminal blocks shall have a write-on marking surface or marker retention feature.
3. Fuse Blocks
   a. Allen-Bradley fuse block kits [Bulletin 1491] shall be used for protection of transformers and control circuits capable of delivering no more than 200,000 RMS symmetrical amps, 600V maximum.
   b. Fuse block kits shall be 1-pole, 2-pole or 3-pole.
   c. Each pole shall have a fuse cover.

J. Alarms and Signals
1. Alarm Horn
   a. The alarm horn shall be an Allen-Bradley High Performance Electronic Horn [Bulletin 855H] and shall have up to 4 stages and low current consumption.
   b. The alarm horn shall have a UV-stable plastic housing and non-moving parts.
   c. The alarm horn shall have an on-board microphone, 45 alarm tones selectable by DIP switch and fine volume control via potentiometer.
   d. The alarm horn shall allow synchronized output in multi-horn installations and shall have the ability to replicate content to other devices (master/slave).
2. Alarm Beacon
   a. The alarm beacon shall be an Allen-Bradley [Bulletin 855B] with high-intensity, minimum 5-Joule Xenon, minimum 20-Watt Halogen or LED illumination as required on the drawings.

b. The alarm beacon shall have polycarbonate housing and lens, available in square or round configuration, and Type 4/4X/13, IP65/IP66 ingress rating as required on the drawings.
c. Flashing frequency shall be 1 Hz.
d. Alarm beacon lens colors shall be red, green, amber, blue, yellow or clear as required on the drawings.

3. Alarm Light Tower
a. The alarm light tower shall consist of Allen-Bradley Control Tower™ Stack Lights [Bulletin 854J or K], stacked 1 [or 2, 3, 4, 5] module(s) high and shall be surface- [or vertical-, quick-release-, pole-] mounted.
b. The alarm light tower shall be 40 mm [or 60 mm] size and the terminal block shall be top-mounted on the base.
c. The light modules shall be Type 4/4X/13, IP65 and are:
1) LED (steady, flashing or strobe)
d. The alarm light tower shall include a continuous (or pulsing) piezo [or transducer] sound module.
e. The alarm light tower shall have a DeviceNet base.

4. Signal Alarm (Panel Mount)
a. The signal alarm shall be an Allen-Bradley Panel Mount Signaling Alarm [Bulletin 855P] in a 30 mm [or 45 mm, 65 mm] size, that mounts in a standard 22.5 mm hole.
b. The signal alarm shall have polycarbonate base and lens.
c. The signal alarm shall be combination sounder and LED
d. The signal alarm shall be rear-securing and finger-safe.

K. Power Supplies
1. Control Power Transformer
a. The control power transformer shall be an Allen-Bradley Global Control Transformer [Bulletin 1497], single-phase and sized as shown on drawings.
b. The control power transformer shall be epoxy encapsulated and shall offer EN 60-529 finger-safe protection.
c. The control transformer shall have a dual primary and secondary fuse block, pre-wired and top-mounted.

2. 24 VDC Power Supplies
a. 24 VDC power supplies shall be Allen-Bradley [Bulletin 1606-XL] with active or passive PFC choke and input as shown in drawings [or auto-select input].
b. 24 VDC power supplies shall have low inrush current, and power supplies with greater than 100-Watt output shall incorporate a minimum 120% Power Burst design.
c. 24 VDC power supplies shall have NEC Class 2 “Limited Power” output.

3. UPS
a. The UPS shall be an Allen-Bradley Industrial Uninterruptible Power Supply [Bulletin 1609-B/D] with 120 VAC input voltage and output power as shown on drawings.
b. The UPS shall be back-of-panel- [or DIN rail-] mounted.
c. The UPS shall provide:
1) Surge protection to 380 Joules
2) Overload protection, resulting in delayed shutdown at 110 to 130% and immediate shutdown at 130%
3) Protection against output short on line – over-current protection from premises branch circuit
4) Protection against output short on battery, resulting in shutdown
5) Thermal protection
d. The UPS shall have USB communications and software, integrated remote on/off and dry I/O contacts.

e. The UPS shall have EtherNet/IP communications, expandable battery capacity and/or pure sine wave output.
f. The UPS shall perform to 40°C [50°C, with hi-temp battery].

L. **Disconnect/breakers shall be external flange mounted type, all metal construction with painted handle, lockable, similar to Allen Bradley Model 1494F-M1-412**. Plastic switches and twist type disconnects and breakers shall not be used.

M. In addition to any auxiliary contacts required for interlocking purposes, each magnetic starter shall be equipped with one normally open auxiliary control circuit contact either for "sealing in" or as a spare for future use.

N. Indicating lights shall be transformer or series resistor type. There shall be one red light for each single speed motor to indicate when motor is running. For multiple speed motors one indicating light for each speed shall be provided.

O. The starter disconnecting means shall be circuit breakers. The external operating handle shall clearly indicate "ON" or "OFF" position of the switch and shall be interlocked with the door to require throwing the handle to the "OFF" position to open the door. The handle shall be arranged for locking both the door closed and the disconnect in the "OFF" position with up to 3 padlocks. Provide defeat device in cover to permit opening door in "ON" position.

P. Circuit breakers in combination starter units shall be of the magnetic trip type with an adjustable trip setting for selecting instantaneous trip points of fault protection (motor circuit protector). Field adjustment of the instantaneous trip shall be performed by the Electrical Contractor. Select the trip setting at approximately 10 times the motor nameplate full-load current. If the circuit breaker trips on starting, incrementally increase the settings. In no case shall the trip setting exceed 13 times the motor full-load current.

Q. Overload heaters shall be furnished for all starters and shall be sized in range of 115 to 125 percent of full load current. The motor starters shall be shipped with the overload heaters inside the compartment but not installed. The Electrical Contractor shall verify the ratings of the heater coils based on the motor nameplate data before installing the overloads. The Contractor supplying the starter shall replace any improperly selected heaters.

R. A transformer shall be supplied in each starter unit for 120 volt control voltage. Transformer capacity shall be adequate to supply the holding coil requirements plus the solenoids, e-p switches, relays and other devices required to be controlled from the starter. A fuse shall be supplied in one secondary terminal of the control transformer. The other terminal shall be grounded to the housing of the starter. Fuses shall be also provided in the transformer primary leads per the National Electrical Code.

S. All enclosures shall be NEMA Type 1 steel with hinged cover for general purpose indoor application, unless otherwise indicated. Enclosures shall be arranged for equipment or wall mounting. Weather resistant NEMA 3R steel enclosures shall be provided for all outdoor starters. All devices mounted on the outside of all enclosures shall be NEMA 4.

T. Each starter shall be clearly identified by engraved nameplates after installation. The nameplates shall be plastic black plates with ½" high white letters and shall be securely fastened to starter with mounting screws made of non-corrosive metals.

U. Stainless steel flush mounted starter and enclosures shall be provided for all starters located in the kitchen and dishwasher areas.

V. All starters, except those furnished as an integral part of equipment and factory installed on the equipment, shall be of the same manufacturer.

W. Starters shall be as manufactured by Westinghouse, General Electric, Square D, Eaton/Cutler-Hammer, or Allen-Bradley.

X. Shop drawings shall be provided with dimensions, ratings, wiring diagrams and schedule of nameplates for approval prior to fabrication.

Y. If a motor is replaced (even with the same horsepower), a new starter shall be provided for that motor.

1.46 MOTOR CONTROLLERS

A. Motor controllers shall be defined as control devices such as pushbuttons, switches, etc. which are not mounted in starter cover, required for remote control of motors.

B. Unless otherwise noted, motor controllers shall be housed in NEMA Type 1 general purpose steel enclosures. Outdoor controllers shall be provided with weather resistant NEMA Type 3R steel enclosures. Provide nameplate to indicate the motor with which they are associated.

C. Provide reduced voltage starters for all motors 10 HP and larger and provide time delay for restart.

D. The controllers to be installed in finished area shall be flush mounted.

E. The Electrical Contractor shall install and provide wiring for motor controllers. The contractor providing the motor shall furnish the controllers.

F. Unless otherwise noted, pushbuttons shall be of the normal duty, spring return momentary type.

G. Selector switches and pushbuttons shall be equipped with nameplates indicating the function of each of their positions as noted in the list of electric motors and motor controls or shown on the drawings.

H. Pilot light shall be transformer or series resistor type for operation at 120 V.

I. Pilot lights shall be equipped with nameplates indicating the operating conditions they annunciate as noted in the list of electric motors and motor controls or shown on the drawings.

J. Electrical Control Devices
   1. Allen-Bradley® Electrical Control Devices are the basis of design,
   2. The electrical control devices shall include:
      a. Pilot Devices
      b. Relays and Timers
      c. Miniature Circuit Breakers
      d. Terminal Blocks and Fuse Blocks
      e. Alarms and Signals
      f. Power Supplies
      g. Panel-mounted disconnect switches
   3. The electrical control devices shall be interoperable with standard electrical equipment.

K. Pilot Devices
   1. 30.5 MM Push Buttons, Selector Switches And Pilot Lights
      a. 30.5 mm push buttons, selector switches and pilot lights shall be Allen-Bradley heavy industrial Type 4/13 watertight/oiltight metal [Bulletin 800T].

b. 30.5 mm push buttons, selector switches and pilot lights shall provide EN/IEC 60529 IP66/65 degree of protection.
c. 30.5 mm push buttons, selector switches and pilot lights shall have electrical ratings of:
   1) Dielectric strength – 2200V for 1 minute [or 300V for 1 minute (Logic Reed)]
   2) Electrical design life cycles – 10,000,000 at max. rated load [200,000 at max rated load (Logic Reed)]
d. 30.5 mm push buttons, selector switches and pilot lights shall have an operating range of -40 to 131°F (-40 to 55°C).
e. Illuminated devices shall offer universal LED that accepts 12 to 130 VAC/VDC voltage input.
f. 30.5 mm push buttons shall have a diaphragm seal for protection from liquids, particles and corrosive agents.
g. 30.5 mm selector switches shall incorporate a positive detent to prevent the switch from hanging up between positions.

2. Potentiometer Devices
   a. 30.5 mm potentiometer devices shall be Allen-Bradley heavy industrial Type 4/13 watertight/oiltight metal [Bulletin 800T].
   b. Potentiometer devices shall be rated for 300 VAC/VDC, 2 W maximum (6 VDC minimum):
      1) Mechanical design life – Min. 25,000 cycles
      2) Rotational torque – 3 to 12 in-oz
      3) Stopping torque – Min. 12 in-lb
   c. Potentiometer devices shall have single-turn operation, 312 degree rotation.
   d. Potentiometer devices shall be finger-safe.
3. Control Stations
   a. Control stations shall provide Allen-Bradley heavy industrial 30.5 mm push button(s) or selector switch with appropriate contact action, button/lever type and color/legend marking. Devices shall be Type 4/13 watertight/oiltight metal [Bulletin 800T].
   b. Control stations shall be constructed of die-cast aluminum

L. Relays And Timers
1. Relays – Time Delay
   a. Allen-Bradley time delay relays [Bulletin 700-HT] shall mount on tube-type bases with pin-style socket mounting.
   b. Time delay relays shall have 10A, B300, DPDT contact ratings and coil voltages as shown on drawings.
   c. Time delay relays shall have adjustable timing ranges [or fixed timing ranges to avoid tampering]. Timing ranges shall be as shown on drawings.
2. Relays – General Purpose
   a. Allen-Bradley general purpose relays [Bulletin 700-HA] shall have tube-base/Octal 8-pin [or 11-pin] terminals and ON/OFF flag indicators.
   b. General purpose relay contacts shall be silver nickel [or silver nickel bifurcated or gold-plated bifurcated] and have 10A, B300, DPDT [or 3PDT] ratings. Coil voltages shall be as shown on drawings.
   c. General purpose relays shall have an electrical schematic on the faceplate, a clear cover for visual inspection and snap-in marker ability.
   d. General purpose relays shall have LED status indicators, push-to-test and manual override.
3. Relays – Miniature
   a. Allen-Bradley miniature relays [Bulletin 700-HC] shall be square-base, 4-pole, plug-in type with blade-style terminals and ON/OFF flag indicators.
   b. Miniature relay contacts shall be silver nickel [or gold-plated silver nickel] and have 7A [or 10A], DPDT [or 4PDT] ratings. Coil voltages shall be as shown on drawings.
   c. Miniature relays shall have an electrical schematic on the faceplate and a clear cover for visual inspection.

d. Miniature relays shall have LED status indicators and push-to-test button with incorporated manual override lever.

4. Relays – Industrial-Type
   a. Allen-Bradley industrial-type relays [Bulletin 700-P] shall be ruggedly constructed (10 million operation mechanical life), 2-pole [or 4-pole, 8-pole, 12-pole], configured N.O./N.C. as shown on drawings, and panel- [or strip-, DIN rail-] mounted.
   b. Industrial-type relays shall be finger-safe.
   c. Industrial-type relay contacts shall be silver nickel with a double-break and bifurcated design and 10A, A600 rating for AC [5A, P600 rating for DC].
   d. Accessories shall include adder decks, time delay, latching, surge suppressors and/or mounting strip.
5. Timers – Solid-State
   a. Allen-Bradley solid-state timers [Bulletin 700-FS] shall be DIN rail-mounted.
   b. The solid-state timer contacts shall be available as SPDT or DPDT, 8A.
   c. Solid-state timers shall be available with On-Delay, Off-Delay, On- and Off-Delay, One-Shot and Flasher operating modes as required on the drawings.
   d. Solid-state timers shall have coil surge protection and adjustable timing ranges of 0.05 seconds to 60 hours as shown on drawings.
6. Timers – Programmable
   a. Allen-Bradley programmable timers [Bulletin 700-HX] shall be digital timing relays with LCD display and shall be socket- [or panel-] mounted.
   b. Programmable timer contacts shall be SPDT, rated 5A, B300.
   c. Programmable timer panel surface shall offer Type 4X/IP66 protection.
   d. Programmable timers shall be configurable for Signal On-Delay, Power On-Delay, Off-Delay, Repeat Cycle, One-Shot and Cumulative operating modes as required on the drawings.
   e. Programmable timers shall have timing ranges of 0.000 seconds to 9999 hours, depending on selected mode and as shown on drawings.

M. Miniature Circuit Breakers
1. Miniature circuit breakers shall be Allen-Bradley Circuit Breakers [Bulletin 1489-M].
2. Miniature circuit breakers shall be thermal-magnetic, current-limiting type, sized as specified on the drawings:
   a. 0.5A to 63A current rating
   b. 1-, 2- or 3-pole
   c. Type C or Type D tripping characteristic
3. Miniature circuit breakers shall be UL Listed (E197878), CSA Certified (259391), CE Marked, VDE and CCC Certified and RoHS Compliant. Standards compliances shall include:
   a. UL 489
   b. CSA C22.2, No. 5.1
   c. EN 60947-2
   d. GB 14048.2
4. Miniature circuit breakers shall be rated for:
   a. Voltage – Max. 480Y/277 VAC (UL/CSA); U_e 230/400 VAC (IEC)
   b. Interrupting capacity – 10 kA (UL/CSA); 15 kA (IEC)
5. Housing shall satisfy Insulation Group II/RAL 7035, shall have IP20 finger-safe design, shall be suitable for DIN rail mounting and shall include status indicator window and scratch- and solvent-resistant printing.
6. Miniature circuit breakers shall support reversible line and load connections and shall have dual terminals that:
   a. Connect up to 4 wires, or 2 wires and a bus bar.
   b. Clamp from both sides.
   c. Have a unique design that directs wires into openings to prevent wiring misses.

7. Miniature circuit breakers shall be compatible with UL 508 Listed bus bars, auxiliary contacts, signal contacts, shunt trips and toggle-mount lockout attachments.

N. Terminal Blocks and Fuse Blocks
   1. Terminal Blocks – Control, #22 to #8 AWG
      a. Control terminal blocks shall be Allen-Bradley screw-type, feed-through [Bulletin 1492-J].
      b. Control terminal blocks shall be certified:
         1) UR/CSA – #22 to #8 AWG wire range, 50A maximum current, 600 VAC/VDC voltage rating
         2) IEC – 6 mm^2 wire range, 41A maximum current, 800 VAC/VDC voltage rating
         3) ATEX – 6 mm^2 (#20 to #10 AWG) wire range, 36A maximum current, 550 VAC/VDC voltage rating
      c. Control terminal blocks shall have a snap-in card marking system.
   2. Terminal Blocks – Power
      a. Power terminal blocks shall be Allen-Bradley [Bulletin 1492-PD]:
         1) Open-style power distribution block with aluminum or copper connectors – 3-pole [or 1-pole], rated at 600 VAC/VDC, 175 to 760A
      b. Power terminal blocks shall be certified by UR, CSA and CE.
      c. Wire ranges and tightening torques shall be labeled on the block.
      d. Power terminal blocks shall have a write-on marking surface or marker retention feature.
   3. Fuse Blocks
      a. Allen-Bradley fuse block kits [Bulletin 1491] shall be used for protection of transformers and control circuits capable of delivering no more than 200,000 RMS symmetrical amps, 600V maximum.
      b. Fuse block kits shall be 1-pole, 2-pole or 3-pole.
      c. Each pole shall have a fuse cover.

O. Alarms and Signals
   1. Alarm Horn
      a. The alarm horn shall be an Allen-Bradley High Performance Electronic Horn [Bulletin 855H] and shall have up to 4 stages and low current consumption.
      b. The alarm horn shall have a UV-stable plastic housing and non-moving parts.
      c. The alarm horn shall have an on-board microphone, 45 alarm tones selectable by DIP switch and fine volume control via potentiometer.
      d. The alarm horn shall allow synchronized output in multi-horn installations and shall have the ability to replicate content to other devices (master/slave).
   2. Alarm Beacon
      a. The alarm beacon shall be an Allen-Bradley [Bulletin 855B] with high-intensity, minimum 5-Joule Xenon, minimum 20-Watt Halogen or LED illumination as required on the drawings.
      b. The alarm beacon shall have polycarbonate housing and lens, available in square or round configuration, and Type 4/4X/13, IP65/IP66 ingress rating as required on the drawings.
      c. Flashing frequency shall be 1 Hz.
      d. Alarm beacon lens colors shall be red, green, amber, blue, yellow or clear as required on the drawings.
   3. Alarm Light Tower
      a. The alarm light tower shall consist of Allen-Bradley Control Tower™ Stack Lights [Bulletin 854J or K], stacked 1 [or 2, 3, 4, 5] module(s) high and shall be surface- [or vertical-, quick-release-, pole-] mounted.
      b. The alarm light tower shall be 40 mm [or 60 mm] size and the terminal block shall be top-mounted on the base.
      c. The light modules shall be Type 4/4X/13, IP65 and are:
         1) LED (steady, flashing or strobe)

d. The alarm light tower shall include a continuous (or pulsing) piezo [or transducer] sound module.
e. The alarm light tower shall have a DeviceNet base.

4. Signal Alarm (Panel Mount)
a. The signal alarm shall be an Allen-Bradley Panel Mount Signaling Alarm [Bulletin 855P] in a 30 mm [or 45 mm, 65 mm] size, that mounts in a standard 22.5 mm hole.
b. The signal alarm shall have polycarbonate base and lens.
c. The signal alarm shall be combination sounder and LED
d. The signal alarm shall be rear-securing and finger-safe.

P. Power Supplies
1. Control Power Transformer
a. The control power transformer shall be an Allen-Bradley Global Control Transformer [Bulletin 1497], single-phase and sized as shown on drawings.
b. The control power transformer shall be epoxy encapsulated and shall offer EN 60-529 finger-safe protection.
c. The control transformer shall have a dual primary and secondary fuse block, pre-wired and top-mounted.

2. 24 VDC Power Supplies
a. 24 VDC power supplies shall be Allen-Bradley [Bulletin 1606-XL] with active or passive PFC choke and input as shown in drawings [or auto-select input].
b. 24 VDC power supplies shall have low inrush current, and power supplies with greater than 100-Watt output shall incorporate a minimum 120% Power Burst design.
c. 24 VDC power supplies shall have NEC Class 2 “Limited Power” output.

3. UPS
a. The UPS shall be an Allen-Bradley Industrial Uninterruptible Power Supply [Bulletin 1609-B/D] with 120 VAC input voltage and output power as shown on drawings.
b. The UPS shall be back-of-panel- [or DIN rail-] mounted.
c. The UPS shall provide:
1) Surge protection to 380 Joules
2) Overload protection, resulting in delayed shutdown at 110 to 130% and immediate shutdown at 130%
3) Protection against output short on line – over-current protection from premises branch circuit
4) Protection against output short on battery, resulting in shutdown
5) Thermal protection
d. The UPS shall have USB communications and software, integrated remote on/off and dry I/O contacts.
e. The UPS shall have EtherNet/IP communications, expandable battery capacity and/or pure sine wave output.
f. The UPS shall perform to 40°C [50°C, with hi-temp battery].

Q. **Disconnect/breakers shall be external flange mounted type, all metal construction with painted handle, lockable, similar to Allen Bradley Model 1494F-M1-412**. Plastic switches and twist type disconnects and breakers shall not be used.

1.47 SEMI-FINAL AND FINAL SITE VISITS FOR OBSERVATION

A. As the project approaches completion, the Engineer and Architect, at their discretion shall determine a period of time in which they shall perform a Semi-Final Site Visit to observe the Mechanical and Electrical installation. At the conclusion of this Semi-Final Site Visit, a Semi-Final Punchlist shall be issued to the appropriate Contractor for the deficiencies in the work of his trade. Complete all work and perform all

corrective measures as required by the Semi-Final Punchlist. After this corrective and completion work has been accomplished, in writing, advise the Architect and the Engineer that every item on the Semi-Final Punchlist has been completed. After the Architect and Engineer make a Final Site Visit to observe the Mechanical and Electrical installation and make a Punchlist, a similar letter of Compliance shall be forwarded through the appropriate channels.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. The Contractor shall be responsible for the installation of all equipment in accordance with the Manufacturer's Installation/Operation & Maintenance Manuals and instructions. If other requirements of this Specification contradict what is stated in the Manufacturer's instructions, the matter shall be brought to the attention of the Architect and Engineer for clarification. Any and all of the Manufacturer's requirements for utilities (electrical power and control wiring, piped water, drain, gas, fuel oil, steam, condensate, etc.), ducted supply or exhaust air, mounting and support shall be provided by the Contractor, regardless of how, or whether or not stated elsewhere in the Contract/Bid Documents.

END OF SECTION

SECTION 018119.11

CONSTRUCTION IAQ MANAGEMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Sections is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to adopt an IAQ management plan to protect the HVAC system and completed areas of construction during construction, control pollutant sources and interrupt contamination pathways. The IAQ management plans shall meet or exceed the recommended design approaches contained in Chapter 3 of the SMACNA IAQ Guideline for Occupied Buildings Under Construction, 1995. Each contractor shall sequence the installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile and gypsum wall board during construction.

1.03 QUALITY ASSURANCE

A. Construction related IAQ procedures and issues shall be presented by each contractor at every construction progress meeting. Each contractor shall report on the implementation of their IAQ plan. Issues related to coordination with other contractors should be addressed. Each contractor shall report to the Construction Manager who will function as the IAQ Manager for the project. As the IAQ Manager, the Construction Manager will identify IAQ problems and direct the responsible contractor as to required mitigation.

B. Each contractor shall provide a minimum of 18 photographs, 6 photographs taken on 3 different occasions during construction: the beginning, the midpoint, and the end. The contractor shall identify each SMACNA approach, as described herein, featured by each photograph.

C. At the completion of the contract, each contractor shall provide a letter, using the LEED Letter Template at the end of this section, signed by him declaring that a Construction IAQ Management Plan has been developed and implemented. The HVAC Contractor shall list each air filter used during construction and at the end of construction, including the MERV value, manufacturer and model number.

D. Each contractor shall provide a declaration of the five Design Approaches of the SMACNA IAQ Guideline for Occupied Buildings Under Construction 1995, Chapter 3 which were used during building construction, which shall include a brief description of how each of the design approaches was used.

E. At the completion of the building flush-out, the HVAC Contractor shall provide a letter using the LEED Letter Template attached, describing the building flush-out procedures and data.

1.04 SUBMITTALS

A. Refer to Section - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

B. Submit all declarations & photographs as required under “Quality Assurance” above.

C. Before the start of construction, submit a narrative of the proposed IAQ plan to be implemented. This shall include the specific procedures which shall be used to implement each of the five design approaches of the SMACNA IAQ Guideline for Occupied Buildings Under Construction 1995, Chapter 3; HVAC Protection, Source Control, Pathway Interruption, Housekeeping and Scheduling. The HVAC Contractor shall include catalog cuts of filters to be utilized and a description of the Building Flush-Out procedure to be implemented.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - NOT USED

PART 3 - EXECUTION

3.01 CONSTRUCTION IAQ MANAGEMENT PLAN: DURING CONSTRUCTION

A. Requirements
1. Each contractor shall develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:
   a. During construction meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3.
   b. Protect stored on-site or installed absorptive materials from moisture damage.
   c. When air handlers are used during construction, the HVAC Contractor shall provide filtration media with a minimum efficiency reporting value (MERV) of 8 at each return air grill. MERV shall be as determined by ASHRAE 52.2-1999.
   d. The HVAC Contractor shall replace all air handler filtration media immediately prior to occupancy. Filtration media shall have a Minimum Efficiency Report Value (MERV) of 13, as determined by ASHRAE 52.2-1999 for media installed at the end of construction.

B. The Plan shall address the protection of the ventilation system components during construction and cleanup of contaminated components after construction is complete. Required temporary ventilation and operation of the air handlers during construction shall be provided as required in the General Conditions of the construction contract.

Construction-related IAQ procedures should be included in the pre-construction and construction progress meeting agendas. The Construction Manager shall make efforts to ensure that all participants in the construction process are aware of the IAQ procedures and understand the importance of the goals of the IAQ Management Plan.

The referenced SMACNA standard recommends control measures in five areas: HVAC protection, source control, pathway interruption, housekeeping and scheduling. Review the applicability of each control measure and include those that apply in the final IAQ Management Plan.

C. HVAC Protection - Shut down the return side of the HVAC system (which is, by definition, ductwork under negative pressure) whenever possible during heavy construction or demolition. The return side should also be isolated from the surrounding environment whenever possible. For example, all ceiling tiles for the ceiling plenum should be in place and all leaks in ducts and air handlers should be repaired promptly. When the ventilation system is operated during construction, it should be fitted with temporary filters that can be replaced with clean media just prior to substantial completion and occupancy.

The HVAC Contractor should insure that return side of the HVAC system is dampered off in the heaviest work areas and return system openings shall be sealed with plastic. In addition to protection of the HVAC system, filter efficiency shall be upgraded where major loading is expected to occur on operating HVAC systems.

D. Source Control - Use nontoxic materials such as paints, caulks, sealants, and cleaning products.

E. Pathway Interruption - During construction, isolate areas of work to prevent contamination of clean or occupied spaces. Depending on the climate, ventilate using 100% outside air to exhaust contaminated air directly to the outside during installation of VOC emitting materials. Pressure differentials shall be utilized to prevent contaminated air from entering clean areas. Erect barriers between work areas and non-work areas.

F. Housekeeping - Institute cleaning activities concentrating on HVAC and building spaces to remove contaminants from the building prior to occupancy. Building materials shall be protected from weather and stored in a clean area prior to unpacking for installation. All coils, air filters, and fans shall be cleaned before performing testing and balancing procedures and especially before conducting baseline air quality tests.

G. Scheduling - Use construction sequencing that reduces absorption of VOCs by materials that act as sinks or contaminant sources. Complete applications of wet and odorous materials such as paints, sealants, and coatings before installing “sink” materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings. Materials directly exposed to moisture through precipitation, plumbing leaks, or condensation from the HVAC system are susceptible to microbial contamination.

3.02 CONSTRUCTION IAQ MANAGEMENT PLAN: BEFORE OCCUPANCY

A. Requirements

The HVAC Contractor shall develop and implement an Indoor Air Quality (IAQ) Management Plan for the pre-occupancy phase as follows:

1. After construction ends and prior to occupancy, conduct a minimum two-week building flush-out with new Minimum Efficiency Reporting Value (MERV) 13 filtration media at 100% outside air. After the flush-out, replace the filtration media with new MERV 13 filtration media.
2. Alternately, if a flush out is not feasible, perform baseline air quality tests according to the requirements of the SMACNA IAQ Guidelines.

END OF SECTION

SECTION 078400

FIRESTOPPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire resistance rated construction by maintaining an effective barrier against the spread of flame, smoke and/or hot gases through penetrations, fire resistive joints, and perimeter openings in accordance with the requirements of the Building Code for this project.

B. Firestop systems shall be used in locations including, but not limited to, the following:

1. Penetrations through fire resistance rated floor and roof assemblies including both empty openings and openings containing penetrants.
2. Penetrations through fire resistance rated wall assemblies including both empty openings and openings containing penetrants.
3. Membrane penetrations in fire resistance rated wall assemblies where items penetrate one side of the barrier.
4. Joints between fire resistance rated assemblies.
5. Perimeter gaps between rated floors/roofs and an exterior wall assembly.

C. Related Sections include, but are not limited to, the following:

1. Division 07 – Thermal and Moisture Protection
2. Division 09 – Finishes
3. Division 21 – Fire Suppression
4. Division 22 – Plumbing
5. Division 23 – Heating, Ventilating and Air Conditioning
6. Division 25 - Automation
7. Division 26 – Electrical
8. Division 27 – Communications
9. Division 28 – Electrical Safety and Security

1.03 REFERENCES

A. New York State Uniform Fire Prevention and Building Code

B. *New York City Building Code.*

C. National Fire Protection Association (NFPA)

1. NFPA 101 (Life Safety Code)

D. American Society For Testing and Materials Standards (ASTM):

1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E814: Standard Test Method for Fire Tests of Through-Penetration Firestops.
3. ASTM E1966: Test Method for Resistance of Building Joint Systems.
4. ASTM E1399: Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Width.
5. ASTM E119: Methods of Fire Tests of Building Construction and Materials.
6. ASTM E2174: Standard Practice for On-Site Inspection of Installed Fire Stops
7. ASTM E2307: Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA)
8. ASTM E2393-04 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

E. Underwriters Laboratories Inc. (UL):

1. UL Qualified Firestop Contractor Program.
2. UL 263: Fire Tests of Building Construction and Materials.
3. UL 723: Surface Burning Characteristics of Building Materials.
4. UL 1479: Fire Tests of Through-Penetration Fire Stops.
5. UL 2079: Tests for Fire Resistance of Building Joint Systems.

F. UL Fire Resistance Directory -Volume 2:

1. Through-Penetration Firestop Devices (XHJI)
2. Fire Resistive Ratings (BXUV)
3. Through-Penetration Firestop Systems (XHEZ)
4. Fill, Void, or Cavity Material (XHHW)

G. Omega Point Laboratories (OPL)

1. Building Products, Materials & Assemblies – Volume II

H. Factory Mutual Research (FM):

1. FM 4991: FM Approval Standard of Firestop Contractors – Class 4991

1.04 DEFINITIONS

A. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.

B. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s).

C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.

D. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.

E. Membrane-penetration: Any penetration in a fire-rated wall or floor/roof-ceiling assembly that breaches only one side of the barrier.

F. Fire Resistive/Construction Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.

G. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and an exterior wall assembly.

H. Approved Testing Agencies: Not limited to: Underwriters Laboratory (UL), Factory Mutual (FM), Warnock Hersey, and Omega Point Laboratory (OPL).

1.05 PERFORMANCE REQUIREMENTS

A. Penetrations: Provide through-penetration and membrane-penetration firestop systems that are produced and installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.

1. Provide and install complete penetration firestopping systems that have been tested and approved by nationally accepted testing agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.

2. F-Rated Systems: Provide firestop systems with F-ratings indicated, as determined per ASTM E814 or UL 1479, but not less than one (1) hour or the fire resistance rating of the assembly being penetrated.

3. T-Rated Systems: Provide firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E814 or UL 1479, and where required by the Building Code for floor penetrations which are not located within the cavity of a wall.

4. L- Rated Systems: Provide firestop systems with L- ratings less than 5cfm/sf.

5. W-Rated systems: Provide firestop systems that are resistant to water. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

6. For penetrations involving non-metallic, CPVC, PVC, or plastic piping, tubing or conduit, provide firestop systems that are chemically compatible in accordance with Manufacturer requirements.

7. For penetrations involving insulated piping, provide firestop systems not requiring removal of insulation.

8. For penetrations involving fire or fire/smoke dampers, only firestop products approved by the damper manufacturer shall be installed in accordance with the damper installation instructions.

B. Fire Resistive Joints: Provide joint systems with fire resistance assembly ratings indicated, as determined by UL 2079 (ASTM E1399 and E1966), but not less than the fire resistance assembly rating of the construction

in which the joint occurs. Firestopping assemblies must be capable of withstanding anticipated movements for the installed field conditions.

1. For firestopping assemblies exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
2. For floor penetrations exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means, as specified by the Architect.
3. L- Rated Systems: Provide firestop systems with L- ratings less than 5cfm/sf.

C. Firestopping products shall have flame spread ratings less than 25 and smoke-developed ratings less than 450, as determined per ASTM E 84. Note: Firestop products installed in plenum spaces shall have a smoke developed rating less that 50.

D. Engineering Judgment (EJ): Where there is no specific third party tested and classified firestop system available for an installed condition, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the Design Professional and where required the Authority Having Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines. Note: Tested and Listed firestop systems are to be used before an Engineering Judgment (EJ). Engineeing Judgments (EJ) shall not be utilized as an alternative to proper construction or coordination.

1.06 SUBMITTALS

A. Product Data: For each type of firestopping product selected. Manufacturers certification must verify that firestopping materials are free of asbestos, lead and contain volatile organic compounds (VOCs) within limits of the local jurisdiction.

B. Design Listings: Submit system design listings, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestop configuration.

C. Installation Instructions: Submit the manufacturer’s installation instruction for each firestop assembly.

D. Where there is no specific third party tested and classified firestop system available for a particular configuration, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) for submittal.

E. Material Safety Data Sheet (MSDS): Submit for each type of firestopping product selected.

F. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Submit documents as per 1.7.

G. A quality control manual approved by FM or UL (if applicable).

H. Firestop Schedule: Submit schedule (see appendix A) itemizing the following:

1. Manufacturer’s product reference numbers and/or drawing numbers.
2. Listing agency’s design number.
3. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.
4. Maximum allowable annular space or maximum size opening.
5. Wall type construction.
6. Floor type construction.
7. Hourly Fire resistance rating of wall or floor.

8. F rating.
9. T rating for floor penetrations not in a cavity of a wall. The F and T ratings shall be equal.
10. L and W rating, if applicable.

I. Firestop Application Log: A separate binder shall be prepared and kept on site for use by the Inspection Agency and the Authority Having Jurisdiction. The binder shall contain the following:

1. The binder shall be a three (3) ring binder.
2. Firestop Schedule (see appendix A)
3. All approved firestopping assemblies including engineering judgments shall be provided and organized by trade.
4. Copy of manufacturer's installation instruction for each firestop assembly.
5. A matrix or table of contents listing each assembly shall be provided.
6. The binder shall be updated as new firestop assemblies or EJ's are added.
7. The binder shall be kept on-site at a location approved by the Owner.
8. Qualifications or Certification of each Installer

1.07 QUALITY ASSURANCE

A. Provide firestopping system design listings from UL, FM, Warnock Hersey or OPL in accordance with the appropriate ASTM Standard(s) per article 1.5.

B. Contractor Qualifications: An acceptable Firestop Contractor shall be:

1. Licensed by State or Local Authority where applicable, or
2. FM Research approved in accordance with FM Standard 4991, or
3. UL Qualified Firestop Contractor, or
4. Meet the following requirements
    i. Installation personnel shall be trained by the approved firestop manufacturer.
    ii. The installation firm shall be experienced in installing firestop systems and fire resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
    iii. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified tested and listed system requirements.
    iv. Minimum of three (3) years experience and shown to have successfully completed not less than 5 comparable scale projects and provide references.

C. Single Source Limitations: Obtain firestop systems for all conditions from a single manufacturer. The only exception is where a listed firestop system is available for a specific opening from another manufacturer, it shall be utilized before an Engineering Judgment.

D. Materials from different firestop manufacturers shall not be installed in the same firestop system or opening.

E. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.

F. Firestopping sealants must be flexible, allowing for normal movement.

G. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces such that a void is created.

H. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.

I. Materials used shall be in accordance with the manufacturer's written installation instructions.

J. Identify installed firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. In addition, for perimeter or joint firestop systems attach labels at locations every 20 feet or at least each section where separated. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and provide a label material that will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Firestop system designation of applicable testing and listing agency.
4. Date of installation.
5. Firestop system manufacturer's name.
6. Installer's name.
7. Inspector's name (if applicable)

K. Special Inspection of penetrations through fire-rated floor and wall assemblies shall be in accordance with ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops and ASTM E2393-04 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers. The Owner may engage a qualified, independent inspection agency, or material testing agency to perform these inspections.

L. Field Mock-up Installations: Prior to installing firestopping, erect mock-up installations for each type firestop system indicated in the Firestop Schedule to verify selections made and to establish standard of quality and performance by which the firestopping work will be judged by the Owner or Owner's Representative. Obtain acceptance of mock-up installations by the Owner or Owner's Representative before start of firestopping installation. Provide at least 72 hours notice to Owner or Owner's Representative prior to inspection.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture/expiration, lot number, listing agency's classification marking, and mixing instructions for multi-component materials.

B. Store and handle materials per manufacturer's instructions to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. All firestop materials shall be installed prior to expiration date.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Install firestopping when ambient or substrate temperatures are within limits permitted by the manufacturer's written instructions. Do not install firestopping when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate per the manufacturers written instructions on the product's Material Safety Data Sheet.

C. Verify the condition of the substrates before starting work.

D. Care should be taken to ensure that firestopping materials are installed so as not to contaminate adjacent surfaces.

1.10 COORDINATION

A. Coordinate areas prior to firestopping installation with the Owner, Construction Manager and/or all other Contractors.

B. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed according to specified requirements. Opening shall not exceed maximum restrictions allowable for annular spacing per listing or acceptable Engineering Judgments.

C. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

D. Do not conceal firestopping installations until the Owner's inspection agency or Authorities Having Jurisdiction have examined each installation.

E. Schedule firestopping after installation of penetrants and joints but prior to concealing or obstructing access to areas requiring firestopping.

F. Preinstallation Conference: This conference should be a joint meeting attended by the Owner's Representative and all prime contractors, respective firestopping sub-contractors and firestopping company field advisor to review project requirements. The agenda for the conference should include the following topics:

1. Review scope of work.
2. Review shop drawings and firestop application log.
3. Review mock-up requirements.
4. Discuss identification labels and locations.
5. Review schedule, coordination and sequencing with all trades.
6. Review any engineering judgments or other special requirements.
7. Function and frequency of inspections and testing labs.

G. Destructive testing shall be performed at mock up and at pre determined intervals according to ASTM E 2174 and ASTM E 2393-04 by the inspector and with the installing Contractor present. Inspector to test for in place installation conformance to tested and listed system or engineering judgment details. Non conformances will result in additional destructive testing, at the cost of the installer.

PART 2 - PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Firestopping products specified in system design listings by approved testing agencies may be used providing they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate assembly.

B. Manufacturer of firestopping products shall have been successfully producing and supplying these products for a period of not less than three years and be able to show evidence of at least ten projects where similar products have been installed and accepted.

C. Accessories: Provide components for each firestop system that is needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by the firestopping manufacturer and by the approved testing agencies for the firestop systems indicated. Accessories include, but are not limited to the following items:

   1. Permanent forming/damming/backing materials, including the following:

      i. Slag wool fiber insulation.

      ii. Foams or sealants used to prevent leakage of fill materials in liquid state.

      iii. Fire-rated form board.

      iv. Polyethylene/polyurethane backer rod.

      v. Rigid polystyrene board.

   2. Temporary forming materials.

   3. Substrate primers.

   4. Steel sleeves

D. All firestopping products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed.

2.02 MIXING

A. For those products requiring mixing before application, comply with firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.03 MANUFACTURERS

A. Subject to compliance with the requirements, provide products by one of the following or equivalent manufacturers:

1. Grace Construction Products.
2. Nelson Firestop Products.
3. Hilti Firestop Products.
4. A/D Fire Protection Systems Inc.
5. RectorSeal Corporation (The).
6. Specified Technologies Inc.
7. 3M; Fire Protection Products Division.
8. Tremco; Sealant/Weatherproofing Division.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that all pipes, conduits, cables, and/or other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with written recommendations of firestopping manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

3.03 FIRESTOP SYSTEMS INSTALLATION

A. General: Install firestop systems to comply with "Performance Requirements" article in Part 1 and firestopping manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Installation of firestopping shall be performed by an applicator/installer qualified as described in article 1.7.

C. Apply firestopping in accordance with approved testing agencies listed system designs or manufacturer's EJ per the manufacturer's installation instructions.

D. Verify that environmental conditions are safe and suitable for installation of firestop products.

E. Install forming/damming/backing materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire resistance ratings required.

F. Install joint forming/damming materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths of installed firestopping material relative to joint widths that allow optimum movement capability and achieve fire resistance ratings required.

G. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and firestop materials as applicable within the system design.

H. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids, joints and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they fully contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

4. Tool non-sag firestop materials after their application and prior to the time skinning begins. Use tooling agents approved by the firestopping manufacturer.

I. On vertical pipe penetrations, lift riser clamps to permit the installation of firestopping around the entire pipe penetration. For penetrations involving fire or fire/smoke dampers, only firestop products approved by the damper manufacturer shall be installed in accordance with the damper installation instructions.

3.04 FIELD QUALITY CONTROL

A. Inspecting Agency: Authorities Having Jurisdiction, the Owner, or Owner's Representative shall be allowed to perform random destructive testing during inspection of firestop systems to verify compliance per listings or manufacturer's installation instructions. All areas of work must be accessible until inspection by the applicable Authorities Having Jurisdiction and inspection agencies. The contractor shall be responsible to repair all tested assemblies with no cost to the owner.

B. Proceed with enclosing firestop systems with other construction only after inspections are complete.

C. Where deficiencies are found, repair or replace firestop systems so they comply with requirements.

3.05 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings, as Work progresses by methods and with cleaning materials that are approved in writing by firestopping manufacturer(s) and that do not damage materials

in which openings occur. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

B. Provide final protection and maintain conditions during and after installation that ensure firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce firestop systems complying with specified requirements.

FIRESTOP SCHEDULE

Project No:	Contractor Name and Address:	Date Submitted:
Project Title:	Supplier/Installer Name and Address:	Company Field Advisor Name and Address:
	Manufacturer Name and Address:	

Manufacturer's Product Reference Numbers and/or Drawing Numbers	U.L., FM, Warnock Hersey or Omega Point Lab Penetration Design Nos.	Penetrating Item: Material, Size, Insulated, Combustible, Joint, Perimeter, etc. Description:	Maximum Allowable Annular Space or Maximum Size Opening	Wall type Construction		Floor Type Construction	Fire Resistance Rating of Wall or Floor (Hourly)	F Rating	T Rating (floors Only)	L Rating (if available)	W Rating (if available)
				DES.	CONST.						
Example No. 1 DCFSS-130	UL #130	Maximum 4" Steel Pipe Non-Insulated		P4	6" CMU	N.A.	1 Hour	1 Hour	N.A	.	
Example No. 2 5300-ICF88.01	UL #591	Maximum 4" PVC Pipe		N.A.	N.A.	UL # D916	3 Hour	1 Hour	2 Hour		
Exmple No. 3	CW-S-2006	Curtain Wall/Perimeter	6” to 12”	NA	NA	4 ½” Reinforced LW concrete	2 Hour	2 Hour	NA	1 CFM/ Lin Ft.	

Manufacturer's Product Reference Numbers and/or Drawing Numbers	U.L., FM, Warnock Hersey or Omega Point Lab Penetration Design Nos.	Penetrating Item: Material, Size, Insulated, Combustible, Joint, Perimeter, etc. Description:	Maximum Allowable Annular Space or Maximum Size Opening	Wall type Construction		Floor Type Construction	Fire Resistance Rating of Wall or Floor (Hourly)	F Rating	T Rating (floors Only)	L Rating (if available)	W Rating (if available)
				DES.	CONST.						

SECTION 210000

GENERAL REQUIREMENTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. Division 21 of the specifications requires the furnishing and installing of all items, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include, but are not limited to, materials, labor, supervision, supplies, equipment, transportation, rigging, storage, utilities, and all required permits and licenses.

B. Before submittal of bid, examine all drawings, specifications, addenda, alternates, special conditions, and all other bidding documents of all sections of this project, verify all governing conditions at the site, and become fully informed as to the extent and character of the work required, as well as its relation to other work in the building. Submittal of a bid is an agreement to all requirements of the Contract Documents, and no consideration will be granted for any claimed misunderstanding thereof.

C. Submittal of a bid is a representation by the bidder that it is qualified in all respects properly to perform the work for which it is bidding and has experience with similar work. Bidders are deemed to be aware, on the basis of their background and experience, materials which may be required in their responsibilities, even though unspecified.

1.2 ABBREVIATIONS

ADA	Americans with Disabilities Act
AGA	American Gas Association
AHJ	Authority Having Jurisdiction
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ASA	Acoustical Society of America
ASME	American Society of Mechanical Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
BSA	New York City Board of Standards & Appeals
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
EPA	Environmental Protection Agency
ETL	Electric Testing Laboratory
FM	Factory Mutual
IEEE	Institute of Electrical and Electronic Engineers
IRI	Industrial Risk Insurers
MSDS	Materials Safety Data Sheet
MSS	Manufacturers' Standardization Society Standards.

NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code (NFPA 70)
NEMA	National Electrical Manufacturers Association
NETA	National Electrical Testing Agency
NFPA	National Fire Protection Association
NUSIG	National Uniform Seismic Installation Guidelines
NYCEC	New York City Electrical Code
NYCMC	New York City Mechanical Code
OSHA	Occupational Safety Health Administration.
OTCR	New York City Office of Technical Certifications and Research
PDI	Plumbing and Drainage Institute
TEMA	Tubular Exchangers Manufacturers Association
UL	Underwriters Laboratories

1.3 DEFINITIONS

A. For purposes of these specifications the following definitions apply:

1. ARCHITECT: The Architect of record.

2. ENGINEER: The Engineer of record.

3. CONTRACTOR: The individual, partnership or corporation to whom has been awarded the contract for providing the fire protection work.

4. SUBCONTRACTOR: The individual, partnership or corporation to whom has been awarded the contract for providing assistance to the Contractors work.

5. GENERAL CONTRACTOR: An individual or group that contracts with another organization or individual (Owner) for the construction of a building or other structure. They may or may not do any actual construction of a portion of the project.

6. CONSTRUCTION MANAGER: An individual or group that contracts with another organization or individual (Owner) for the scheduling and coordination of all design and construction processes, including the selection, hiring and oversight of specialty Trade Contractors, for a building or other structure.

7. PROVIDE: To “furnish” and “install”.

8. INSTALL: To join; unite; fasten; link; attach; set up or otherwise connect together; complete, tested and ready for normal satisfactory operation.

9. FURNISH: To supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application.

10. AS DIRECTED: As directed by the Architect or the Engineer.

11. CONCEALED: Embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings or accessible raised floor cavities.

12. SUBMIT: Submit to the Architect and/or the Engineer for review.

13. FINISHED SPACES: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

14. EXPOSED: Exposed to view.

15. SUPPLY: To purchase, procure, acquire, and deliver complete with related accessories.

16. WORK: Includes labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.

17. PIPING: Includes pipe, tube, fittings, flanges, valves, controls, strainer, hangers, supports, unions, traps, drains, insulation, and all related accessories.

18. WIRING: Includes raceway, fittings, wire, boxes, and all related accessories.

19. INDICATED: As shown or noted on the drawings or specifications.

1.4 RELATED DOCUMENTS

A. The General Conditions and Supplementary Conditions accompanying these specifications are hereby made a part of the requirements for the work under this section of the specifications.

B. No General Conditions and/or Supplementary General Conditions clause referring to the work of this section shall be considered waived unless specifically stated herein.

C. Refer to Owner's "Commissioning Requirements" for the scope of work related to systems furnished and installed under Division 21.

1.5 REFERENCE STANDARDS

A. Comply with the currently enforced versions of all applicable laws, rules, regulations, codes and ordinances of New York City and shall be BSA approved or have an OTCR approval. Modifications required by the Authorities Having Jurisdiction shall be made without additional cost to the Owner.

1. Secure and pay for necessary approvals, permits, inspections, carting, legal dumping, etc., and deliver the official records of the granting of permits to the Owner without additional cost to the Owner.

2. The drawings have been filed. Contractor shall pay all fees to obtain release of approved plans and shall complete and file all forms, tabulations, plans, etc., required for Special Inspections.

3. Where so required by the Building Code of the City of New York, the Owner shall employ the services of a Special Inspector to perform inspections of materials, installations, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

B. All equipment, materials, and methods to be furnished and/or installed by this division shall comply with all applicable requirements of laws, codes, ordinances, legislation, standards, etc., of all federal, state, and local authorities, whether indicated on the Contract Documents or not.

C. Where Contract Drawing and specification requirements are in excess of rules, regulations and code requirements, and are permitted under the code, the Contract Drawings and specifications shall govern. In the event of a conflict between the Contract Documents and the applicable laws, rules, regulations, codes, and ordinances of federal, state, and local Authorities Having Jurisdiction, the latter shall govern.

D. Where alterations to and/or deviations from the Contract Drawings and specifications are required by the Authorities listed above, report the requirements to the Architect and secure his written approval before starting the required modifications.

E. Pay royalties or fees required in connection with the use of patented devices, or systems, and save the Owner, the Engineer and the Construction Manager harmless from any claims or lawsuits arising from such use and indemnify each thereof against attorneys' fees in connection therewith.

1.6 QUALITY ASSURANCE

A. All materials and equipment shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products of the type specified herein. The manufacturer shall have been in continuous operation in the manufacture of the products specified for a minimum of ten (10) years.

B. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

C. Make every effort to furnish all equipment of any equipment type (such as pumps, hot water heaters, storage tanks, etc.) from one manufacturer.

D. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A "Materials Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

E. All adhesives specified herein or utilized in the manufacture of equipment or components which are specified herein shall meet or exceed the volatile organic compound (VOC) limits of South Coast Air Quality Management District Rule No. 1168.

F. All sealants specified herein or utilized in the manufacture of equipment or components which are specified herein shall meet or exceed Bay Area Resources Board Reg. 8, Rule 51. Submit as part of the shop drawing process for review by the Engineer and/or Owner, supporting documentation which demonstrates conformance with these requirements.

G. In the event that products, materials and/or processes are not available that do not contain asbestos, PCB's, VOC's formaldehyde formulations, hazardous materials or may result in hazardous out-gassing as determined by the manufacturer a "Materials Safety Data Sheet", as described above, shall be submitted as part of the shop drawing process for review by the Engineer and/or Owner.

H. Furnish all equipment, materials and accessories new and free from defects.

1.7 ENGINEERING REFERENCE POINTS

A. The Construction Manager shall provide benchmarks, monuments, and other reference points on the job which will be available for this Contractor's use.

B. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

1.8 INDEMNIFICATION

A. Covenant and agree that this Contractor and his Subcontractors and his and their agents, servants and employees will provide and maintain a safe place to work and that he and they will comply with all laws and regulations of any governmental Authority Having Jurisdiction thereof.

B. This Contractor agrees to indemnify, defend and hold harmless the Owner, Owner's agents and Engineer from and against any liability, loss, damage or expense, including attorneys' fees, arising from a failure or alleged failure on the part of this Contractor, his Subcontractors and his and their agents, servants and employees to provide and maintain a safe place to work or to comply with all laws and regulations of any governmental Authority Having Jurisdiction thereof.

C. This Contractor agrees to indemnify, defend and hold harmless the Owner, Owner's agents and Engineer from and against any liability, loss, damage or expense, including attorneys' fees, arising from a failure or alleged failure on the part of this Contractor, his Subcontractors and his and their agents, servants and employees to discharge the obligations assumed by him or them in the performance of the work, including any act or omission allegedly resulting in death or personal injury or property damage, or due to improper construction, construction techniques, or the use of improper or inappropriate material or tools.

1.9 COMPLETE PERFORMANCE OF WORK

A. Work shall be executed in strict accordance with the best practice of the trades in a thorough, workmanlike manner by competent, skilled technicians and trade personnel.

B. This Contractor shall provide a competent, experienced, full-time Superintendent who is authorized to make decisions on behalf of the Contractor.

C. All labor, materials, apparatus, and appliances essential to the complete and proper functioning of the systems described and/or indicated herein, or which may be reasonably implied as essential, whether mentioned in the Contract Drawings and specifications or not, shall be provided by the Contractor. The entire installation shall be ready in every respect for the satisfactory and efficient operation when completed.

D. In cases of doubt as to the work intended, or in the event of need for explanation thereof, request supplementary written instructions in the form of a Request for Information (RFI) from the Architect and/or Engineer.

E. Coordinate the work specified herein and shown on the Contract Drawings with all other trades.

F. Be responsible for material and workmanship until completion and final acceptance. Replace any of same which may be damaged, lost or stolen, without additional cost to Owner. Guard the building and its contents against damage by this Contractor, his employees or Subcontractors, and make good any damage free of charge.

G.

H. Where, due to union regulations or trade agreements, any of the work shown on the drawings or specified herein is not considered this trade's work, subcontract the work in question, but assume full responsibility for the complete installation. Except for such changes as may be specifically approved by the Architects and Consulting Engineers, in accordance with alternates or options stated hereinafter, all work must be in full accordance with the intent of the plans and specifications, complete in every way and ready for satisfactory and efficient operation when delivered to the Owner.

I. Provide signs required by the Authorities Having Jurisdiction.

J. Provide all rigging required for complete installation and furnish drawings showing necessary points of support, reactions and supplementary bracing. This shall be submitted for approval by the Owner. Should any shoring be required, provide same after Owner's approval.

K. Become thoroughly acquainted with the work involved, obtain and verify at the building all measurements necessary for the proper installation of work. Furnish to other Contractors any information relating to work of this division necessary for the proper installation of their contracts. Coordinate with other Contractors for finish adjacent to work of this section and arrange to have visible portions of the work (such as access doors, escutcheons, etc.) fit in with the finish in a manner satisfactory to the Architects.

L. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

M. Wherever this Contractor's work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to ensure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items (valves, dampers, pull boxes, etc.) in an approved manner in order that the other trades may know where to install such items such as access doors, panels, etc.

N. Provide required supports and hangers for piping and equipment, so that loading will not exceed allowable loadings of structure. Submittal of a bid shall be deemed a representation that the Contractor submitting such bid has ascertained allowable loadings and has included in his estimates the costs associated with furnishing required supports.

O. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this section shall be coordinated through the Construction Manager and approved by the Structural Engineer. All such drilling, cutting and reinforcing costs shall be borne by this Contractor.

P. At the conclusion of each day's work, clean up and stockpile on site, at a location designated by the Construction Manager, all rubbish, debris and trash, which may have accumulated during the day as a result of work of this Contractor and of his presence on the job.

Q. Due to the nature of the alteration work, which requires the building to be kept operable at all times, except for those floors being actively altered, this Contractor shall coordinate his activities with the Construction Manager and the building Owner. Any interruption of building services must be done at the convenience of the building Owner. If temporary connections to maintain services are required or if the work must be performed after hours, this work shall be so arranged with all parties involved.

R. If this Contractor must perform work in occupied areas, he shall make arrangements with the Construction Manager and the Owner as to the time and method by which this work shall be performed. He shall arrange for all adjacent areas to be properly protected against damage, dirt and dust.

1.10 DESCRIPTION OF BID DOCUMENTS

A. Specifications, in general, describe quality and type of materials and equipment.

B. The drawings show the various systems schematically, no added compensation shall be permitted for variations due to field conditions.

C. Where disagreements occur between the plans and the specifications or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the Base Bid.

D. Work not shown on the drawings but called for in the specifications, or vice versa, shall be provided by the Contractor without additional expense to the Owner.

E. Where a variance occurs between the drawings and specifications, or within either document itself, the Contractor shall request through the Construction Manager, clarification in writing from the Architect on which item and manner in which the work shall be installed.

F. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

G. Equipment shown on the drawings with particular manufacturers identified has been coordinated for structural penetrations, electrical connection, operating and service (maintenance) requirements, and physical size with regard to the space where the equipment is shown. If they comply with the project specifications, these and the other specified manufacturers of this equipment will be acceptable contingent on the Contractor providing a complete installation and maintaining full responsibility to provide, at no additional cost, any modifications to the structure or electrical service that are required to properly install, operate, and service the equipment being used. These modifications shall not include additional area for equipment unless approved by the Architect.

1. The Contractor shall note these changes on the equipment submittal and shall show all differences in equipment being supplied from that shown on the drawings. Failure of the Contractor to provide this information with the submittal will indicate that the submitted equipment meets or exceeds the equipment shown on the drawings in performance and is physically no larger in housing size.

a. Failure of the Contractor to comply with the above and any discrepancies found shall result in the Contractor providing equipment equal to that specified at the Contractor's expense.

1.11 SUBMITTALS

A. No part of the work shall be started in the shop or in the field until the Architect and/or Engineer have reviewed the shop drawings and samples for that portion of the work. Thereafter, the work shall be executed in accordance with the Contract Documents and the indicated status of the reviewed shop drawing.

B. All shop drawings and samples shall be identified as follows:

1. Date of submittal.

2. Title of project (including floor and room designations).

3. Name of Contractor and date of his approval.

4. Name of Subcontractor or supplier and date of submittal to Contractor.

5. Number of submission.

6. Any qualification(s), departure(s) or deviation(s) from the requirements of the Contract Documents.

7. Federal specification, FM Approval, OTCR number, UL Listing, or ASTM number or any local listing or approval where required.

8. Such additional information as may be required by the specifications for the particular material being furnished.

9. When the submitted materials modify components, styles, etc., on the same drawing, or alternate or options available for the intended material, the material shall be appropriately annotated in a manner to avoid any misunderstanding of the submission.

C. Shop drawings and samples shall be submitted for review sufficiently in advance of the scheduled start of the work in the shop or in the field to allow ample time, in consideration of the number and complexity of the drawings in the submittal, for the Architect and/or Engineer to make an orderly review. No extension of the time to complete the work shall be granted to the Contractor by reason of his failure in this respect.

D. The Contractor shall carefully check shop drawings and samples, including those received by him from Subcontractors and manufacturers, for accuracy, completeness of required information, and conformance with the Contract Documents. Shop drawings found to be inaccurate, incomplete or not in conformance with the Contract Documents shall be corrected before being submitted to the Architect and/or Engineer for review.

E. Within three (3) weeks after award of the Contract, the Contractor shall submit for the Architect's and/or Engineer's review, a list of the manufacturers and Subcontractors whose products and services he proposes to use for the work. Proposed substitutions for material and equipment required by the Contract Documents shall be submitted to the Architect and/or

Engineer for review during this period. Submittals proposing or requesting substitutions shall be expressly identified as such in a letter of transmittal, with the reasons for requesting the substitution stated. Submittals for this purpose shall be complete in every respect, shall conform to all the information requirements for shop drawing and sample submittals, and shall include, at no cost to the Owner, the necessary revisions to other related work required by the Contract Documents. The judgment of the Architect and/or Engineer with respect to the adequacy and acceptability of a proposed substitution shall be final and binding on the Contractor and shall not be subject to question in any other place. After the expiration of this period, substitutions for material or equipment shall not be proposed or requested in shop drawing and sample submittals, and the Contractor shall be required to execute the work in accordance with the provisions of the Contract Documents.

F. Within six (6) weeks after award of the Contract, the Contractor shall submit a schedule listing all shop drawings and samples with the projected date that each item will be submitted to the Architect and/or Engineer for review.

G. Shop drawings and RFI's related to commissioning items shall be copied to the Commissioning Authority.

H. Prior to Final Acceptance, the following data shall be furnished in accordance with the Conditions of the Construction Contract, Division 01 Specifications, and Division 21 Specifications, and shall include, but not be limited to:

1. Record Drawings.

2. Operating and Maintenance Books.

3. Contract or Coordination Drawings.

1.12 SHOP DRAWINGS

A. The term "shop drawings" shall include layout, detail, and assembly drawings, diagrams, schedules, catalog sheets, printed descriptive matter, and tabular and graphical presentations of operating and performance data that describe work required by the Contract Documents. Catalogs and catalog sheets shall be clearly annotated indicating the specific items being proposed.

B. In addition, during the installation period, submit detailed shop layout drawings for each floor of the project, including all the Mechanical Equipment Rooms, showing equipment and piping work and other distribution services described herein, including locations and sizes of all openings in cellular steel floor decks, walls and floors. Shop drawings with multiple parts shall be submitted as a package. Shop drawings will be 3/8 inch equal to 1 ft. 0 in. scale. Piping shop drawings shall also indicate the point loading and spacing of each hanger and the method of support. Drawings shall include full coordinated plans and sections for Mechanical Equipment Rooms, floor plans and risers. In addition, required detail drawings, such as anchor and guide details, etc., shall be submitted.

C. Shop drawings for Equipment Rooms, and for piping and similar distribution services shall show by dimension the exact size and location of each element of the system in both the horizontal and vertical plane, as well as relationship to the building structure, architectural construction, equipment, and the work of other trades. Where new work is added to an existing structure, the shop drawings shall show the location of all existing services and equipment. Pads, foundations, anchorages, supports and attachments to the building structure where required for the

installation of the work shall be shown in layout and detail with sizes, dimensions, materials and methods of construction noted. The work described in any shop drawing submission shall be carefully checked by this Contractor for all clearances field conditions, maintenance of architectural conditions and proper coordination with all trades on the job.

D. Each submitted shop drawing shall include a certification by the Construction Manager that all related job conditions have been checked and that no conflict exists. No shop drawing submission shall be reviewed without such certification.

E. The Contractor shall submit shop drawings of the following work for review:

1. Equipment pads, foundations and supports.

2. Construction details for piping.

3. Control and alarm systems.

4. All items of manufactured material and equipment.

5. Other specific items of work as required by the provisions of the technical sections of the Contract Documents should be included in Submittal section.

1.13 CERTIFICATION

A. Any certifications required by the specifications, in addition to those required for shop drawings, product data, equipment and other items, shall be so certified by the Owner, a Partner, or a Corporate Officer of the firm required to provide the Certification, or by another person duly authorized to sign binding agreements for and in behalf of the Owner, Partner, or Corporation.

1.14 CONTRACTOR'S COORDINATION DRAWINGS

A. Contractor shall furnish in writing, with copies to the Architect and Construction Manager any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. This Contractor and his Subcontractors shall prepare a complete set of construction "Coordination Drawings" indicating the equipment actually purchased and the exact routing and elevations for all lines such as piping, busway, conduit, ductwork, etc., including conduit embedded in concrete. The "Coordination Drawing" preparation and completion shall comply with the requirements of the project construction schedule. The sheet metal drawings, prepared on electronic media (CAD) at a scale not less than 3/8 in. = 1 ft. 0 in., shall serve as the base drawings to which all other Contractors will overlay and add their work. Each trade shall draw their work on separate layers represented by individual colors. Each "Coordination Drawing" shall be completed and signed off by the other Contractors and this Contractor prior to the installation of the work in the area covered by the specific coordination drawing. The Contractors work shall be installed in accordance with the shop drawings and the "Coordination Drawings". If the Contractor allows one trade to install their work before coordinating with the work of other trades, the Contractor shall make necessary changes to correct the condition without extra cost to the Owner. The Contractor's "Coordination Drawings" indicating piping, conduit, busway, and equipment support points and loads exceeding 200 lb. imposed on the building structure shall be submitted to the Project Structural Engineer for review and approval. The elevation, location, support points, static, dynamic and expansion forces and loads imposed on the structure at support, and anchor points,

and the size of all lines shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All work routed underground or embedded in concrete shall be indicated by dimension to column and building lines and shall be coordinated. This requirement for "Coordination Drawings" shall not be construed as authorization for the Contractor or Subcontractor to make any unauthorized changes to the Contract Drawings. Prior to final acceptance of the work of this section, the Contractor shall give the drawing files, in AutoCAD containing the Contractor's coordination documentation to the Owner.

1.15 ARCHITECT'S AND ENGINEER'S REVIEW

A. The Architect and Engineer shall review shop drawings and samples for conformance with the design concept of the project and the information contained in the Contract Documents. The review of shop drawings and samples shall be only for the convenience of the Owner in following the work and shall not relieve the Contractor of responsibility for deviations from the requirements of the Contract Documents. The review shall not be construed as a complete or detailed check of the work submitted, nor shall it relieve the Contractor of responsibility for errors of any sort in the shop drawings and samples, or from the necessity of furnishing any work required by the Contract Documents which may have been omitted from the shop drawing submittals. The review of a separate item shall not indicate review of the complete assembly in which it functions. Nothing in the Architect's and/or Engineer's review of shop drawings and samples shall be considered as authorizing a departure from Contract Documents or specifications; additional cost to the Owner; or increased time for completion of the work.

B. Architect's and/or Engineer's review is for general compliance with the design concept and Contract Documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departing therefrom. The Contractor remains solely responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for coordination with other work, whether new or existing and other trades, for selecting fabrication processes, for techniques of construction, for performing his work in a safe manner.

C. The Architect and/or Engineer shall review shop drawings and samples with reasonable promptness and shall return them to the Contractor stamped to indicate the appropriate action as follows:

1. "NO EXCEPTION TAKEN" means that fabrication, manufacture or construction may proceed, providing the submittal complies with the Contract Documents.

2. "EXCEPTIONS AS NOTED" means that fabrication, manufacture or construction may proceed, providing the submittal complies with the Architect's and/or Engineer's notations and the Contract Documents. A copy of the corrected submittal shall be returned to the Architect and/or Engineer for record. If, for any reason, the Contractor cannot comply with the notations, the Contractor shall resubmit as described for submittals stamped "REVISE AND RESUBMIT".

3. "REVISE AND RESUBMIT" means that the Contractor must comply with the Architect's and/or Engineer's notations and resubmit before fabrication, manufacture or construction may proceed. Submittals stamped in this manner shall not be permitted on the job site.

4. "REJECTED" means that the submittal does not comply with the Contract Documents and that fabrication, manufacture or construction shall not proceed. Submittals stamped in this manner shall not be permitted on the job site.

D. Each submitted shop drawing shall bear the Contractor's stamped and signed certification that the work has been checked for all related job conditions, for maintenance of architectural conditions, and has been coordinated with the shop drawings of other affected trades for interrelated work, as required for the proper and complete performance of the work. No shop drawing submittal shall be reviewed without this certification.

E. Shop drawings for manufactured material and equipment shall include model numbers, dimension drawings, operating weights, material specifications, operating features and controls, wiring diagrams, performance characteristics, service procedures, including clearance requirements for maintenance work, and conformance to specified codes and code ratings. Note that in addition to these requirements, other specific submittal data, and forms of data submission, are required by the Contract Documents for particular items of equipment and material.

F. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein shall be the minimum standards acceptable. The Engineer shall retain the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require that the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

1.16 MANUFACTURER'S RECOMMENDATIONS

A. With the exceptions as specified and/or indicated on the drawings or in the specifications, the Contractor shall apply, install, connect, erect, use, clean, commission and condition manufactured articles, materials, and equipment per manufacturer's current printed instructions and recommendations. Copies of such printed recommendations shall be kept at the project site and made available as required.

B. Where the manufacturer's recommendations conflict with the Contract Documents, the conflict shall be brought to the Engineer's attention immediately.

1.17 SPACE LIMITATIONS

A. The equipment selections used in the preparation of the Contract Documents shall fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts. Adequate space shall be allowed for clearance in accordance with code requirements, the requirements of the Local Authorities Having Jurisdiction, and the equipment manufacturer's recommendations.

B. In the preparation of drawings, a reasonable effort to accommodate acceptable equipment manufacturer's space requirements has been made. However, since space requirements and equipment arrangement vary according to each manufacturer, the responsibility for initial access, maintenance access, code-required access, and proper fit rests with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to the Architect's and Engineer's review.

D. Coordinate the installation of piping and equipment with lighting fixtures, special ceiling construction, air distribution equipment and the structure. Provide additional risers, drops and offsets as required. If, after installed, new piping or equipment is found to be in conflict with the

architecture, structure, or other trade work which is either existing or shown on the Contract Documents, the piping or equipment shall be relocated without additional cost to the Owner.

E. No piping or equipment shall be installed in the eight (8) inch high zone directly above the finished ceiling in Tenant areas to allow for Tenant build-out and flexibility unless otherwise specifically shown on the drawings or prior written authorization is received from the Engineer.

F. The Contractor shall follow the drawings in laying out the Work and check drawings of all trades to verify spaces in which Work will be installed. Maintain maximum headroom and, where space conditions appear inadequate, the Architect shall be notified before proceeding with the installation.

1.18 RECORD DRAWINGS

A. The Contractor shall maintain on a daily basis at the project site a complete set of "Record Drawings". The "Record Drawings" shall consist of a set of blue-line prints and AutoCAD files of the Contractor Coordination Drawings for this division. The prints shall include the updated AutoCAD files, which shall be periodically electronically updated to show the precise location of all buried or concealed work and equipment, including embedded piping and valves, and all changes and deviations in the mechanical work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without written definite instructions from the Architect or Engineer. Prior to commencing work, the Contractor shall obtain from the Architect or Engineer a set of AutoCAD format Architectural and Engineering Drawings on CD-ROM, to be used only to produce the Contractor's Coordination Drawings. The continuously updated coordination drawings shall be used to produce the final "Record Drawings" which shall be delivered to the Owner in AutoCAD electronic format upon project completion. The Contractor shall give to the Engineer a written release signed by a corporate officer of the Contractor prior to receipt of the Engineer's disks.

B. Dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two (2) dimensions to permanent structures.

C. Upon completion of the Work, the Contractor and his Subcontractors shall certify all "Record Drawings" on the front lower right-hand corner adjacent to the above marking with a rubber stamp impression or an AutoCAD image that states the Project name, the Contractor's name, the area covered, and the date.

D. Prior to final acceptance of the work of this division, the Contractor shall submit properly certified "Record Drawings" to the Architect and Engineer for review and shall make changes, corrections, or additions as the Architect and/or Engineer may require to the "Record Drawings". Submit four (4) prints of each version until accepted.

E. After the Architect's and Engineer's review, and any required Contractor revisions, the "Record Drawings" shall be delivered to the Construction Manager in AutoCAD format for the Owner's use. Upon acceptance, provide electronic versions within sixty (60) days of Final Acceptance.

1.19 ELECTRICAL EQUIPMENT AND ELECTRICAL ROOM PRECAUTIONS

A. In general, the Contractor shall not install piping or equipment in any switchboard, switchgear, transformer, elevator equipment, telephone, telecommunications, or electrical equipment rooms unless this piping or equipment serves only these rooms. Installation is strictly prohibited where it violates the requirements of the applicable Electrical Code.

B. No piping or other equipment foreign to the electrical installation shall be installed within the dedicated zone above switchboards, panelboards, distribution boards, and motor control centers to a height of six (6) feet above the equipment or the structural ceiling, whichever is lower. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in such foreign systems.

C. Caution workers both verbally and in writing as to the dangers involved in doing work within or adjacent to electrical equipment within electrical closets on various floors, the Mechanical Rooms and the Switchgear Rooms, Elevator Machine Rooms, due to dangers caused by the presence of high voltages and currents in these spaces.

D. Provide all necessary personal protective equipment meeting OSHA requirements when working in areas within live electrical equipment.

1.20 CUTTING AND PATCHING

A. In general, cutting and patching will be done under other divisions of the specifications.

B. Furnish to the Construction Manager necessary information so that openings for this work can be built into the floors and walls in time. Such cooperation is required to keep cutting of walls and floors to a minimum.

C. Set sleeves for pipes accurately before concrete floors are poured or set boxes on the forms to leave openings in the floors and subsequently set required sleeves in the openings.

D. Should Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

1.21 PROTECTION OF EQUIPMENT AND MATERIALS

A. Protect from damage, water, dust all material and equipment provided under this division, both in storage and installed in accordance with manufacturer’s recommendations until Notice of Completion has been filed and accepted.

B. Arrange with Construction Manager for storage facilities for materials and equipment.

C. All products stored off site and delivered to the site must be kept in factory packing with positioning devices in place until installation. Equipment which is subject to damage from moisture shall be stored indoors in a suitably controlled environment with factory covering in place.

D. Material, equipment or apparatus damaged because of improper storage or protection shall be rejected.

E. Protect equipment from damage due to moisture, water, spray-on fireproofing, and construction debris during construction.

F. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting and conduits with caps to prevent obstruction and damage.

G. Protect the system against freezing in cold weather.

H. Prior to starting equipment, remove all protective materials, shipping bars, retainers, positioning devices.

1.22 CONSTRUCTION REVIEW

A. Work may be reviewed at any time by the Architect or Engineer.

B. Advise the Architect and/or Engineer that work is ready for review at the following times:

1. Prior to backfilling buried work.

2. Prior to concealment of work in walls and above ceilings.

3. Testing of systems and equipment.

4. When all requirements of the Contract have been completed.

1.23 EQUIPMENT NOISE AND VIBRATION

A. Equipment and systems, as defined herein, shall be quiet and free of apparent vibration while in operation.

B. Vibration shall not be apparent to the senses in occupied areas of the building. To this end, both the balancing of rotating machinery and the installation of vibration isolation at various locations are required.

C. It shall be the responsibility of this Contractor to obtain equipment that is quiet in operation as compared to other available equipment of its size, capacity, and type; to install equipment so that a minimum amount of noise and/or vibration is transmitted to the building; and to fabricate the piping systems so that noises generated in the systems are held to an absolute minimum.

D. Any additional precautions deemed necessary to provide a quiet installation shall be done as part of the work of this division, subject to review by the Engineer and without additional cost to the Owner. After the systems are in operation, it shall be the responsibility of the Contractor to make any changes to equipment or Work installed that may be required to provide systems which are quiet in operation and comply with the acoustic requirements as specified herein.

E. Except in various special areas listed herein, the system noise level, in occupied spaces, shall be equal to or less than the “lowest value in the range” of the noise criteria curves for the particular space in accordance with the current edition of Applications Volume of the ASHRAE Handbook. The noise criteria curves shall be based on ANSI Standard S1.6-1984 (R-1990) octave bands and a sound pressure level in decibels referenced to 0.002 microbars. Sound levels within the occupied spaces must meet the criteria described above and with all building, wall partition, floor, ceiling plenum depth, and ceiling construction in place as they exist for the individual spaces. The attenuation through boundary construction of Equipment Rooms must be considered in selecting equipment for acceptable noise level as described herein.

F. The system noise level in the Tenant-occupied spaces of the project shall not exceed NC-35 (except as noted hereinbelow). This shall include all areas occupied by the Tenant, including areas directly under piping or any equipment.

1.24 FINAL REVIEW

A. At a time designated, the entire installation shall be reviewed for compliance with the Contract Drawings and specifications. The Contractor shall be available at all times during this Review.

B. The Contractor shall demonstrate prior to the Final Review that all systems and all equipment have been properly balanced and adjusted and are in compliance with the requirements of the Contract Documents. After these demonstration tests are completed satisfactorily, but prior to the Final Review field visit by the Engineer, the Contractor shall submit to the Engineer a written certification that attests to Contract Document compliance for this project.

C. Certificates and documents required herein shall be in order and presented to the Architect and Engineer at least two (2) weeks prior to the Final Review.

D. After the Final Review, any changes or corrections noted as necessary for the Work to comply with these specifications and the drawings shall be accomplished without delay in order to secure final acceptance of the Work.

1.25 DATE OF COMPLETION AND TESTING OF SYSTEMS

A. The date for the final performance and acceptance testing shall comply with the project construction schedule and shall be sufficiently in advance of the Contract completion date to permit the execution of the testing by the Contractor prior to occupancy and the close-out of the Contract. Any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper and satisfactory functioning of all equipment and systems shall be completed prior to the close-out of the Contract. Re-tests shall not relieve the Contractor of completion date responsibility.

B. The Contractor shall provide a detailed schedule of completion indicating when each system component and entire system is to be completed and outlining when tests will be performed. Completion schedule shall be submitted to the Architect, Engineer, and Owner for review at a time requested by the Construction Manager after the notice to proceed has been given by the Construction Manager to the respective Division 21 Subcontractors. This schedule shall be updated periodically by the Contractor as the project progresses. Each update shall be submitted to the Construction Manager, Architect, Engineer, and Owner for review.

1.26 OPERATING INSTRUCTIONS

A. The Contractor shall provide the services of a factory-trained specialist to supervise the commissioning, startup, and operation of all equipment specified herein and to instruct the Owner’s operators during a five (5) day operating instruction period at or near the project site. The operating instruction period shall be defined as straight-time working hours and shall not include nights, weekends, or travel time to and/or from the project and shall include a period for videotaping of the operating instructions. See individual sections of these specifications for additional instructions by manufacturer-trained specialists.

B. The Owner shall be notified in writing at least two (2) weeks before each operating instruction period begins. The Contractor shall commence no instruction period until the Owner has issued his written acceptance of the starting time.

1.27 WARRANTY PERIOD

A. The warranty period shall be for the period from beneficial use by the Owner, in accordance with the construction schedule.

B. During the warranty period, the Contractor shall guarantee the following in a form satisfactory to the Owner:

1. All work installed will be free from any and all defects in workmanship and/or materials.

2. All apparatus will develop capacities and performance characteristics specified.

3. The systems shall operate without malfunction.

C. The Contractor shall, without cost to the Owner, remedy any defects within a reasonable time to be specified in notice from the Architect. In default thereof, the Owner may have such work done and charge all costs to the Contractor.

D. The start of the Contractor's warranty period, as defined in the General Conditions, shall commence on the issue of a "Certificate of Substantial Completion" by the Owner or the Owner's Representative for each item of material, equipment, or system.

E. The Subcontractor shall confer with the General Contractor prior to the bid date concerning the project schedule and determine if there is a need to operate any items of equipment or systems for temporary heating and/or cooling or other reasons prior to "Substantial Completion". All required extended warranty costs for equipment, materials, and systems shall be included in the Subcontractor's bid.

F. Provide complete documentation of all component and system tests prior to Owner acceptance and turnover of components or systems. In addition, the Owner reserves the right to review all test objectives, test plans and test cases, and witness all preoperational tests. Provide the Owner with a comprehensive schedule detailing the preparation of testing documentation and the conduct of all component or system tests.

G. Warrant that all components, subsystems and systems will perform their specified functions from the date of turnover and commercial operation through the useful life of the system, as determined by the various equipment manufacturers and installing Contractor. In the event components fail for any reason, be responsible to repair/replace said components, and reimburse the Owner for all costs associated with the component, subsystem or system that failed to perform the specified function.

1.28 GUARANTEE

A. Submit a single guarantee stating that all portions of the work are in accordance with Contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one year from date of final acceptance by the Owner; except that where guarantees or warranties for longer terms are specified herein, such longer term shall apply. At no additional cost to Owner, within 24 hours after notification, correct any deficiencies which occur during the guarantee period, all to the satisfaction of the Owner and Architect. Require similar guarantees from his Subcontractors.

B. Guarantee that the materials and workmanship supplied under these specifications will be of the best grade, that the apparatus will be erected in a practical and first class manner, that it will be complete in operation, nothing being omitted in the way of labor and material required to make this so, although not specifically shown or mentioned herein and that it will be delivered in well working order, complete and perfect in every respect without additional cost - whether or not shown in detail on the drawings or described in detail in this specification.

C. Be responsible for all damage to or caused by the work performed under this division for a period of one year from date of the acceptance of work under this Contract. Repair at no cost to Owner all such damage which occurs within 24 hours' notice thereof by the Owner. Damage which occurs prior to the completion of this Work shall be repaired at once. Be responsible for any damage and repair thereof and reimburse Owner for all expense incurred thereby. Indemnify the Owner, the Architect, the Consulting Engineers and the Construction Manager against loss, liability, damage or expense, including reasonable attorneys' fees, in connection with any claim resulting from such leaks which may be asserted by tenants or any other third person.

1.29 DELIVERY, STORAGE AND HANDLING

A. Include all delivery, hauling, hoisting, shoring, and placement in the building of equipment and materials specified herein, including any equipment pre-purchased by the Construction Manager for installation by this Contractor. The Contractor shall be responsible for the timely delivery and introduction of equipment to the Project as required by the construction schedule for this Project. If any item of equipment is received prior to the time it is required, the Contractor shall be responsible for its proper storage and protection until such time as it may be required. The Contractor shall pay for all costs of demurrage or storage in a bonded warehouse.

B. If any item of equipment is not delivered to or installed at the project site in a timely manner as required by the project construction schedule, the Contractor shall be solely responsible for disassembly, re-assembly, manufacturer's supervision, shoring, general construction modifications, delays, overtime costs, etc. No additional cost or delays shall be incurred by the Owner.

PART 2 - PRODUCTS

2.1 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB's) or other hazardous materials identified by the Owner.

2.2 GENERAL

A. Refer to specific specification sections for addition equipment and system piping requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall be in accordance with the specification section pertaining to the individual equipment and system piping.

END OF SECTION

SECTION 210100

OPERATION AND MAINTENANCE OF FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all operation and maintenance instructions and manuals for the fire suppression systems and equipment as indicated and scheduled on the drawings in accordance with the Construction Documents.

B. Section includes:

1. Operation and maintenance instructions.

2. Operation and maintenance manuals.

3. Recommended spare parts.

4. Service contracts.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. Each product required for the common fire suppression work shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fire Code.

2. Reference Standards

a. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

1) ASHRAE Guideline 4: Preparation of Operating and Maintenance Documentation for Building Systems.

b. National Fire Protection Association (NFPA)

1) NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

1.4 SUBMITTALS

A. Submittals shall be furnished in accordance with the requirements of Section 21 00 00 and shall include, but not be limited to, the following:

1. Two (2) copies of operation and maintenance manuals covering the complete operation and recommended maintenance procedures and intervals for each system and each piece of equipment provided by this Contract as indicated and scheduled on the drawings and in accordance with the Contract Documents for review before Final Review of the Project. Assemble all data in a completely indexed electronic volume(s) and identify the size, model, and features indicated for each item. The media shall be submitted and subjected to the same approval process as detailed for shop drawings and samples as described hereinbefore but shall be returned as “Reviewed”.

2. Submit six (6) bound copies of the “Reviewed” operation and maintenance books with all corrections to the Construction Manager upon Project completion.

3. Six (6) copies of the valve charts required by Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.

B. Provide spare parts data listing source and current price of replacement parts and supplies for each item of equipment.

C. Furnish manufacturer's installation instructions, indicating special procedures and installation requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Hard copies of O&M manuals shall be furnished in three-ring binders, each with a clearly defined table of contents and index tabs.

B. O&M manuals shall include complete lubrication, cleaning and servicing data compiled in clearly and easily understandable form. Data shall show serial numbers and model numbers of each piece or equipment, complete lists of replacement parts (including part numbers), motor ratings, and actual loads. Manuals shall include information specific to the actual equipment model installed, including all options clearly indicated.

C. Each manual shall include the following documentation:

1. A document directory identifying each system and all associated equipment.

2. Operating procedures for each system and all associated equipment.

3. Manufacturer’s maintenance procedures supplemented by project specific information.

4. Assembly and disassembly instructions with exploded view drawings where available.

5. Parts lists and a list recommended spare parts recommended for normal service requirements.

6. Project-specific wiring diagrams for each piece of equipment.

7. Troubleshooting and diagnostic procedures for each system and all associated equipment.

8. Description of alarm and trouble codes for software-based systems.

9. Performance curves and data.

10. Test reports.

11. Emergency contact information.

12. Identifying name and mark number.

13. Locations of major equipment (where several similar items are used, provide a list).

14. Complete nameplate data.

15. All set points.

PART 3 - EXECUTION

3.1 PREPARATION

A. Submit an outline of the instruction programs and instruction manuals to the Owner or Owner's representative for his approval at least two (2) weeks prior to the proposed start date of the instruction sessions.

END OF SECTION

SECTION 210500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This Contractor and his Subcontractors shall provide all labor, materials, tools, scaffolding, machinery, equipment, appliances, and services necessary to complete the fire suppression work under this Contract. All systems and equipment shall be complete in every respect and all items of material, equipment and labor shall be furnished and installed for a fully operational system. This Contractor shall coordinate his work with the work of the other trades so as to resolve conflicts without impeding job progress or the project construction schedule. Provide notice with the bid proposal of any concrete work required by this division that is not indicated on the Structural or Architectural drawings or drawings of other trades.

B. This Contractor shall examine all Contract Documents for all divisions of the specifications in order to determine the extent of work required to be completed under this division. Failure to examine all the Contract Documents for this project will not relieve this Contractor of the responsibility to perform all the work required for a complete, fully operational and satisfactory installation.

C. Provide all miscellaneous common fire suppression products required for a complete fire suppression installation as indicated, in accordance with the requirements of the Contract Documents.

D. Section includes:

1. Sleeves.

2. Formed steel channel.

3. Escutcheons.

4. Protective pans.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. Each product required for the common fire suppression work shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fire Code.

2. Reference Standards

a. ASTM International

1) ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 21 00 00 and shall include, but not be limited to:

1. Product cut sheets and schedule of sleeves and mechanical sleeve seals used for the project. The schedule shall include the material, diameter, length, number of links, location and service the sleeve and sleeve seal will be provided.

2. Product cut sheets and schedule of access doors used for the project. The schedule shall include the material, size, finish type, location and purpose of installation the access door will be provided.

3. Product cut sheets of formed steel channel.

4. Product cut sheets of escutcheons. The cut sheets shall indicate the size, finish and location, which the escutcheons will be installed.

B. Product Data: Submit manufacturer's literature, including general assembly.

C. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for each product and system that is installed.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 21 00 00 shall apply to all work specified herein.

B. All materials and equipment shall be fabricated by companies, whose primary business expertise is the manufacturing of commercial and industrial products of the type specified herein. The manufacturer shall have been in continuous operation in the manufacture of the products specified for a minimum of ten (10) years.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all materials of any type from one manufacturer.

A. Furnish all equipment, materials and accessories new and free from defects.

1.6 WORK INCLUDED

A. The work includes, but is not limited to, the following systems, equipment and services:

1. Fire suppression system consisting of all items indicated on the drawings and/or specified herein, such as:

   a. Automatic sprinkler systems.

2. Furnish and install all miscellaneous supports for Division 21 work and equipment.

3. Furnishing of shop drawings, product data and samples.

4. Furnishing of “Record Drawings”.

5. Furnishing of Contractor “Coordination Drawings”.

6. Furnishing of operating and maintenance books.

7. Miscellaneous items as required for complete and functioning systems as specified herein and as indicated on the drawings.

8. All systems, equipment and services specified herein shall be furnished and installed complete and ready for use.

9. Provide all excavation and backfill required for Division 21 work.

10. Furnish and install all sleeves for the fire protection work complete with seals and firestop as specified herein and as required by the Authority Having Jurisdiction.

11. Furnish and install insulation for freeze protection, over the cable wrap type heat tracing provided by Division 26, on all piping as indicated on the drawings.

12. Patching or replacement of all fireproofing if it is damaged or removed during the installation of the Division 21 work.

13. Participate in and assist in the operation of the fire safety ventilation equipment as required during the performance testing and startup of the Division 28 fire detection, alarm and communication systems. Refer to Division 28 - Fire Detection, Alarm and Communication System for additional requirements.

14. Instruments as required for operating and testing the various systems shall be furnished and installed complete as specified herein.

15. Hydrostatic testing, operational testing and adjusting of all systems.

16. Complete flushing and chemical treatment and initial water treatment for all water systems.

17. Complete all tests required by all rules, regulations, etc., of all Authorities Having Jurisdiction and prepare, complete and file all forms, tabulations, plans, etc., pertinent thereto with the referenced authorities, and accomplish such work with personnel of proper caliber, in particular, Professional Engineers, where so required.

18. Participate in and provide all labor as required for "off-hour" testing of equipment and systems if required by job conditions or by Authorities Having Jurisdiction and as required to obtain the "Temporary Certificates of Occupancy (TCO)."

19. Participate in and provide all labor as required for system commissioning including any time required for a detailed review of the commissioning process as requested by the Engineer or the Owner.

20. Sprinkler systems shall be hydraulically calculated to the following hazard classification parameters:

    a. Office Areas: Light Hazard, 0.10 gpm/sq.ft. over 1,500 sq.ft.

    b. Storage, Mechanical Equipment Rooms: Ordinary Hazard Group 1, 0.15 gpm/sq.ft. over 1,500 sq.ft.

    c. Fuel Oil Storage and Emergency Generator Room: Ordinary Hazard Group 2, 0.20 gpm/sq.ft. over 1,500 sq.ft.

    d. Dry Pipe Sprinkler Systems: Ordinary Hazard Group 1, 0.15 gpm/sq.ft. over 1,950 sq.ft.

1.7 WORK OF OTHER DIVISIONS

A. Electrical connections for motors and mounting of loose motors.

B. Individual motor controllers except motor controllers furnished as integral parts of pieces of equipment.

C. Pits for sewage ejectors, sumps and pumps; however, this Contractor shall be responsible for correct dimensions, layout, coordination, etc.

D. All concrete work indicated on the structural, architectural, and mechanical/electrical drawings.

E. Concrete equipment pads, concrete thrust blocks, and concrete fill for equipment and inertia bases. However, this Contractor shall be responsible for providing the Construction Manager with the correct dimensions, layout, etc., for all equipment.

F. Metal architectural louvers.

G. Painting, except touch-up painting and as otherwise specified herein.

H. Installing access doors in general construction.

I. Fire reserve tank supporting structure.

J. Standby power generator.

K. Wiring for automatic controls and interlocks.

L. Utility mains and piping 5 feet beyond the foundation walls unless shown otherwise on the Drawings.

1.8 VERIFYING EXISTING CONDITIONS

A. Before commencing work, examine all adjoining work on which this work is in any way dependent for perfect workmanship according to the intent of this specification, and report to the Construction Manager any condition, which prevents performance of first-class work. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

B. Become thoroughly familiar with actual existing conditions at the building of the present installations to which connections must be made or which must be changed or altered. The intent of the work is shown on the drawings and described hereinafter, and no consideration shall be granted by reason of lack of familiarity on the part of the Contractor with actual physical conditions at the site. Inspect each and every area affected by the total alteration of the building before submitting bid.

1.9 SUBCONTRACTS

A. Where Contract Documents require manufacturers' services, and wherever the staff of this Contractor performing the work of this section cannot adequately perform such services, this Contractor shall stipulate such performance in its contracts with its Subcontractors or Sub-Subcontractors, vendors, manufacturers, and the like, or else subsequently pay them any additional fees required therefor.

1.10 FACTORY TESTING

A. All mechanical sleeve seals and access doors shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

1.11 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

1.12 COORDINATION

A. Coordinate the installation of work in this section with the following:

1. Division 03 - Concrete.

2. Division 04 - Masonry.

3. Division 05 - Metals.

4. Division 09 - Finishes.

5. Division 10 - Specialties.

1.13 UNIT PRICES

A. The Contractor shall state in the proposal, unit prices in accordance with the following schedule and the requirements of Section 21 00 00.

1. Sleeves $_____/each

1.14 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Warranty period shall commence upon final acceptance by the Owner.

C. Furnish a one (1) year manufacturer's warranty for each mechanical sleeve seal and access door.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Escutcheons

1. Chicago Specialty.
2. Producers Specialty.
3. Sanitary-Dash.

D. Formed Steel Channel

1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Unistrut Corp.

E. Sleeves

1. Metraflex Co.
2. Pipeline Seal & Insulator Inc. (Link-Seal)
3. Calpico, Inc.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair including, but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 SLEEVES

A. Furnish sleeves for all pipes passing through floors, walls and concrete, or concrete fireproofed beams.

B. Sleeves in Concrete Beams, Through Concrete Walls, and Exposed Pipes Penetrating Floors: Schedule 40 steel pipe.

C. Provide sleeves in foundation walls and in concrete pits with anchor flange.

D. Sleeves within Furred-out Enclosures in Floors, Through Partitions, Steel Beams and Walls: 18 gauge (1.2 mm) thick galvanized steel.

2.4 FORMED STEEL CHANNEL

A. Provide formed steel channel as required to sufficiently support piping and equipment in accordance with the Contract Documents.

B. Formed steel channel shall be galvanized 12 gauge (2.8 mm) thick steel, with holes 1-1/2 inches (38 mm) on center.

2.5 ESCUTCHEONS

A. Provide escutcheons as required to sufficiently enclose penetrations in fire and smoke rated walls and partitions in accordance with the Contract Documents.

B. Where pipes penetrate fire or smoke rated walls provide metal escutcheons on both sides of the wall penetration.

C. Escutcheons shall be either one-piece or two-piece construction, chrome-plated brass or stainless steel.

2.6 PROTECTIVE PANS

A. Provide protective pans under individual or rack of pipes passing over critical equipment, high voltage (440V) electrical bus duct, switchgear or starting equipment.

B. Protective pans shall be 12 gauge black iron with a 6 inch lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-Oleum paint and support with pipe hangers, and drain clear of the equipment below.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and returned to the manufacturer for replacement.

3.2 INSTALLATION

A. Installation shall be in accordance with the specification section pertaining to the individual equipment.

B. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the drawings shall be followed as closely as possible, but the right is reserved by the Architect to change locations and elevations to accommodate conditions which may arise during the progress of the work, prior to installation, without additional compensation for such changes. The responsibility for accurately laying out the work and coordinating the installation with other trades rests with this Contractor. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

C. Carry fixture connections, concealed in building construction, to points above floor, break out close to the underside or adjacent to fixture and continue exposed to fixture.

D. Piping Installation

1. Install pipes approximately as shown on the drawings and as directed during installation, as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and neatly spaced. Erect pipe risers plumb and true, and parallel with walls and other pipes and neatly spaced.

2. Keep all horizontal runs of piping, except where concealed in partitions, as high as possible and close to walls.

3. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

4. Ream all pipe smooth before installation. Do not bend, flatten, split or otherwise injure pipe.

5. Use reducing fittings, unless otherwise approved in special cases, in making reduction in size of pipe. Bushings shall not be allowed unless specifically approved.

6. Do not install exterior piping in water or when trench or weather conditions are unsuitable for the work, as decided by the Architect.

E. Sleeves

1. Set sleeves in position in forms. Provide reinforcing around sleeves.

2. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

3. Extend waterproof sleeves through floors 1 inch (25mm) above finished floor level. Caulk sleeves tight.

4. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with firestopping and caulk airtight. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.

5. Sleeves passing through fire-rated floors or walls shall be sealed with an intumescent formulation similar to Metraflex Metraseal 120 FireSeal or approved.

6. Sleeves passing through foundation walls or pit walls shall be sealed utilizing a mechanical seal similar to Link-Seal or approved.

7. Install chrome-plated steel escutcheons at finished surfaces.

8. Set sleeves as construction progresses and secure in place during pouring of concrete.

9. Firestopping shall be installed as specified under Section 07 84 00.

F. Mechanical Sleeve Seals

1. Mechanical sleeve seal installation shall be in accordance with the manufacturer's recommendations and as indicated on the drawings.

2. Install mechanical sleeve seals at all exterior water tight entries, foundation walls and pit walls.

G. Access Doors

1. Size access doors as required for the equipment being accessed, however access doors shall not be smaller than 16 inches by 16 inches. Install all valves to fit within the limit of the following size access doors; where two (2) or less valves are located with their bonnets within 12 inches of the face of the door and all portions of the valves are within the area defined by the opening in the door, 16 inch x 16 inch doors may be used. Where more than two (2) valves are served by a door and the bonnets are within 12 inches of the face of the door, the size of the door shall be increased so that all portions of the valves are within the area defined by the opening in the door. Where the bonnets of the valves are more than 12 inches from the face of the door, the doors shall be minimum of 20 inch x 20 inch clear opening.

2. Furnish buttons or tabs to Ceiling Contractor for setting, as approved by Architect, to indicate location of valves, cleanouts or other equipment located above removable-type ceilings where access doors are not furnished.

H. Protective Pans

1. Install protective pans within 6 inches of the underside of piping or equipment.

2. Pans shall be sized a minimum 2 inches greater in each dimension around the piping and equipment, which it's being supported under.

3. Protective pans shall be supported by hangers and supports sized sufficient to carry the weight of the pan filled with water. All hangers and supports shall be attached to the structure. Hanging protective pans from the equipment or piping above shall not be acceptable.

4. Make drain connections to the side or bottom of pan by welding or brazing and drain clear of the equipment, which the pan is protecting.

5. Perform a standing water test on the pan by filling with water to within 1 inch of the top of the lip and let stand for 30 minutes with no leakage.

I. Escutcheons

1. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings, and pipe sleeve extensions, if any. Furnish pipe escutcheons with chrome finish for occupied areas, prime paint finish for unoccupied areas.

2. Escutcheons for waterproof floors, and areas where water and condensation can be expected to accumulate shall be stainless steel or chrome plated cast brass, solid or split hinged.

3. Escutcheons for dry areas shall be chrome plated cast brass or galvanized sheet steel, solid or split hinged.

3.3 CLEANING

A. Before final connections are made and before operation of equipment and piping, thoroughly blow out, rod out, or wash out all piping at least twice, in a manner as directed and/or approved by the Architect, to remove all accumulation of dirt, chips or other deleterious material. Make all temporary connections and furnish all appliances required for the purpose of cleaning at no extra expense to the Owner.

B. Clean up all equipment and leave in condition for finish painting before acceptance.

3.4 PROTECTIVE PAINTING

A. Painting, except as specified herein or indicated otherwise, shall be done under another division. This division shall cooperate with the other divisions to determine the size of equipment, sizes and lengths of pipes, etc., to be painted.

B. Equipment and materials furnished under this section shall be factory-finished as specified. If the factory finish is damaged during shipment, storage, installation, etc., it shall be repainted by this Contractor subject to the Engineer's approval. Touch-up painting is acceptable only for minor finish damage.

C. Repair damaged and marred factory-painted finishes with materials and procedures to match original factory finish.

D. Paint products for identification of fire suppression systems shall be exterior grade, alkyd-based products.

E. Finish painting of the fire standpipe and sprinkler risers, cross-connections, handles of all fire protection valves and apparatus shall be in accordance with Local Law 58 of 2009. Refer to Section 09 90 00 for all painting requirements, including, but not limited to, work included, materials, primers, application, surface preparation, paint specification for ferrous pipe and VOC limits.

F. Provide a heavy field coat of paint as specified in Section 09 90 00, on all fire standpipe and sprinkler piping in accordance with Local Law 58 of 2009, prior to the hydrostatic pressure test and whether the pipe will be encased, partially encased in building construction or exposed, as described herein:

1. Fire Standpipe Systems

    a. Main distribution piping, cross-connection and risers shall be painted red.

    b. Handles of valves serving dedicated fire standpipe systems shall be painted red.

2. Sprinkler Systems

    a. Main distribution piping, cross-connection and risers shall be painted red.

    b. Handles of valves serving dedicated sprinkler systems shall be painted green.

3.5 FIELD TESTS

A. Test all systems in full accordance with applicable Underwriters' and Municipal requirements.

B. Notify the Architects and Inspectors Having Jurisdiction at least 48 hours in advance of performing the required tests, so that arrangements may be made for their presence to witness the tests.

C. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architects, fire suppression and other Inspectors of the City, applicable Insurance Association and Public Utilities Inspectors Having Jurisdiction.

D. Repair or, if required by the Architects, replace defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Test the systems before any paint or insulation is applied.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

H. Performance Tests

1. Prior to applying the hydrostatic test, the system shall be tested with 50 psig compressed air or dry nitrogen for a period of ten minutes with no loss in pressure.

2. Apply a hydrostatic test to each fire standpipe and sprinkler system. Each system shall be tested to a pressure not less than 200 psig or 50 psig above the normal operating pressure, whichever is greater. Apply the test for a minimum of two (2) consecutive hours with no loss in pressure.

I. Final Acceptance

1. Prior to final acceptance the Contractor shall submit all performance test reports for each test performed. The reports shall be bound in a three-ring binder and submitted to the Architect, Engineer and Owner for review.

2. Final acceptance testing shall comply with the project construction schedule and shall be sufficiently in advance of the Contract completion date to permit the execution of the testing by the Contractor prior to occupancy and the close-out of the Contract.

3. Any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper and satisfactory functioning of all equipment and systems shall be completed prior to the closeout of the Contract. Re-tests shall not relieve the Contractor of completion date responsibility.

END OF SECTION

SECTION 210523

GENERAL-DUTY VALVES FOR WATER-BASED FIRE SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all valves required for equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Ball valves.

2. Butterfly valves.

3. Check valves.

4. Tamper switches.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

C. The following specification sections apply to all work herein:

1.3 REFERENCES

A. Each valve and all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fire Code.

2. Reference Standards

a. American Society of Mechanical Engineers (ASME)

1) ASME/ANSI B16.5: Pipe Flanges and Fittings.

2) ASME B16.34: Valves Flanged Threaded and Welding End.

b. Manufacturers Standardization Society (MSS)

1) MSS SP-6: Standard Finishes for Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2) MSS SP-25: Standard Marking System for Valves, Fittings, Flanges and Unions.

3) MSS SP-53: Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components.

4) MSS SP-61: Pressure Testing Steel of Valves.

5) MSS SP-67: Butterfly Valves.

6) MSS SP-68: High Pressure Offset Seat Butterfly Valves.

7) MSS SP-70: Cast Iron Gate Valves, Flanged and Threaded Ends.

8) MSS SP-71: Cast Iron Swing Check Valves, Flanged and Threaded Ends.

9) MSS SP-80: Bronze Gate, Globe, Angle and Check Valves.

10) MSS SP-82: Valve Pressure Testing Methods.

11) MSS SP-85: Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

12) MSS SP-110: Ball Valves - Threaded, Socket-welding, Solder Joint, Grooved and Flared Ends.

c. National Fire Protection Association (NFPA)

1) NFPA 13: Standard for the Installation of Sprinkler Systems.

2) NFPA 14: Standard for the installation of Standpipe, Private Hydrants and Hose Systems.

3) NFPA 20: Standard for the Installation of Stationary Pumps for Fire Protection.

4) NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 21 00 00 and shall include, but not be limited to:

1. Schedule of valves, complete with typical mill reports.

2. Fire suppression piping control valves, pressure-reducing valves, breach control valves, deluge valves, check valves, alarm valves and chain operators.

B. Product Data: Submit manufacturer's literature including general assembly, including but not limited to the following:

1. Dimension and specification sheets.
2. Model number.
3. Pressure rating.
4. Working pressure.
5. List of materials.
6. Manufacturer's installation instructions.

C. Schedule of Valves: Submit a single, well-organized schedule for all valves indicating the following:

1. Valve type/model number.
2. System type.
3. Location/floor.
4. Pressure rating.
5. Pipe size.
6. Connection method.

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer's Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 21 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

F. Maintain one (1) copy of the approved submittals for each product on site.

1.6 FACTORY TESTING

A. All valves shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. The valve manufacturer shall provide documentation that all valves have been factory tested and performs to the performance and pressure ratings specified.

2. All valves shall be factory tested in accordance with the latest applicable version of NFPA and UL Standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer’s rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

D. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, pilot line and weld ends.

3. Set angle, gate, and globe valves closed to prevent rattling.

4. Set ball valves open to minimize exposure of functional surfaces.

5. Set butterfly valves closed or slightly open.

6. Block check valves in either closed or open position.

E. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

3. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

1.8 COORDINATION

A. Coordinate the installation of work in this section with the following sections:

B. The installation of all wiring for monitoring devices furnished under this section shall be installed as specified under Division 28.

1.9 UNIT PRICES

A. The Contractor shall state in the proposal, unit prices in accordance with the following schedule and the requirements of Section 21 00 00.

1. Ball Valve $_____/each
2. Butterfly Valve $_____/each
3. Check Valve $_____/each

1.10 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Furnish a five (5) year manufacturer's warranty for all manual valves.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Ball Valves

1. Apollo.
2. Crane.
3. Hammond.
4. Milwaukee.
5. NIBCO.
6. Stockham.
7. Watts.

D. Butterfly Valves

1. Jenkins.
2. Milwaukee.

3. Nibco.
4. Victaulic.

E. Check Valves

1. Crane.
2. Kennedy.
3. Mueller.
4. Nibco.
5. Williams Hagar.

F. Tamper Switches

1. Acme.
2. Grinnell.
3. Potter.
4. Viking.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. Shutoff valves, isolation valves, pressure-reducing valves and check valves shall be provided as indicated on the Construction Documents or as required by the Authorities Having Jurisdiction on the drawings, required or directed.

E. Valve pressure ratings shall not be less than indicated and as required for system pressures.

F. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

G. The use of butterfly valves shall be limited to shutoff services only and only where specifically permitted by the Engineer.

H. Valve-End Connections

1. Flanges on iron valves shall meet ASME B16.1

2. Flanges on steel valves shall meet ASME B16.5

3. Flanges on bronze and/or brass valves shall meet ASME B16.24

4. Grooved end valves shall meet AWWA C606.

5. Threaded ends shall meet ASME B1.20.1.

6. Soldered lines double union ends with solder joints ASME B16.18.

I. Valve Operators

1. Gear operators shall be provided on all quarter turn valves.

2. Handwheels shall be provided on all water supply valves including quarter-turn types.

3. Provide ladders or chain operating devices in Mechanical Equipment Rooms or stairwells for all valves located more than 7 feet 0 inches above floor.

J. Valves in insulated piping shall be provide with 2 inch (50 mm) stem extensions having the following features:

1. Extended operating handle of non-thermal-conductive material.

K. Valves controlling sprinkler takeoffs shall be FM approved, UL listed, NYC OTCR approved, OS&Y gate, butterfly or ball valves, approved for the proper pressure rating in the zone, which it is served.

L. All valves controlling water to sprinklers shall be as scheduled below:

Valve Type	*1/2 to 2 in.*	*2-1/2 to 12 in.*
Butterfly	*Nibco LD-3510-8 (2 in. Only, 300 wwp) (20.7 bar)*	*Nibco GD-6765-8N (350 wwp) (24.2 bar)*
Ball	*Milwaukee* *Butterball BB-SCS02 (350 wwp) (24.2 bar)*	

2.3 BALL VALVES

A. Ball valves shall be all brass, bronze or steel construction with replaceable Teflon seat ring, two-piece union or three-piece bolted design as specified herein.

B. Threaded valves used in brazed or soldered piping systems shall be fitted with adapters.

C. Drain Valves (at Riser Heels and Low Points): Ball valves shall be used as drain valves at all low points in water piping. Provide 3/4 inch (19 mm) with male threaded nipple for hose connection with 3/4 inch (19 mm) hose cap to protect hose threads and chain Milwaukee Butterball BB2 Series.

D. Ball valves shall be two-piece type with adjustable stem packing using a threaded packing nut. Valves shall provide positive shutoff.

E. Bronze ball valves shall be constructed as follows:

Body	Brass or Bronze
Body Style	Two-piece or three-piece full port
Trim	316 stainless steel ball and stem
Seat	Reinforced Teflon (RTFE)
Body P/T Rating	600 psig (41.7 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	300 psig (20.7 bar) minimum

F. Steel ball valves shall be constructed as follows:

Body	Cast steel
Body Style	Two-piece full port
Trim	316 stainless steel ball and stem
Seat	Reinforced Teflon (RTFE)
Body P/T Rating	600 psig (41.7 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	300 psig (20.7 bar) minimum

2.4 BUTTERFLY VALVES

A. Resilient Seated and High Performance Butterfly valves shall be full lug type suitable for bidirectional dead-end service at rated pressure without use of downstream flange. Conforming to ANSI Class 150 flange drilling.

B. Stem seal shall not rely on compression between seating material and disc but shall be accomplished by EPDM O-ring seals and have threaded upper and lower collar bushings to provide blowout proof stems and low torque operation.

C. Disc shall not be attached to stem by fasteners or locknuts. Molded-in seat material shall be EPDM and designed to prevent dislocation during closure; seating material must simultaneously act as flange gasket.

D. Valve must be factory tested and certified to seat bubble tight.

E. Gear operators shall be used on all fire protection butterfly valves.

F. Fire protection butterfly valve shall be suitable for indoor/outdoor use, equipped with two (2) factory-mounted internal supervisory switches.

G. Resilient seated butterfly valves shall be constructed as follows:

Body	Ductile Iron
Body Style	Tapped full lug or Grooved
Trim	316 stainless steel stem
Disc	Ductile iron, Aluminum bronze, bronze or stainless steel
Seat	EPDM

Body P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum
Seat P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum

H. High performance butterfly valves, ANSI Class 150 valves shall be constructed as follows:

Body	Ductile Iron
Body Style	Tapped full lug or Grooved
Trim	316 stainless steel stem
Disc	Aluminum bronze, bronze or stainless steel
Seat	PTFE
Body P/T Rating	285 psig (19.6 bar) at 100°F (38°C) minimum
Seat P/T Rating	200 psig (13.5 bar) at 100°F (38°C) minimum

2.5 CHECK VALVES

A. Check valves shall be threaded, flanged or grooved ends suitable for the system, which it is being installed.

B. Check valves shall be a horizontal swing check with renewable bronze seat and disc.

C. Valve must be factory tested and certified to seat bubble tight.

D. Cast iron swing check valves shall be constructed as follows:

Body	Cast Iron
Body Style	Bolted Cover
Disc	Cast Bronze
Ends	Flanged
Body P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum
Seat P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum

E. Class 600 cast steel swing check valves shall be constructed as follows:

Body	Carbon steel
Body Style	Bolted cover
Disc	Stainless steel
Seat	Steel
Trim	Carbon steel
Ends	Flanged
Body P/T Rating	ASME A216
WOG Rating	600 psig (41.4 bar) minimum

2.6 TAMPER SWITCHES

A. Provide tamper switches for all valves controlling water flow in fire suppression systems as identified on the Construction Documents or as required by the Authority Having Jurisdiction.

B. All interconnecting electrical wiring will be furnished under Division 26 for tamper switches on valves and tamper switches directly connected to equipment provided by this Contractor, required for the transmission of alarm impulses.

C. Tamper switches shall be open or closed type to conform with the alarm system to which they are connected.

D. Tamper switches shall give an alarm if the valves served are closed, the switches are removed, or if the cover is opened. Valve stems shall be notched to take tamper switches.

E. Provide tamper switches for the following valves including but not limited to the following:

1. All valves controlling the flow of water to the fire standpipe system, fire hose valves, fire pumps and jockey pumps.

2. All valves on the incoming fire service control valves, meter valves, fire reserve tank fill lines and all valves on the outlet of each fire reserve tank.

3. All valves controlling the flow of water to sprinkler heads, floor control valves, supply valves to pre-action and deluge valves.

F. Tamper switches shall be Acme Fire Alarm Co. Type OSYS-U, or as approved.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. All valve installations shall be in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

B. Exposed valves shall be installed as nearly as possible parallel to or at right angles to the column lines of the building.

C. Valves in finished portions of the building, except in mechanical equipment rooms, stairwells, or where otherwise indicated on the drawings shall be concealed and provided with access doors.

D. All piping shall be carefully graded so as to eliminate traps and pockets. Where water traps cannot be avoided, provide drain valves.

E. All valves throughout the building shall be thoroughly and substantially supported with UL listed and/or FM approved hangers and support devices. Furnish and install any special hangers or supports that may be required due to any peculiarities of construction. The design, selection spacing, and application of horizontal hangers, supports, restraints, anchors, and guides shall be in accordance with the applicable NFPA 13 and 14.

F. All valves shall be installed according to the Local Authority rules and an inspection certificate furnished.

G. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Balanced Check Valves (center-guided): In horizontal or vertical position, with stem upright and plumb.

3.3 CLEANING

A. Before final connections are made and before operation of all valves, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all valves in condition suitable for finish painting, before final acceptance.

3.4 INSPECTION AND STARTUP SERVICE

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that material composition is suitable for service, and that it is free from defects and damage.

E. A factory representative from the pressure-reducing valve and control valve manufacturer shall be present for startup service, inspection and any necessary adjustments.

F. After completion of the automatic sprinkler system and at the beginning of the warranty period the Automatic Sprinkler Subcontractor shall perform, without charge to the Owner, one (1) inspection of the sprinkler system during the warranty period. Inspection shall be as per the applicable NFPA No. 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems", plus the following maintenance to be performed during the course of the inspection:

G. Defective valves shall be replaced with new valves.

H. Integrated Test

1. Test the communication between tamper switches and the fire alarm systems. Verify that alarms are fully functional prior to final acceptance testing.

2. Verify that all valves have been properly lubricated and left ready for operation.

3. All alarms (BMS, fire alarms, etc.) shall be tested to fulfill satisfactory operating conditions. Verify proper operation of electrical safety interlocks and limit switches.

I. Final Acceptance Test: The Standard Form of the National Fire Sprinkler Association, Inc., "Report of Inspection" (Sheets 1 and 2), shall be filled out in triplicate after each inspection and the copies sent to the Architect and Owner.

J. Commissioning

1. Reserved.

3.5 ADJUSTING AND BALANCING

A. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

B. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

C. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

D. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

E. The building fire alarm system devices shall be properly adjusted and left in good working condition.

F. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

G. Adjust valve stops to assure positive shutoff.

END OF SECTION

SECTION 210529

HANGERS AND SUPPORTS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all hangers, supports and anchors required for piping and equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. The Division 21 Subcontractor shall assume complete responsibility for the anchoring of the equipment, piping systems, specified hereinafter to the concrete foundation pads, to the concrete inertia bases, and to the supporting structural steel and concrete beams.

C. Section includes:

1. Pipe hangers and supports.

2. Attachments to structure.

3. Formed steel channel supports and accessories.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. All hangers and supports, including all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

2. Reference Standards

a. American Society of Mechanical Engineers

1) ASME B31.1: Power Piping.

2) ASME B31.9: Building Services Piping.

b. ASTM International

1) ASTM A 36: Standard Specification for Carbon Structural Steel.

2) ASTM A 47: Standard Specification for Ferritic Malleable Iron Castings.

3) ASTM A 48: Standard Specification for Gray Iron Castings.

4) ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5) ASTM A 240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

6) ASTM A 283: Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

7) ASTM A 536: Standard Specification for Ductile Iron Castings.

8) ASTM A 575: Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

9) ASTM A 668: Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.

10) ASTM A 1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

11) ASTM B 633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

12) ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials.

13) ASTM E 119: Method for Fire Tests of Building Construction and Materials.

14) ASTM E 814: Test Method of Fire Tests of Through Penetration Firestops.

15) ASTM F 708: Standard Practice for Design and Installation of Rigid Pipe Hangers.

c. American Welding Society

1) AWS D1.1: Structural Welding Code - Steel.

d. Manufacturers Standardization Society of the Valve and Fittings Industry

1) MSS SP 58: Pipe Hangers and Supports - Materials, Design and Manufacturer.

2) MSS SP 77: Guidelines for Pipe Support Contractual Relationships.

3) MSS SP 89: Pipe Hangers and Supports - Fabrication and Installation Practices.

4) MSS SP 90: Guidelines on Terminology for Pipe Hangers and Supports.

5) MSS SP 127: Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

e. National Fire Protection Association (NFPA)

1) NFPA 13: Standard for the Installation of Sprinkler Systems.

2) NFPA 14: Standard for the installation of Standpipe, Private Hydrants and Hose Systems.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 21 00 00 and shall include, but not be limited to:

1. Provide shop drawings indicating system layout with location showing critical dimensions, sizes, pipe hanger and support locations and detail of trapeze hangers.

2. Method of attachment to and load imposed on building structures by hangers, anchors, supports, guides and supplemental steel shall be submitted for review and approved by the project Architect and Structural Engineer.

3. Shop drawings indicating support methods, point loadings to the building structure and hanger locations shall be submitted for review sufficiently in advance of concrete pouring schedules to permit evaluation, critique and any necessary changes to hanging and support methods.

B. Product Data: Submit manufacturer’s literature including general assembly,

1. Hangers and Supports: Submit manufacturer’s catalog data including load capacity and sizing schedules specific to this project.

2. Inserts: Submit manufacturer’s catalog data including load capacity.

C. Design Data: Indicate load-carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load-carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit sizing methods and calculations sealed by a Professional Engineer

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer’s Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

1. Hangers and Supports: Submit special procedures and assembly of components.

2.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 21 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

F. Maintain one (1) copy of the approved submittals for each product on site.

1.6 FACTORY TESTING

A. All hangers, rods, supports and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

1.8 COORDINATION

A. Coordinate with other trades to use common means of support. Submit for approval all pertinent design data relating to the support as well as verification of the responsibility for the support.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Furnish a five (5) year manufacturer's warranty for all pipe hangers and supports.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Anchors and Inserts (Wedge Type)

1. Allfasteners.
2. DeWalt.
3. Hilti.
4. ITW Red Head.
5. MKT Fastening, LLC.
6. Simpson Strong-Tie.

D. Anchors and Inserts (Adhesive Type)

1. Allfasteners.
2. DeWalt.
3. Hilti.
4. ITW Red Head.
5. Simpson Strong-Tie.

E. Formed Steel Channel Supports

1. Allfasteners.
2. Anvil International.
3. Carpenter & Patterson, Inc.
4. Empire Industries, Inc.
5. Eaton
6. Erico – Caddy.
7. Hilti.
8. National Pipe Hanger Corporation.
9. PHS Industries, Inc.
10. Piping Technology and Products.
11. Thomas & Betts - Kindorf.
12. Tolco Inc.

F. Pipe Hangers, Supports and Guides

1. Allfasteners.
2. Anvil International.

3. Carpenter & Patterson.
4. Cooper B-Line.
5. Empire Industries, Inc.
6. Eaton
7. Erico – Caddy.
8. Hilti.
9. National Pipe Hanger Corporation.
10. PHS Industries, Inc.
11. Piping Technology and Products.
12. Thomas & Betts - Kindorf.
13. Witch Co.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 PIPE HANGERS AND SUPPORTS

A. Provide suitable and substantial hangers and supports for all piping and equipment. Hangers and supports shall be of the type, size and spacing specified or as required by the Authority Having Jurisdiction.

B. Hangers shall be UL Listed and/or FM Approved and approved for use on fire service as listed in NFPA 13. All hangers and supports shall be designed to support five (5) times the weight of the water-filled pipe plus 250 lb. (114 Kg) at each point of piping support.

C. Comply with maximum load ratings with consideration for allowable stresses prescribed by ASME B31.1 or MSS SP-58 and shall comply with NFPA 13 requirements.

D. Pipe hangers, anchors, supports and guides shall be manufactured, selected, fabricated and installed in accordance with MSS SP-58, MSS SP-69 and MSS SP-89.

E. Provide supports, guides and anchors that do not transmit unacceptable vibration to building structure.

F. The support systems shall provide for, and control, the free or intended movement of the piping, including its movement in relation to that of connected equipment.

G. In addition to the short-term frame shortening anticipated during the initial construction period, all systems shall be installed with provisions to accommodate long-term frame shortening equivalent to 1/16 inch (1.6 mm) per foot in addition to any expansion and/or contraction of the systems as a result of thermal changes.

H. Provide for vertical adjustments after installation of supported material and during commissioning, where feasible, to ensure pipe is at design elevation and slope.

I. Select hangers and supports to perform under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses being introduced into piping system and connected equipment.

J. Where piping is required to be seismically restrained, the yoke on clevis hangers and/or roller hangers shall be reinforced to prevent the yoke from deforming. In the case of clevis hangers providing nuts on the inside and outside of the threaded rod connecting the yoke and clevis is acceptable.

K. Provide drawings indicating pipe loads, including method of suspension and hanger location, and submit them for approval prior to proceeding with installation. Provide all the supplementary steel required to support, guide and anchor piping within shafts, Mechanical Equipment Rooms and all the other floors.

L. Particular care shall be taken to support all pipes in a manner approved by the Architect, including the providing of supplementary steel, if required.

M. Where insulation is provided, protect the insulation, the length of the sleeve with a galvanized 20 gauge shield (360 deg.).

N. Support vertical risers from the building construction by means of pipe clamps at every floor. Provide channels of approved sizes where pipe clamps are too short to connect to the building construction.

O. Finishes

1. Hangers, anchors, inserts, supports and guides (swivel ring, split ring, roller, wrought pipe clamp, or adjustable wrought clevis-type hangers, roller supports, floor stands, wall brackets, etc.) installed within the building shall be hot dipped galvanized in accordance with ASTM A123 or stainless steel.

2. Strut channels installed indoors shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90.

3. Hangers, anchors, supports, guides and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123 or stainless steel. All hanger hardware shall be hot-dip galvanized or stainless steel. Zinc-plated hardware shall not be acceptable for outdoor or corrosive use.

P. Hangers

1. Pipes 2 inches (50 mm) and smaller shall be supported with one of the following:

a. Adjustable steel swivel ring (band type) hanger.

b. Malleable iron split ring hanger.

c. Adjustable steel clevis hanger.

2. Pipes 2-1/2 inches (63.5 mm) and larger shall be supported with one of the following:

a. Adjustable steel swivel ring (band type) hanger.

b. Adjustable steel clevis hanger.

3. Insulated pipes shall be supported adjustable steel clevis hangers and pre-insulated sheet metal insulation shields.

Q. Trapeze Hangers

1. Shall be constructed of one of the following:

a. 12 gauge roll-formed 1-5/8 inch (40 mm) by 1-5/8 inch (40 mm) minimum structural steel channel.

b. Two (2) structural steel channels secured together with 1/2 inch (12.5 mm) or 3/4 inch (20 mm) steel pipe sections.

2. Pipes shall be secured to trapeze by one of the following methods:

a. Uninsulated Pipe: 2-piece pipe straps with thermoplastic elastomeric liner sized for outside diameter of pipe.

b. Insulated Pipe: 2-piece pipe straps sized for outside diameter of pipe and insulation using insulation shields.

R. Accessories

1. Pipe protection saddles shall be formed from carbon steel, 1/8 inch (3 mm) minimum thickness, sized for insulation thickness.

2. Preinsulated shields shall be 180 degree, 18 gauge minimum galvanized sheet metal, minimum 12 inch (305 mm) long, with high density water-repellant Kaylo insulation, foam glass or high-density polyisocyanurate inserts minimum thickness to match outside diameter of the insulated pipe.

2.4 ATTACHMENTS TO STRUCTURE

A. All piping shall be carried by pipe hangers and supports attached to building structure. All supports and restraints requiring connections to steel-plated building construction shall be welded to steel plating.

B. Method of attachment to and load imposed on building structures by hangers, anchors, supports, guides and supplemental steel shall be submitted for review.

C. In no case shall hangers be supported by means of vertical expansion bolts.

D. Powder and power-actuated devices, grip nails, and/or expansion nails shall NOT be permitted.

E. Structural Steel Attachments

1. Center-loaded beam clamps or welded beam attachments shall be used where piping is to be suspended from building steel. Clamp shall be forged steel or malleable iron with cross bolts sized as required to fit beams and selected on the basis of load configuration and load to be supported.

2. Where allowed by Structural Engineer, C-clamps with locknuts, cup point set screws and retaining straps shall be used. Top flange C-clamps shall be used when attaching a hanger rod to the top flange of structural shapes. Set screw torque shall be in accordance with manufacturer's recommendation.

F. Concrete Inserts

1. Cast-in-place continuous or spot concrete inserts shall be used where applicable.

2. Continuous inserts shall be made of 12 gauge, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs./ft. in concrete.

3. Spot inserts shall be constructed of one of the following:

a. Malleable iron or pressed steel having a space for rods of all sizes. All inserts for pipes 3 inches (75 mm) and larger in size shall be installed with a reinforcing rod 5/8 inch (16 mm) in diameter, run through a slot in the insert specifically provided for this purpose.

b. Internally threaded machined steel insert with large, flanged heads suitable for installation on wood forms and/or formed metal decking.

G. Post Installed Anchors

1. Contractor shall submit each anchor's ICC-ES report to the Structural Engineer of the project for review.

a. Anchors shall be installed in accordance with the manufacturer's ICC-ES report and published installation instructions.

b. All post-installation anchors shall be listed in the manufacturer's ICC-ES report for use in cracked concrete.

2. Contractor shall review the structural composition of all concrete slabs where post-installation anchors will be used and only anchor models/types approved for use in the specific structural slab type shall be permitted, in accordance with the manufacturer's ICC-ES report and per approval of the project's Structural Engineer.

3. Each post-installation anchor shall be sized for the worst-case operating loads imposed to the structure.

4. Post-installed anchors may be installed in the vertical position under any of the following conditions:

   a. When used in concrete having gravel or crushed stone aggregate to support pipes 4 inches or less in diameter.

   b. When post-installed anchors are alternated with hangers connected directly to the structural members, such as trusses and girders, or to the sides of concrete beams to support pipe 5 inches and larger.

   c. When post-installed anchors are spaced not over 10 ft. apart to support pipes 4 inches or larger.

5. Post-installed anchors shall not be used in ceilings of gypsum or other similar soft material.

6. Post-installed anchors shall not be used in cinder concrete, except for branch lines where the post-installed anchors are alternated with through-bolts or hangers attached to beams.

7. Where through-bolts or hangers attached to beams is not feasible, the Contractor is responsible for providing hangers certified by a registered Professional Engineer capable of complying with the following:

   a. Hangers shall be designed to support five times the weight of the water-filled pipe plus 250 lbs (114 kg) at each point of piping support.

   b. These points of support shall be adequate to support the system.

   c. The spacing between hangers shall not exceed the value given for the type of pipe as indicated in Table 9.2.2.1(a) or Table 9.2.2.1(b).

   d. Hanger components shall be ferrous.

   e. Detailed calculations shall be submitted, when required by the reviewing authority, showing stresses developed in hangers, piping, and fittings and safety factors allowed.

8. Where periodic/continuous Special Inspections are required, coordinate with the Special Inspector prior to and during the installation of anchors.

2.5 FORMED STEEL CHANNEL SUPPORTS AND ACCESSORIES

A. Formed steel channel supports shall be capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3 and shall comply with NFPA 13 requirements.

B. Channel shall be made of minimum 12 gauge ASTM A570 Grade 33 steel electro galvanized after fabrication. Channel sections may be formed by single or factory welded multiple sections of any of the following:

   1. 1-5/8 inch (41.25 mm) x 1-5/8 inch (41.25 mm) channel.

2. 2-7/16 inch (62 mm) x 1-5/8 inch (41.25 mm) channel.

3. 3-1/4 inch (82.5 mm) x 1-5/8 inch (41.25 mm) channel.

C. Grip/Lock nuts shall be made of 3/8 inch (10 mm) thick case hardened mild steel bars electro galvanized after fabrication.

D. All angle brackets connectors and washers shall be made of 1/4 inch (6.35 mm) steel plate electro galvanized after fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Hanger, rods, supports and accessories shall be installed in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

B. Furnish and install all necessary supports for equipment furnished under this section. To meet the varying conditions in each case, these supports shall consist of pipestands, steel angle or strap hangers, saddles, brackets, as required for a complete installation.

C. All such supports shall have substantial flanges bolted to floor construction; hangers shall be supported from the framing as described hereinabove. Supports shall be properly located with reference to any supporting pads, legs of the equipment carried and must be distributed as not to bring any undue strains to the equipment.

D. All hanger and support details shall be submitted for review and approval.

E. Guarantee that the work, as installed under this section of the specifications, will not result in the transmission of objectionable noise or vibration to any occupied parts of the building, and take full responsibility for any necessary modifications of this equipment, or of the foundations and supports for the same, necessary to secure this result.

F. All attachments to the building structure shall comply with the requirements of Section 21 05 48.13 Vibration Isolation for Fire Suppression Piping and Equipment and Section 21 05.48.16 Seismic Controls for Fire Suppression Piping and Equipment

G. Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom beam flanges.

H. Proper care and ventilation should be given when welding galvanized components.

I. Clamps on Riser Piping

1. Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

2. Bolt tightening torques shall be to industry standards.

3. Steel Pipes: Clamp is fitted preferably below coupling or welded pipe lug.

J. Support from Structural Members: Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

K. Field welding of supports should be done by qualified welders using qualified welding procedures.

L. Space supports so that there is at least one hanger for each length of pipe, with one hanger within 30 inches (762 mm) of the end sprinkler head.

M. Horizontal piping shall be supported in accordance with the following schedules:

SINGLE ROD SUPPORT - STEEL PIPE		
Pipe Size	Maximum Hanger Spacing	Rod Size
1 to 1-1/4 inches	12 feet 0 inches	3/8 inch
1-1/2 and 4 inches	15 feet 0 inches	3/8 inch
5 to 8 inches	15 feet 0 inches	1/2 inch
10 inches	15 feet 0 inches	5/8 inch
12 inches	15 feet 0 inches	3/4 inch

N. Maximum hanger spacing may not be exceeded; however, actual installed spacing will depend on location of structural framing and floor slab construction. Where building construction does not permit the above spacing, provide additional steel supports.

O. Unsupported lengths of branch sprinkler piping shall be in conformance with NFPA standards based on static or flowing pressure, whichever is greater. Systems with pressures exceeding 100 psi have more restrictive unsupported lengths and require restraints to prevent upward movement of the pipe.

P. Install lock nuts at the bottom of all hanger rods.

Q. Vertical pipe risers shall be supported independently of connected horizontal piping.

R. Support vertical risers from the building construction by means of pipe clamps, Grinnell Model No. 261, at every story height

S. Where hangers cannot be supported from building framing, they may be supported from concrete inserts, subject to the approval of the Structural Engineer. Furnish, locate and set such inserts and make sure that such inserts are in place when the concrete is poured.

T. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

U. Smaller pipes may be suspended from cross-pieces of pipe or steel angles, which, in turn, shall be hung from building concrete construction by means of rods and inserts. The intention is to provide supports which, in each case, shall be amply strong and rigid for the load, but which shall not weaken or unduly stress the building construction.

V. Provide approved roller supports, floor stands, wall brackets, etc., for all lines running near the floor or near walls, which can be properly supported or suspended by the floors or walls. Pipelines near walls may also be hung by hangers carried from approved wall brackets at a higher level than the pipe.

W. No piping shall be hung from other piping or ductwork. In no case shall hangers be supported by means of vertical expansion bolts.

X. Hangers for piping shall support the pipe without piercing the insulation. Pre-insulated pipe shields shall be used to protect the insulation on pipes. It is the intent that the insulation shields shall bear only on the insulation, which is of such density that the insulation will not be compressed, crushed or deformed.

Y. Power- or powder-actuated devices shall *not* be permitted.

3.3 CLEANING

A. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all hangers and supports in condition suitable for finish painting, before final acceptance.

B. Touch up, repair or replace damaged products before Substantial Completion.

3.4 INSPECTION AND STARTUP SERVICE

A. Inspect each hanger, rod and support for piping and equipment for proper installation according to the manufacturer’s instructions.

3.5 FIELD TESTS

A. Performance Test: All hanger and support devices and components shall be tested in accordance with the latest applicable industry standards.

3.6 ADJUSTING AND BALANCING

A. Adjust all pipe hangers, miscellaneous supports and equipment supports to equalize load for the piping and equipment they carry and to ensure that rods are vertical under operating conditions.

B. Hangers at equipment shall be adjusted to ensure that there are no loads imposed on the equipment by the piping connected to the equipment.

C. Hangers and Supports

1. Ensure that rod is vertical under operating conditions.

2. Equalize loads for all piping and equipment supports.

D. Adjustable Clevis

1. Tighten hanger load nut securely to ensure proper hanger performance.

2. Tighten upper nut after adjustment.

E. Beam Clamps: Tighten all set screws and lock nuts.

F. Riser Clamps

1. Ensure all riser clamps are securely resting on the concrete slab or Kindorf after system is tested and pressurized.

2. Tighten riser clamp nuts after vertical adjustments are made.

END OF SECTION

SECTION 210553

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all identification nameplates and tags required for equipment and piping as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Charts.

2. Equipment nameplates.

3. Pipe identification.

4. Signage.

5. Valve tags.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. All nameplates, signs and valve tags shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fire Code.

2. Reference Standards

a. American Society of Mechanical Engineers

1) ASME A13.1: Scheme for the Identification of Piping Systems.

b. American National Standards Institute

1) ANSI Z535: Safety Color Code - Environmental Facility Safety Signs - Criteria for Safety Symbols - Product Safety Sign & Labels - Accident Prevention Tags.

c. ASTM International

1) ASTM D 882: Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

d. National Fire Protection Association (NFPA)

1) NFPA 13: Standard for the Installation of Sprinkler Systems.

2) NFPA 14: Standard for the installation of Standpipe, Private Hydrants and Hose Systems.

3) NFPA 20: Standard for the Installation of Stationary Pumps for Fire Protection.

4) NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

5) NFPA 72: National Fire Alarm Code.

6) NFPA 101: National Life Safety Code.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 21 00 00 and shall include, but not be limited to:

1. Schedule of valve tags, including catalog cut, color, model number and diagrammatic charts.

2. Schedule of nameplates for all equipment, including model number, reference name and diagrammatic charts.

3. Catalog cuts of pipe markers.

B. Product Data: Submit manufacturer's literature for each product submitted.

C. Manufacturer's Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 21 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Furnish all equipment, materials and accessories new and free from defects.

E. Maintain one (1) copy of the approved submittals for each product on site.

F. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories and ANSI Z535 - Safety Color Code - Environmental Facility Safety Signs - Criteria for Safety Symbols - Product Safety Sign & Labels - Accident Prevention Tags.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

D. Store tapes, adhesives, mastics, and labeling materials in ambient conditions acceptable to and in accordance with the recommendations of the manufacturer.

E. Labeling and markers which become damaged in the opinion of the Engineer may be rejected and shall be repaired or replaced by the Contractor at no additional expense to the Contract.

1.7 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Furnish a one (1) year manufacturer's warranty for all system tags and nameplates.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved

neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Pipe Identification

1. Brady Corporation.
2. Brimar Industries Incorporated.
3. Marking Services Incorporated.
4. Seton Nameplate Corp.

D. Valve Tags

1. Brady Corporation.
2. Brimar Industries Incorporated.
3. Marking Services Incorporated.
4. Seton Nameplate Corp.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 PIPING IDENTIFICATION

A. All piping shall piping shall be identified as to type of use, service and direction of flow in accordance with ANSI A13.1.

B. Pipe markers shall meet ANSI and OSHA requirements for identifying the service, direction of flow, system and zone, for the various piping systems.

C. They shall be factory-fabricated, flexible, semi-rigid UV-resistant heavy-duty vinyl, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

D. Each marker shall consist of one (1) label with direction-of-flow arrows and the name of the service printed in black letters not less than 1 inch (25 mm) high for pipe 2-1/2 inches (60 mm) and smaller, 2 inch (50 mm) high for 3 inches (75 mm) pipe and larger. Markers shall have backgrounds of different colors for the various service groups.

E. Locate markers at each valve, at each entry thru walls, within access doors and on 20 foot (6,096 mm) centers for straight runs of pipe.

1. All fire standpipe and sprinkler piping shall be painted in accordance with the New York City Building Code, prior to the hydrostatic pressure test and whether the pipe will be encased, partially encased in building construction or exposed. as described herein:

a. Fire Standpipe System

1) Main distribution piping, cross connection and risers shall be painted red.

2) Handles of valves serving dedicated fire standpipe systems shall be painted red.

b. Combination Fire Standpipe Systems

1) Main distribution piping, cross connection and risers shall be painted red.

2) Handles of valves serving combination fire standpipe systems shall be painted yellow.

c. Sprinkler Systems

1) Sprinkler floor control assemblies and main distribution piping within egress stairs shall be painted red.

2) Handles of valves serving dedicated sprinkler systems shall be painted green.

2.4 SIGNAGE

A. Provide all designating signs for curb valves, fire department connections, control valves, alarms, hydraulically designed systems, and equipment as required by the Contract Documents and Authorities Having Jurisdiction.

B. Fire department connections and fire pump test headers located on the exterior of the building shall be conspicuously marked to indicate their function.

2.5 VALVE TAGS

A. Provide a valve tag for each valve.

B. Each valve tag shall be 2 inch (50 mm) diameter, brass or aluminum, stamped with designating numbers, minimum 2 inches (50 mm) high, prefixed by the letters “FP”, painted with white enamel, and background painted with red enamel.

C. Attach each valve tag to valve handle or spindle with a brass chain.

D. All valves and controls shall be designated with corresponding numbers on the valve charts or diagrams.

E. The nomenclature to be used on these tags shall be submitted to the Consulting Engineer for approval.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Valve tags and nameplates shall be installed in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

B. Install nameplates with adhesive.

C. Install valve tags with corrosion-resistant brass chain.

3.3 CLEANING

A. Clean and remove all accumulation of dirt, chips or other deleterious material on equipment nameplates, valve tags and signage. Leave all valve tags and equipment nameplates in clean and legible condition before final acceptance.

B. Touch-up, repair or replace damaged tags and nameplates before final acceptance.

END OF SECTION

SECTION 211313

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all piping, material, fittings and appurtenances required for a complete sprinkler system as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Alarm devices.

2. Material of piping systems.

3. Signage.

4. Sprinkler heads.

5. Sprinkler drains.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. All piping, materials, fittings and appurtenances and all associated components of the sprinkler system shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

A. New York City Building Code.

B. New York City Fire Code.

2. Reference Standards

A. American Society of Mechanical Engineers

1. ASME B16.1: Cast Iron Pipe Flanges and Flanged Fittings.

2. ASME B16.3: Malleable Iron Threaded Fittings.

3. ASME B16.4: Gray Iron Threaded Fittings.

4. ASME B16.5: Pipe Flanges and Flanged Fittings.

5. ASME B16.9: Factory-Made Wrought Steel Buttwelding Fittings.

6. ASME B16.11: Forged Fittings, Socket-Welding and Threaded.

7. ASME B16.25: Buttwelding Ends.

8. ASME B36.10M: Welded and Seamless Wrought Steel Pipe.

B. ASTM International

1. ASTM A 53/A 53M: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2. ASTM A 135: Standard Specification for Electric-Resistance-Welded Steel Pipe.

3. ASTM A 234: Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

4. ASTM A 733-16: Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples

5. ASTM A795: Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

C. American Welding Society

1. AWS A5.8: Specification for Filler Metals for Brazing and Braze Welding.

2. AWS D1.1: Structural Welding Code - Steel.

3. AWS D10.12M/D10.12: Guide for Welding Mild Steel Pipe

D. Manufacturers Standardization Society

1. MSS SP6: Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2. MSS SP9: Spot Facing for Bronze, Iron and Steel Flanges.

3. MSS SP43: Wrought Stainless Steel Butt-welding Fittings.

4. MSS SP44: Steel Pipe Line Flanges.

5. MSS SP-51: Class 150LW Corrosion Resistant Cast Flanges and Flanged Fittings.

6. MSS SP-75: Specifications for High-Test Wrought Butt Welding Fittings.

7. MSS SP-77: Guidelines for Pipe Support Contractual Relationships.

8. MSS SP-83: Steel Pipe Unions Socket-Welding and Threaded.

9. MSS SP-97: Forged Carbon Steel Branch Outlet Fittings-Socket Welding, Threaded and Butt-welding Ends.

E. National Fire Protection Association (NFPA)

1. NFPA 13: Standard for the Installation of Sprinkler Systems.

2. NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

3. NFPA 72: National Fire Alarm Code.

4. NFPA 101: Life Safety Code.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and *Section 21 00 00* and shall include, but not be limited to:

1. Provide a pipe, material and fitting schedule for all sprinkler systems including:

A. System working pressure.

B. Type of pipe including material of construction.

C. Fitting type of each type of pipe and each size.

2. Sprinkler system appurtenances, sprinkler heads, sprinkler guards, water flow devices, tamper switches and signage as required by the Authority Having Jurisdiction.

3. The Contractor shall submit piping shop drawings and hydraulic calculations for review prior to fabrication of any of the systems. Shop drawings shall indicate plan locations and elevations of piping and hangers, including bottom elevation of major piping and be coordinated with ductwork and other mechanical and electrical services.

4. Provide hydraulic calculations indicating compliance with the construction documents and the local code requirements.

B. Welders' Certificate: Submit welders' certification of compliance with ASME Section IX and AWS D1.1 prior to proceeding with any welding.

C. Product Data: Submit manufacturer's literature including general assembly, materials of construction, manufacturing process, pressure ratings and approvals.

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections**.**

E. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for the system.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and *Section 21 00 00* shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

F. The Contractor must maintain on site current copies of each welder or welding operator's Procedure Qualification Record.

G. All welds shall bear the identifying number, letter or symbol of the welder or welding operator.

H. To ensure uniformity and compatibility of piping components in grooved in piping system all grooved products and grooving tools must be the products of a single manufacturer.

I. The manufacturer of grooved piping fittings shall provide on-site training for Contractor's field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

J. Maintain one (1) copy of the approved submittals for each product on site.

1.6 FACTORY TESTING

A. All piping, fittings and couplings shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment and as specified herein:

1. The piping manufacturer shall provide hydrostatic test reports indicating pressure rating and compliance with the specifications.

2. The fitting and coupling manufacturer shall provide hydrostatic test reports indicating pressure rating and compliance with the specifications.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

1.8 COORDINATION

A. Certain materials will be furnished, installed, or furnished and installed, under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to insure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general construction drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

E. Furnish and set all sleeves for passage of pipes through structural masonry and concrete walls and floors and elsewhere as required for proper protection of each pipe passing through building surfaces. Coordinate this work with Construction Manager in order to expedite and properly perform this work.

F. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this section shall be coordinated through the Construction Manager and must be approved by the Structural Engineer.

G. Should the Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

H. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Contractor to coordinate, protect and schedule his work with other trades in accordance with the construction sequence.

I. Architectural drawings shall be checked for ceiling height requirements.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Furnish a five (5) year manufacturer's warranty for all piping.

C. Furnish a five (5) year manufacturer's warranty for all fittings and couplings.

D. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Alarm Devices

1. Tamper Switches
   A. Potter Electric Signal Co.
   B. System Sensor.

2. Water Flow Switches

   A. Potter Electric Signal Co.
   B. System Sensor.

D. Material of Piping Systems

1. Mechanical Couplings and Fittings for Grooved Steel Pipe

   A. Grinnell
   B. Gruvlok.
   C. Victaulic

2. Steel Pipe

   A. Allied Pipe & Tube.
   B. Ward Mfg.
   C. Wheatland Pipe & Tube.

3. Steel Pipe Flanges

   A. Anvil International.
   B. Taylor Forge.

C. Weldbend.

4. Threaded Steel Pipe Fittings

A. Anvil International
B. Ward Mfg.

5. Welded Steel Pipe Fittings

A. Merit
B. National Flange and Fitting Co.
C. Weldbend.

E. Sprinkler Heads

1. Reliable Sprinkler Corp.
2. Tyco Fire.
3. Victaulic
4. Viking Corp.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. Use materials as scheduled and indicated on the fire protection drawings.

E. All piping, fittings and appurtenances shall be UL Listed and/or FM approved.

F. An inspection certificate shall be provided by the Contractor stating the installation complies with the local Authority Having Jurisdiction.

G. All piping, fittings, and appurtenances shall be installed according to NFPA 13

H. Pitch all branch piping at a minimum 1/2 in. (13 mm) in 10 feet (3 m) and all main distribution piping at a minimum 1/4 in. (7.5 mm) in 10 feet (3 m). All trapped piping shall be provided with low point drains where required.

2.3 ALARM DEVICES

A. Provide all alarm devices directly connected to equipment and piping required for a complete system and for the transmission of alarms to the building fire alarm system.

B. Switches shall be normally open or closed type in order to conform with the alarm system which they are connected.

C. All interconnecting electrical wiring will be furnished under Division 26.

D. Provide tamper switches for all valves controlling the flow of water to sprinkler systems including floor control valves

E. Tamper switches shall give an alarm if the valves served are closed, the switches are removed, or if the cover is opened.

F. Valve stems shall be notched to take the switches unless valves are provided with tamper switches from the factory.

G. Tamper switches shall be the following:

1. For each OS&Y valve, 2 in. (50 mm) through 6 in. (150 mm) provide one (1), Potter Model No. OSYSU-1 supervisory switch.

2. For each butterfly valve, provide one (1), Potter Model No. PCVS-2 supervisory switch with two (2) sets of alarm contacts.

3. Where tamper switches are located outdoors or in corrosive environments provide with corrosion resistant hardware of 316 stainless steel and nickel plated to ASTM B377 Type V Brackets.

H. Provide water flow switches for each sprinkler control valve assembly.

I. Water flow switches shall give an alarm due to water flow in the sprinkler system.

J. Water flow switches shall be vane type, closed circuit with an adjustable retard or time delay to prevent false alarms due to water pressure surges and two (2) sets of alarm contacts.

K. Water flow devices shall be the following:

1. For each sprinkler system control assembly provide one (1) Potter Model No. VSR, vane type water flow alarm switch with retard.

2.4 MATERIAL OF PIPING SYSTEMS

A. Piping:

1. Sprinkler piping shall be as indicated in the “Material Schedule” on the Construction Documents. Pipe ends may be factory or field-formed to match joining method.

2. Sprinkler drain piping shall be Schedule 40 galvanized steel pipe.

3. All Schedule 40 sprinkler pipe, black steel or galvanized, shall be of United States or Canadian origin and manufactured in accordance with ASTM A-53A-53M, Type E , Grade B.

4. Each length of pipe shall be legibly marked by the Manufacturer to show company name, type of pipe, specification number and pipe length.

5. Black steel and galvanized pipe nipples shall be manufactured in accordance with ASTM A733-16, and made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.

6. When grooved steel pipe is used in lieu of threaded pipe Schedule 40 pipe shall be either rolled or cut grooved.

B. Fittings

1. Fittings shall be threaded or welded, standard weight or extra-heavy pattern, UL and FM approved fittings, manufactured of steel, ductile iron or malleable iron as required for the pressures experienced in the system. Grooved ductile iron fittings with mechanical couplings may be used in lieu of threaded fittings.

2. When grooved pipe and rigid fittings are utilized, mechanical couplings shall be Victaulic Model No. 07 “Zero-Flex”. Where required to comply with project seismic requirements, flexible fittings with mechanical couplings shall be Victaulic Model No. 77.

3. Welded joints and fittings may be used where permitted by the Authorities Having Jurisdiction. Safety procedures described in NFPA 13 must be followed and pressure ratings shall meet or exceed maximum system working pressures.

4. Welding filler metals shall comply with AWS D10.12M/D10.12.

5. Mechanical-T fittings may be used for less than full size branch pipe connections 2 in. (50 mm) and larger. Mechanical-T fittings shall be Victaulic Model No. 920 with a locating collar engaged into the pipe.

6. The manufacturer’s hole cutting tool with coupon retaining pilot dual bit shall be used for all holes made outside of the fabrication shop.

7. The following pipe preparation and installation procedures shall be followed:

   A. Holes must be drilled on centerline of pipe.

   B. Make certain the hole to receive the Mechanical-T is the proper size.

   C. Check pipe surface within 5/8 in. (16 mm) of hole to be certain it is clean, smooth and free from indentations or projections which would affect gasket sealing. The pipe around the entire circumference within the Mechanical-T fitting shall be free of any dirt, scale or projection, which might prevent the Mechanical-T from seating fully on the pipe surface.

D. Remove any burrs, sharp or rough edges from the hole, which might affect assembly, proper seating of the locating collar, or flow from the outlet or gasket seating.

E. Install in accordance with the manufacturer's installation instructions.

F. Tighten bolt nuts uniformly until the upper housing is in complete surface contact in the gasket pocket area and the assembly is rigid. Nuts must be tightened to 50 lb.ft. with even gaps between the bolt pads.

C. Joining Methods

1. Make threaded joints with the use of utility compound or teflon tape applied to male threads only. The use of lampwick or filler shall not be acceptable.

2. Cut or rolled grooves in pipe for use with mechanical grooved couplings shall be made with an approved machine manufactured by the supplier of the couplings.

3. Make welded joints (except for pipe welded end-to-end) with forged one-piece welding flanges, caps, nozzles, elbows, branch outlets and tees. Submit cut samples for approval if directed. Use fittings of a type which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends. "Weld-o-lets" may be used where standard fittings of required sizes are not available and elsewhere as approved. Weld fittings shall be UL and FM listed.

4. All job welding shall be done by the electric arc welding process in accordance with the following:

A. All joints shall be 45 degree bevel type. Pipe mill-beveled or machine-beveled by this Contractor.

B. All scale and oxide removed with hammer, chisel or file and bevel left smooth and clean.

C. Pipe lengths lined up straight with abutting pipe ends concentric.

D. Both conductors from the welding machine shall be extended to locations at which welding work is being done. The leads from welding machine to location of welding work shall be held together with tape or other approved means so as to prevent induced current in structural steel, in piping or in other metals within the building. The ground lead shall be connected to length of pipe with suitable clamp in such manner that welding current will not flow through joints in pipe, structural steel of building or steel pipe supports.

E. Weld metal thoroughly fused with base metal at all sections. Welds shall be of sound metal, free from laps, slag inclusion or other defects.

2. All welders shall be certified for the service for which they are employed and on which they work by the National Certified Pipe Welding Bureau of the Mechanical Contractors Association of America.

3. Connections to equipment shall be made with weld neck flanges of forged steel or stainless steel as required.

2.5 SPRINKLER PIPING SPECIALTIES

A. Sprinkler Inspector's Test Fittings

1. Basis of Design Product: Subject to compliance with requirements, provide AGF Manufacturing “DrainanTest" or equal.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

3. Pressure Rating: 300 psig (2,070 kPa).

4. Body Material: Cast bronze housing with sight glass.

5. Size: Same as connected piping.

6. Inlet and Outlet: Threaded or grooved end.

7. Provide with pressure-relief valve for sprinkler systems with pressure-reducing valves.

B. Adjustable Drop Nipples

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a) Aegis Technologies, Inc.

b) Merit Manufacturing.

2. Standard: UL 1474.

3. Pressure Rating: 250 psig (1,725 kPa) minimum

4. Body Material: Steel pipe with EPDM rubber O-ring seals.

5. Size: Same as connected piping.

6. Length: Adjustable.

7. Inlet and Outlet: Threaded.

2.6 SIGNAGE

A. Provide all designating signs for sprinkler control valves, alarms and hydraulically designed systems as required by the Authorities Having Jurisdiction.

2.7 SPRINKLER HEADS

A. Sprinkler heads shall be as scheduled on the drawings.

B. Furnish and install all sprinkler heads required for a complete sprinkler system installation in accordance with these specifications, the Authority Having Jurisdiction, and applicable standards with UL and or FM approval.

C. Provide automatic sprinkler heads of finish as approved by the Architect.

D. All sprinkler heads shall be commercial quick response sprinklers with 1/2 in. (13 mm) diameter orifice. Sprinkler heads shall be upright, pendent, flush pendent, concealed pendant or dry type pendent to fit the conditions in which they are installed.

E. All pendent, flush pendent and recessed pendant sprinkler heads installed in finished areas with ceilings shall be chrome plated with chrome plated escutcheons unless otherwise noted on the construction documents.

F. All upright, sidewall and pendent sprinkler heads in areas without ceilings or unfinished areas shall be rough brass construction unless otherwise noted on the construction documents.

G. All concealed sprinkler heads installed in finished areas with ceilings shall have white cover plates unless otherwise noted on the Construction Documents.

H. All sprinkler heads shall be of the proper temperature rating for the locations in which they are installed. In general temperature rating shall be an ordinary temperature rating of 165°F (74°C), except for Mechanical Equipment Rooms and Kitchen areas, which shall be 286°F (141°C). Where the maximum ceiling temperatures exceed 100°F (38°C), install sprinkler heads with temperature ratings in accordance with NFPA 13.

I. All sprinkler heads located in areas subject to damage or less than 7 ft. 0 in. above the finished floor shall be provided with a protective sprinkler guard. Sprinkler guards shall be Reliable Model C for sprinklers installed prior to cage assembly and Reliable Model D for sprinkler guard installation prior to sprinkler installation.

J. Furnish and install, where directed, one (1) approved type sprinkler cabinet containing not less than six (6) extra sprinkler heads, of the various degrees used in the work and provide one (1) sprinkler wrench for emergency use. The sprinkler cabinet shall be Reliable Sprinkler Model A4.

2.8 SPRINKLER DRAINS

A. Provide all necessary drain valves, capped nipples and auxiliary piping as required to drain trapped portions of the sprinkler system.

B. Inspector test connections shall be provided with a sight connection and piped to waste.

C. Main drain and test connection shall be piped to waste.

D. All sprinkler drain piping, test connections and auxiliary piping shall be Schedule 40 galvanized steel pipe.

E. Provide all piping required to spill the drains and test connections to the floor, funnel or other drainage connections provided under the Plumbing Contract or arrange with the Plumbing Subcontractor to provide additional drainage facilities, in which case pay all charges related to the additional plumbing work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify existing conditions prior to starting work.

C. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto.

D. Wherever this Contractor's work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to ensure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items in an approved manner in order that the Ceiling Trade may know where to install access doors and panels.

E. The Construction Manager will provide benchmarks, monuments, and other reference points on the job, which will be available for this Contractor's use.

F. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

3.2 INSTALLATION

A. Install work in accordance with NFPA 13 and the New York City Building Code.

B. Run and arrange piping approximately as indicated on the construction documents and coordinate with other trades.

C. The arrangement, positions and connections of pipes, drains, valves and the like, indicated on the Construction Documents shall be followed as closely as possible; however, the right is reserved by the Architect to change locations and elevations to accommodate conditions that may arise during the progress of the work, without additional compensation for such changes, provided that no additional appurtenances are required prior to the installation of the work.

D. Install piping in concealed spaces above finished ceilings and as neatly spaced, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes.

E. Erect all risers plumb and true, parallel with walls and other pipes.

F. Ream all pipe smooth before installation. Do not bend, split, flatten nor otherwise injure pipe.

G. The Contractor shall provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

H. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

I. Provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not. Include the complete installation of the quantity of heads indicated on the drawing with all required piping, valves, etc. The layout to be determined and shop drawings prepared after the tenant layouts and reflected ceiling plans are available.

J. Install sprinkler heads in all areas on a true axis line in both directions in center of tile with a maximum deviation of 1/2 in. (13 mm) plus or minus from the axis line as established by the Architect for use of all trades. At the completion of the installation, remove and reinstall any heads found to exceed the tolerance above.

K. Install flush plate sprinkler heads within the manufacturer's tolerances.

L. Prior to installation of flush plates, notify Architect and Consulting Engineer for verification of installation.

M. Install "U" bends for all pendent heads. Any heads found out of tolerance shall be removed and reinstalled.

N. Install all pendent sprinkler heads in exposed hung ceiling areas, in strict accordance with shop drawings. The Architect reserves the right to reject any and all installed heads not in accordance with the approved shop drawings.

O. The arrangement, positions and connections of pipes, drains, valves, and the like, indicated on the construction documents shall be followed as closely as possible, however the right is reserved by the Architect to change locations, and elevations, to accommodate conditions which may arise during the progress of the work, without additional compensation for such changes, provided that no additional fire standpipe appurtenances are required prior to the installation of the work.

P. It is the responsibility of this Contractor for accurately laying out the work. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

Q. No piping shall pass over high voltage (440V) electrical bus duct, motor control centers, motor starter racks, telephone equipment, transformer equipment, switchgear equipment or any other electrical equipment. Where required, provide protective pans under or over individual pipes and construct the pans of 16 gauge stainless steel with a 6 in. (150 mm) lip, the corners being welded to make the pans watertight. The pan shall drain clear of the bus duct or electrical or telephone equipment. Where pans are above piping, they shall be designed to serve as a deflector plate. Pans over bus duct and electrical or telephone equipment shall be sized to fully protect equipment. Support pans with pipe hangers/Kindorf and pipe drain clear of the equipment below to safe waste. Give each pan three (3) coats of Rust-Oleum paint and support with pipe hangers and drain clear of the equipment below.

R. Route piping in an orderly manner parallel and perpendicular to walls maintaining gradient and headroom without interfering with use of space or taking more space than necessary. Whenever practical group piping at common elevations.

S. Do not install pipes or other apparatus in a manner that interferes with the full swing of the doors and the path of egress as determined by the Architectural Documents.

T. Furnish and install sleeves for pipe passing through partitions, walls and floors.

U. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

V. Install valves in accordance with the specifications and provide access where valves and fittings are not accessible. Coordinate size and location of access doors with valves.

W. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

X. Grooved Piping:

1. All grooved end components shall be the product of one manufacturer.

2. The manufacturer shall provide on-site training for Contractor's field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

3. Piping shall have rolled or cut grooved-ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with coupling manufacturer's current listed standards conforming to ANSI/AWWA C-606.

4. Mechanical couplings for grooved pipe couplings shall be of the rigid or flexible type as required for the installation, with plated nuts and bolts to secure housing sections together and a synthetic rubber flush seal gasket of the cavity pressure-responsive design.

5. Grooved piping systems shall be installed in accordance with the requirements of the manufacturer's latest published literature.

6. Flexible type couplings shall be installed at final connections to equipment and/or in locations where vibration attenuation and stress relief are required as determined by the Engineer.

7. Coupling housings shall be cast ductile iron conforming to ASTM A 536 (Grade 65-45-12), or malleable iron conforming to ASTM A 47, finished painted with alkyd enamel.

8. Flange adapters shall be cast ductile iron conforming to ASTM A 536 (Grade 65-45-12), or malleable iron conforming to ASTM A 47, finished painted with alkyd enamel.

9. Gaskets for mechanical couplings and flange adapters shall be molded flush seal type conforming to the outside diameter of the steel pipe. Synthetic rubber of elastomers

having properties as indicated in ASTM D 2000 shall be used. Gasket selection shall comply with the coupling manufacturer's standards, installation and design requirements and shall be suitable for the intended service and temperature range.

10. Gaskets for water service from -30°F (-34°C) to 230°F (110°C) shall be Grade "E" EPDM.

11. Bolts for mechanical couplings shall be zinc plated (ASTM B 633) heat treated carbon steel track head conforming to physical properties of ASTM A 183, minimum tensile strength 110,000 psi (7,585 bar).

3.3 CLEANING

A. During construction, properly cap all lines, so as to prevent the entrance of sand, dirt, etc. Each system of piping shall be blown through after completion (for the purpose of removing grit, dirt, sand, etc., from coils and piping), for as long a time as required to thoroughly clean the apparatus.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all sprinkler piping and appurtenances in suitable condition, before final acceptance.

C. Touch up, repair or replace damaged piping before final acceptance.

D. As soon as sprinkler heads are in place, cover each head with a small paper bag of an approved type, and remove it only after all painting is complete. After the bag is removed, clean and polish all heads.

E. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting to prevent obstruction and damage.

F. Protect the system against freezing in cold weather.

3.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Fire Protection Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all piping, hangers, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

D. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

3.5 FIELD TESTS

A. Performance Test

1. Test all systems before any paint is applied, piping is insulated, furred in or otherwise covered.

2. Required tests shall be witnessed by Fire Marshal, Authority Having Jurisdiction, Owner's representative or Engineer.

3. Test all systems in full accordance with applicable Underwriters' and Municipal requirements, but in no case shall the system be tested at less than 200 psi (13.8 bar) hydrostatic pressure. Apply the test for a minimum of one (1) hour with no loss in pressure. Prior to applying the hydrostatic test, the system shall be tested with 50 psi (3.5 bar) compressed air for a period of ten minutes with no loss in pressure.

4. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

B. Final Acceptance Test

1. After completion of the sprinkler system and at the beginning of the warranty period the Contractor shall perform, without charge to the Owner, one (1) inspection of the sprinkler system during the warranty period. Inspection shall be as per the applicable NFPA No. 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems", plus the following maintenance to be performed during the course of the inspection:

A. Operation of all control valves.

B. Lubrication of operating stems of all interior valves.

C. Operation of all water gong, water flow and tamper switches.

D. The Standard Form of the National Fire Sprinkler Association, Inc., "Report of Inspection" (Sheets 1 and 2), shall be filled out in triplicate after each inspection and the copies sent to the Architect and Owner.

3.6 ADJUSTING AND BALANCING

A. Upon completion of installation, hangers for piping, and supports for equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping or the equipment that it is connected to.

B. Securely tighten clevis hanger load nuts first to ensure proper hanger performance. Tighten top nut after adjustment.

END OF SECTION

SECTION 220000

GENERAL REQUIREMENTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Division 22 of the specifications requires the furnishing and installing of all items, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include, but are not limited to, materials, labor, supervision, supplies, equipment, transportation, rigging, storage, utilities, and all required permits and licenses.

B. Before submittal of bid, examine all drawings, specifications, addenda, alternates, special conditions, and all other bidding documents of all sections of this project, verify all governing conditions at the site, and become fully informed as to the extent and character of the work required, as well as its relation to other work in the building. Submittal of a bid is an agreement to all requirements of the Contract Documents, and no consideration will be granted for any claimed misunderstanding thereof.

C. Submittal of a bid is a representation by the bidder that it is qualified in all respects properly to perform the work for which it is bidding and has experience with similar work. Bidders are deemed to be aware, on the basis of their background and experience, materials which may be required in their responsibilities, even though unspecified.

1.2 ABBREVIATIONS

ADA	Americans with Disabilities Act
AGA	American Gas Association
AHJ	Authority Having Jurisdiction
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ASA	Acoustical Society of America
ASME	American Society of Mechanical Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratory
FM	Factory Mutual
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
MSDS	Material Safety Data Sheet
MSS	Manufacturers Standardization Society

NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code (NFPA 70)
NEMA	National Electrical Manufacturers Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NUSIG	National Uniform Seismic Installation Guidelines
NYCEC	New York City Electrical Code
NYCMC	New York City Mechanical Code
OSHA	Occupational Safety and Health Administration
PDI	Plumbing and Drainage Institute
TEMA	Tubular Exchanger Manufacturers Association, Inc.
UL	Underwriters Laboratories

1.3 DEFINITIONS

A. For purposes of these specifications the following definitions apply:

1. ARCHITECT: The Architect of record.

2. ENGINEER: The Engineer of record.

3. CONTRACTOR: The individual, partnership or corporation to whom has been awarded the contract for providing the plumbing work.

4. SUBCONTRACTOR: The individual, partnership or corporation to whom has been awarded the contract for providing assistance to the Contractors work.

5. GENERAL CONTRACTOR: An individual or group that contracts with another organization or individual (Owner) for the construction of a building or other structure. They may or may not do any actual construction of a portion of the project.

6. CONSTRUCTION MANAGER: An individual or group that contracts with another organization or individual (Owner) for the scheduling and coordination of all design and construction processes, including the selection, hiring and oversight of specialty Trade Contractors, for a building or other structure.

7. PROVIDE: To “furnish” and “install”.

8. INSTALL: To join, unite, fasten, link, attach, set up or otherwise connect together; complete, tested and ready for normal satisfactory operation.

9. FURNISH: To supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application.

10. AS DIRECTED: As directed by the Architect or the Engineer.

11. CONCEALED: Embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings or accessible raised floor cavities.

12. SUBMIT: Submit to the Architect and/or the Engineer for review.

13. FINISHED SPACES: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

14. EXPOSED: Exposed to view.

15. SUPPLY: To purchase, procure, acquire, and deliver complete with related accessories.

16. WORK: Includes labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.

17. PIPING: Includes pipe, tube, fittings, flanges, valves, controls, strainer, hangers, supports, unions, traps, drains, insulation, and all related accessories.

18. WIRING: Includes raceway, fittings, wire, boxes, and all related accessories.

19. INDICATED: As shown or noted on the drawings or specifications.

1.4 RELATED DOCUMENTS

A. The General Conditions and Supplementary Conditions accompanying these specifications are hereby made a part of the requirements for the work under this section of the specifications.

B. No General Conditions and/or Supplementary General Conditions clause referring to the work of this section shall be considered waived unless specifically stated herein.

C. Refer to Owner's "Commissioning Requirements" for the scope of work related to systems furnished and installed under Division 22.

1.5 REFERENCE STANDARDS

A. Comply with the currently enforced versions of all applicable laws, rules, regulations, standards, codes and ordinances of federal, state, and local authorities, Underwriters Laboratory, IRI, ETL, NFPA and the National Electric Code. Modifications required by the Authorities Having Jurisdiction shall be made without additional cost to the Owner.

B. Comply with the currently enforced versions of all applicable laws, rules, regulations, codes and ordinances of New York City and shall be BSA approved or have an OTCR approval. Modifications required by the Authorities Having Jurisdiction shall be made without additional cost to the Owner.

1. Secure and pay for necessary approvals, permits, inspections, carting, legal dumping, etc., and deliver the official records of the granting of permits to the Owner without additional cost to the Owner.

2. The drawings have been filed. Contractor shall pay all fees to obtain release of approved plans and shall complete and file all forms, tabulations, plans, etc., required for Special Inspections.

3. Where so required by the Building Code of the City of New York, the Owner shall employ the services of a Special Inspector to perform inspections of materials, installations,

fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

C. All equipment, materials, and methods to be furnished and/or installed by this division shall comply with all applicable requirements of laws, codes, ordinances, legislation, standards, etc., of all federal, state, and local authorities, whether indicated on the Contract Documents or not.

D. Where Contract Drawing and specification requirements are in excess of rules, regulations and code requirements, and are permitted under the code, the Contract Drawings and specifications shall govern. In the event of a conflict between the Contract Documents and the applicable laws, rules, regulations, codes, and ordinances of federal, state, and local Authorities Having Jurisdiction, the latter shall govern.

E. Where alterations to and/or deviations from the Contract Drawings and specifications are required by the authorities listed above, report the requirements to the Architect and secure his written approval before starting the required modifications.

F. Pay royalties or fees required in connection with the use of patented devices, or systems, and save the Owner, the Engineer and the Construction Manager harmless from any claims or lawsuits arising from such use and indemnify each thereof against attorneys' fees in connection therewith.

1.6 QUALITY ASSURANCE

A. All materials and equipment shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products of the type specified herein. The manufacturer shall have been in continuous operation in the manufacture of the products specified for a minimum of ten (10) years.

B. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

C. Make every effort to furnish all equipment of any equipment type (such as pumps, hot water heaters, storage tanks, etc.) from one manufacturer.

D. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A "Materials Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

E. All adhesives specified herein or utilized in the manufacture of equipment or components which are specified herein shall meet or exceed the volatile organic compound (VOC) limits of South Coast Air Quality Management District Rule No. 1168.

F. All sealants specified herein or utilized in the manufacture of equipment or components which are specified herein shall meet or exceed Bay Area Resources Board Reg. 8, Rule 51. Submit as part of the shop drawing process for review by the Engineer and/or Owner, supporting documentation which demonstrates conformance with these requirements.

G. In the event that products, materials and/or processes are not available that do not contain asbestos, PCB's, VOC's formaldehyde formulations, hazardous materials or may result in

hazardous out-gassing as determined by the manufacturer a “Materials Safety Data Sheet”, as described above, shall be submitted as part of the shop drawing process for review by the Engineer and/or Owner.

H. Furnish all equipment, materials and accessories new and free from defects.

1.7 ENGINEERING REFERENCE POINTS

A. The Construction Manager shall provide benchmarks, monuments, and other reference points on the job which will be available for this Contractor's use.

B. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

1.8 INDEMNIFICATION

A. Covenant and agree that this Contractor and his Subcontractors and his and their agents, servants and employees will provide and maintain a safe place to work and that he and they will comply with all laws and regulations of any governmental Authority Having Jurisdiction thereof.

B. This Contractor agrees to indemnify, defend and hold harmless the Owner, Owner’s agents and Engineer from and against any liability, loss, damage or expense, including attorneys’ fees, arising from a failure or alleged failure on the part of this Contractor, his Subcontractors and his and their agents, servants and employees to provide and maintain a safe place to work or to comply with all laws and regulations of any governmental Authority Having Jurisdiction thereof.

C. This Contractor agrees to indemnify, defend and hold harmless the Owner, Owner’s agents and Engineer from and against any liability, loss, damage or expense, including attorneys’ fees, arising from a failure or alleged failure on the part of this Contractor, his Subcontractors and his and their agents, servants and employees to discharge the obligations assumed by him or them in the performance of the work, including any act or omission allegedly resulting in death or personal injury or property damage, or due to improper construction, construction techniques, or the use of improper or inappropriate material or tools.

1.9 COMPLETE PERFORMANCE OF WORK

A. Work shall be executed in strict accordance with the best practice of the trades in a thorough, workmanlike manner by competent, skilled technicians and trade personnel.

B. This Contractor shall provide a competent, experienced, full-time Superintendent who is authorized to make decisions on behalf of the Contractor.

C. All labor, materials, apparatus, and appliances essential to the complete and proper functioning of the systems described and/or indicated herein, or which may be reasonably implied as essential, whether mentioned in the Contract Drawings and specifications or not, shall be provided by the Contractor. The entire installation shall be ready in every respect for the satisfactory and efficient operation when completed.

D. In cases of doubt as to the work intended, or in the event of need for explanation thereof, request supplementary written instructions in the form of a Request for Information (RFI) from the Architect and/or Engineer.

E. Coordinate the work specified herein and shown on the Contract Drawings with all other trades.

F. Be responsible for material and workmanship until completion and final acceptance. Replace any of same which may be damaged, lost or stolen, without additional cost to Owner. Guard the building and its contents against damage by this Contractor, his employees or Subcontractors, and make good any damage free of charge.

G. Where, due to union regulations or trade agreements, any of the work shown on the drawings or specified herein is not considered this trade's work, subcontract the work in question, but assume full responsibility for the complete installation. Except for such changes as may be specifically approved by the Architects and Consulting Engineers, in accordance with alternates or options stated hereinafter, all work must be in full accordance with the intent of the plans and specifications, complete in every way and ready for satisfactory and efficient operation when delivered to the Owner.

H. Provide signs required by the Authorities Having Jurisdiction.

I. Provide all rigging required for complete installation and furnish drawings showing necessary points of support, reactions and supplementary bracing. This shall be submitted for approval by the Owner. Should any shoring be required, provide same after Owner's approval.

J. Become thoroughly acquainted with the work involved, obtain and verify at the building all measurements necessary for the proper installation of work. Furnish to other Contractors any information relating to work of this division necessary for the proper installation of their contracts. Coordinate with other Contractors for finish adjacent to work of this section and arrange to have visible portions of the work (such as access doors, escutcheons, etc.) fit in with the finish in a manner satisfactory to the Architects.

K. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as fresh water connections, foundations, electric wiring, access doors, and the like) in ample time for installation.

L. Wherever this Contractor's work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to insure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items (valves, dampers, pull boxes, etc.) in an approved manner in order that the other trades may know where to install such items such as access doors, panels, etc.

M. Provide required supports and hangers for piping and equipment, so that loading will not exceed allowable loadings of structure. Submittal of a bid shall be deemed a representation that the Contractor submitting such bid has ascertained allowable loadings and has included in his estimates the costs associated with furnishing required supports.

N. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this section shall be coordinated through the Construction Managerand approved by the Structural Engineer. All such drilling, cutting and reinforcing costs shall be borne by this Contractor.

O. At the conclusion of each day's work, clean up and stockpile on site, at a location designated by the Construction Manager, all rubbish, debris and trash, which may have accumulated during the day as a result of work of this Contractor and of his presence on the job.

1. Sidewalks and streets adjoining the property shall be kept broom-clean and free of debris, rubbish, trash and obstructions of any kind caused by work of this Contractor, which will affect the condition and safety of streets, walks, utilities and property.

P. Due to the nature of the alteration work, which requires the building to be kept operable at all times, except for those floors being actively altered, this Contractor shall coordinate his activities with the Construction Managerand the building Owner. Any interruption of building services must be done at the convenience of the building Owner. If temporary connections to maintain services are required or if the work must be performed after hours, this work shall be so arranged with all parties involved.

Q. If this Contractor must perform work in occupied areas, he shall make arrangements with the Construction Managerand the Owner as to the time and method by which this work shall be performed. He shall arrange for all adjacent areas to be properly protected against damage, dirt and dust.

1.10 DESCRIPTION OF BID DOCUMENTS

A. Specifications, in general, describe quality and type of materials and equipment.

B. The drawings show the various systems schematically, no added compensation shall be permitted for variations due to field conditions.

C. Where disagreements occur between the plans and the specifications or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the Base Bid.

D. Work not shown on the drawings but called for in the specifications, or vice versa, shall be provided by the Contractor without additional expense to the Owner.

E. Where a variance occurs between the drawings and specifications, or within either document itself, the Contractor shall request through the Construction Manager, clarification in writing from the Architect on which item and manner in which the work shall be installed.

F. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

G. Equipment shown on the drawings with particular manufacturers identified has been coordinated for structural penetrations, electrical connection, operating and service (maintenance) requirements, and physical size with regard to the space where the equipment is shown. If they comply with the project specifications, these and the other specified manufacturers of this equipment will be acceptable contingent on the Contractor providing a complete installation and maintaining full responsibility to provide, at no additional cost, any modifications to the structure or electrical service that are required to properly install, operate, and service the equipment being used. These modifications shall not include additional area for equipment unless approved by the Architect.

1. The Contractor shall note these changes on the equipment submittal and shall show all differences in equipment being supplied from that shown on the Drawings. Failure of the Contractor to provide this information with the submittal will indicate that the submitted equipment meets or exceeds the equipment shown on the Drawings in performance and is physically no larger in housing size.

a. Failure of the Contractor to comply with the above and any discrepancies found shall result in the Contractor providing equipment equal to that specified at the Contractor's expense.

1.11 SUBMITTALS

A. No part of the work shall be started in the shop or in the field until the Architect and/or Engineer have reviewed the shop drawings and samples for that portion of the work. Thereafter, the work shall be executed in accordance with the Contract Documents and the indicated status of the reviewed shop drawing.

B. All shop drawings and samples shall be identified as follows:

1. Date of submittal.

2. Title of project (including floor and room designations).

3. Name of Contractor and date of his approval.

4. Name of Subcontractor or supplier and date of submittal to Contractor.

5. Number of submission.

6. Any qualification(s), departure(s) or deviation(s) from the requirements of the Contract Documents.

7. Federal specification, FM Approval, OTCR number, BSA approval number, or ASTM number or any local listing or approval where required.

8. Such additional information as may be required by the specifications for the particular material being furnished.

9. When the submitted materials modify components, styles, etc., on the same drawing, or alternate or options available for the intended material, the material shall be appropriately annotated in a manner to avoid any misunderstanding of the submission.

C. Shop drawings and samples shall be submitted for review sufficiently in advance of the scheduled start of the work in the shop or in the field to allow ample time, in consideration of the number and complexity of the drawings in the submittal, for the Architect and/or Engineer to make an orderly review. No extension of the time to complete the work shall be granted to the Contractor by reason of his failure in this respect.

D. The Contractor shall carefully check shop drawings and samples, including those received by him from Subcontractors and manufacturers, for accuracy, completeness of required information, and conformance with the Contract Documents. Shop drawings found to be inaccurate, incomplete or not in conformance with the Contract Documents shall be corrected before being submitted to the Architect and/or Engineer for review.

E. Within three (3) weeks after award of the Contract, the Contractor shall submit for the Architect's and/or Engineer's review, a list of the manufacturers and Subcontractors whose products and services he proposes to use for the work. Proposed substitutions for material and equipment required by the Contract Documents shall be submitted to the Architect and/or Engineer for review during this period. Submittals proposing or requesting substitutions shall be

expressly identified as such in a letter of transmittal, with the reasons for requesting the substitution stated. Submittals for this purpose shall be complete in every respect, shall conform to all the information requirements for shop drawing and sample submittals, and shall include, at no cost to the Owner, the necessary revisions to other related work required by the Contract Documents. The judgment of the Architect and/or Engineer with respect to the adequacy and acceptability of a proposed substitution shall be final and binding on the Contractor, and shall not be subject to question in any other place. After the expiration of this period, substitutions for material or equipment shall not be proposed or requested in shop drawing and sample submittals, and the Contractor shall be required to execute the work in accordance with the provisions of the Contract Documents.

F. Within six (6) weeks after award of the Contract, the Contractor shall submit a schedule listing all shop drawings and samples with the projected date that each item will be submitted to the Architect and/or Engineer for review.

G. Shop drawings and Requests for Information (RFI's) related to commissioning items shall be copied to the Commissioning Authority.

H. Prior to Final Acceptance, the following data shall be furnished in accordance with the Conditions of the Construction Contract, Division 01 Specifications, and this Division 22 of the Specifications, and shall include, but not be limited to:

1. Record drawings.

2. Operating and maintenance books.

3. Contract or coordination drawings.

1.12 SHOP DRAWINGS

A. The term "shop drawings" shall include layout, detail, and assembly drawings, diagrams, schedules, catalog sheets, printed descriptive matter, and tabular and graphical presentations of operating and performance data that describe work required by the Contract Documents. Catalogs and catalog sheets shall be clearly annotated indicating the specific items being proposed.

B. In addition, during the installation period, submit detailed shop layout drawings for each floor of the project, including all the Mechanical Equipment Rooms, showing equipment and piping work and other distribution services described herein, including locations and sizes of all openings in cellular steel floor decks, walls and floors. Shop drawings with multiple parts shall be submitted as a package. Shop drawings will be 3/8 inch equal to 1 ft. 0 in. scale. Piping shop drawings shall also indicate the point loading and spacing of each hanger and the method of support. Drawings shall include full coordinated plans and sections for Mechanical Equipment Rooms, floor plans and risers. In addition, required detail drawings, such as anchor and guide details, etc., shall be submitted.

C. Shop drawings for Equipment Rooms, and for piping and similar distribution services shall show by dimension the exact size and location of each element of the system in both the horizontal and vertical plane, as well as relationship to the building structure, architectural construction, equipment, and the work of other trades. Where new work is added to an existing structure, the shop drawings shall show the location of all existing services and equipment. Pads, foundations, anchorages, supports and attachments to the building structure where required for the installation of the work shall be shown in layout and detail with sizes, dimensions, materials and

methods of construction noted. The work described in any shop drawing submission shall be carefully checked by this Contractor for all clearances field conditions, maintenance of architectural conditions and proper coordination with all trades on the job.

D. Each submitted shop drawing shall include a certification by the Construction Manager that all related job conditions have been checked and that no conflict exists. No shop drawing submission shall be reviewed without such certification.

1.13 CERTIFICATION

A. Any certifications required by the specifications, in addition to those required for shop drawings, product data, equipment and other items, shall be so certified by the Owner, a Partner, or a Corporate Officer of the firm required to provide the Certification, or by another person duly authorized to sign binding agreements for and in behalf of the Owner, Partner, or Corporation.

1.14 CONTRACTOR'S COORDINATION DRAWINGS

A. Contractor shall furnish in writing, with copies to the Architect and Construction Manager any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. This Contractor and his Subcontractors shall prepare a complete set of construction “Coordination Drawings” indicating the equipment actually purchased and the exact routing and elevations for all lines such as piping, busway, conduit, ductwork, etc., including conduit embedded in concrete. The “Coordination Drawing” preparation and completion shall comply with the requirements of the project construction schedule. The sheet metal drawings, prepared on electronic media (CAD) at a scale not less than 3/8 in. = 1 ft. 0 in., shall serve as the base drawings to which all other Contractors will overlay and add their work. Each trade shall draw their work on separate layers represented by individual colors. Each “Coordination Drawing” shall be completed and signed off by the other Contractors and this Contractor prior to the installation of the work in the area covered by the specific coordination drawing. The Contractors work shall be installed in accordance with the shop drawings and the “Coordination Drawings”. If the Contractor allows one trade to install their work before coordinating with the work of other trades, the Contractor shall make necessary changes to correct the condition without extra cost to the Owner. The Contractor's “Coordination Drawings” indicating piping, conduit, busway, and equipment support points and loads exceeding 200 lb. imposed on the building structure shall be submitted to the Project Structural Engineer for review and approval. The elevation, location, support points, static, dynamic and expansion forces and loads imposed on the structure at support, and anchor points, and the size of all lines shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All work routed underground or embedded in concrete shall be indicated by dimension to column and building lines and shall be coordinated. This requirement for “Coordination Drawings” shall not be construed as authorization for the Contractor or Subcontractor to make any unauthorized changes to the Contract Drawings. Prior to final acceptance of the work of this section, the Contractor shall give the drawing files, in AutoCAD containing the Contractor’s coordination documentation to the Owner.

1.15 ARCHITECT'S AND ENGINEER'S REVIEW

A. The Architect and Engineer shall review shop drawings and samples for conformance with the design concept of the project and the information contained in the Contract Documents. The review of shop drawings and samples shall be only for the convenience of the Owner in following the work and shall not relieve the Contractor of responsibility for deviations from the

requirements of the Contract Documents. The review shall not be construed as a complete or detailed check of the work submitted, nor shall it relieve the Contractor of responsibility for errors of any sort in the shop drawings and samples, or from the necessity of furnishing any work required by the Contract Documents which may have been omitted from the shop drawing submittals. The review of a separate item shall not indicate review of the complete assembly in which it functions. Nothing in the Architect's and/or Engineer's review of shop drawings and samples shall be considered as authorizing a departure from Contract Documents or specifications; additional cost to the Owner; or increased time for completion of the work.

B. Architect's and/or Engineer's review is for general compliance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departing therefrom. The Contractor remains solely responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for coordination with other work, whether new or existing and other trades, for selecting fabrication processes, for techniques of construction and for performing his work in a safe manner.

C. The Architect and/or Engineer shall review shop drawings and samples with reasonable promptness and shall return them to the Contractor stamped to indicate the appropriate action as follows:

1. “NO EXCEPTION TAKEN” means that fabrication, manufacture or construction may proceed, providing the submittal complies with the Contract Documents.

2. “EXCEPTIONS AS NOTED” means that fabrication, manufacture or construction may proceed, providing the submittal complies with the Architect's and/or Engineer's notations and the Contract Documents. A copy of the corrected submittal shall be returned to the Architect and/or Engineer for record. If, for any reason, the Contractor cannot comply with the notations, the Contractor shall resubmit as described for submittals stamped “REVISE AND RESUBMIT”.

3. “REVISE AND RESUBMIT” means that the Contractor must comply with the Architect's and/or Engineer's notations and resubmit before fabrication, manufacture or construction may proceed. Submittals stamped in this manner shall not be permitted on the job site.

4. “REJECTED” means that the submittal does not comply with the Contract Documents and that fabrication, manufacture or construction shall not proceed. Submittals stamped in this manner shall not be permitted on the job site.

D. Each submitted shop drawing shall bear the Contractor's stamped and signed certification that the work has been checked for all related job conditions, for maintenance of architectural conditions, and has been coordinated with the shop drawings of other affected trades for interrelated work, as required for the proper and complete performance of the work. No shop drawing submittal shall be reviewed without this certification.

E. Shop drawings for manufactured material and equipment shall include model numbers, dimension drawings, operating weights, material specifications, operating features and controls, wiring diagrams, performance characteristics, service procedures, including clearance requirements for maintenance work, and conformance to specified codes and code ratings. Note that in addition to these requirements, other specific submittal data, and forms of data submission, are required by the Contract Documents for particular items of equipment and material.

F. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein shall be the minimum standards acceptable. The Engineer shall retain the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require that the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

1.16 MANUFACTURER'S RECOMMENDATIONS

A. With the exceptions as specified and/or indicated on the drawings or in the specifications, the Contractor shall apply, install, connect, erect, use, clean, commission and condition manufactured articles, materials, and equipment per manufacturer's current printed instructions and recommendations. Copies of such printed recommendations shall be kept at the project site and made available as required.

B. Where the manufacturer's recommendations conflict with the Contract Documents, the conflict shall be brought to the Engineer's attention immediately.

1.17 SPACE LIMITATIONS

A. The equipment selections used in the preparation of the Contract Documents shall fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts. Adequate space shall be allowed for clearance in accordance with code requirements, the requirements of the Local Authorities Having Jurisdiction, and the equipment manufacturer's recommendations.

B. In the preparation of drawings, a reasonable effort to accommodate acceptable equipment manufacturer's space requirements has been made; however, since space requirements and equipment arrangement vary according to each manufacturer, the responsibility for initial access, maintenance access, code-required access, and proper fit rests with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to the Architect's and Engineer's review.

D. Coordinate the installation of piping and equipment with lighting fixtures, special ceiling construction, air distribution equipment and the structure. Provide additional risers, drops and offsets as required. If, after installed, new piping or equipment is found to be in conflict with the architecture, structure, or other trade work which is either existing or shown on the Contract Documents, the piping or equipment shall be relocated without additional cost to the Owner.

E. No piping or equipment shall be installed in the eight (8) inch high zone directly above the finished ceiling in Tenant areas to allow for Tenant build-out and flexibility unless otherwise specifically shown on the Drawings or prior written authorization is received from the Engineer.

F. The Contractor shall follow the Drawings in laying out the Work and check drawings of all trades to verify spaces in which Work will be installed. Maintain maximum headroom and, where space conditions appear inadequate, the Architect shall be notified before proceeding with the installation.

1.18 RECORD DRAWINGS

A. The Contractor shall maintain on a daily basis at the project site a complete set of “Record Drawings”. The “Record Drawings” shall consist of a set of blue-line prints and AutoCAD files of

the Contractor Coordination Drawings for this division. The prints shall include the updated AutoCAD files, which shall be periodically electronically updated to show the precise location of all buried or concealed work and equipment, including embedded piping and valves, and all changes and deviations in the mechanical work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without written definite instructions from the Architect or Engineer. Prior to commencing work, the Contractor shall obtain from the Architect or Engineer a set of AutoCAD format Architectural and Engineering Drawings on CD-ROM, to be used only to produce the Contractor's Coordination Drawings. The continuously updated coordination drawings shall be used to produce the final "Record Drawings" which shall be delivered to the Owner in AutoCAD electronic format upon project completion. The Contractor shall give to the Engineer a written release signed by a corporate officer of the Contractor prior to receipt of the Engineer's disks.

B. Dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two (2) dimensions to permanent structures.

C. Upon completion of the work, the Contractor and his Subcontractors shall certify all "Record Drawings" on the front lower right-hand corner adjacent to the above marking with a rubber stamp impression or an AutoCAD image that states the Project name, the Contractor's name, the area covered, and the date.

D. Prior to final acceptance of the work of this division, the Contractor shall submit properly certified "Record Drawings" to the Architect and Engineer for review and shall make changes, corrections, or additions as the Architect and/or Engineer may require to the "Record Drawings". Submit four (4) prints of each version until accepted.

1.19 ELECTRICAL EQUIPMENT AND ELECTRICAL ROOM PRECAUTIONS

A. In general, the Contractor shall not install piping or equipment in any switchboard, switchgear, transformer, elevator equipment, telephone, telecommunications, or electrical equipment rooms unless this piping or equipment serves only these rooms. Installation is strictly prohibited where it violates the requirements of the applicable Electrical Code.

B. No piping or other equipment foreign to the electrical installation shall be installed within the dedicated zone above switchboards, panelboards, distribution boards, and motor control centers to a height of 6 ft. above the equipment or the structural ceiling, whichever is lower. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in such foreign systems.

C. Caution workers both verbally and in writing as to the dangers involved in doing work within or adjacent to electrical equipment within electrical closets on various floors, the Mechanical Rooms and the Switchgear Rooms, Elevator Machine Rooms, due to dangers caused by the presence of high voltages and currents in these spaces.

D. Provide all necessary personal protective equipment meeting OSHA requirements when working in areas within live electrical equipment.

1.20 CUTTING AND PATCHING

A. In general, cutting and patching will be done under other divisions of the specifications.

B. Furnish to the Construction Managernecessary information so that openings for this work can be built into the floors and walls in time. Such cooperation is required to keep cutting of walls and floors to a minimum.

C. Set drains and sleeves for pipes accurately before concrete floors are poured, or set boxes on the forms to leave openings in the floors and subsequently set required sleeves in the openings.

D. Should the Contractor neglect to perform preliminary work, and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

1.21 UTILITY CONNECTIONS

A. Arrange and pay costs for all specified utilities, including the following:

1. Connection to municipal water mains and sewers.

2. Connection to utility company gas mains.

3. Payment of service charges.

4. Provisions for temporary utilities.

5. Connections to electric and other utility points of service interface.

1.22 PROTECTION OF EQUIPMENT AND MATERIALS

A. Protect from damage, water, dust all material and equipment provided under this division, both in storage and installed in accordance with manufacturer’s recommendations until Notice of Completion has been filed and accepted.

B. Arrange with Construction Manager for storage facilities for materials and equipment.

C. All products stored off site and delivered to the site must be kept in factory packing with positioning devices in place until installation. Equipment which is subject to damage from moisture shall be stored indoors in a suitably controlled environment with factory covering in place.

D. Material, equipment or apparatus damaged because of improper storage or protection shall be rejected.

E. Protect equipment from damage due to moisture, water, spray-on fireproofing, and construction debris during construction.

F. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting and conduits with caps to prevent obstruction and damage.

G. Protect the system against freezing in cold weather.

H. Prior to starting equipment, remove all protective materials, shipping bars, retainers, positioning devices.

1.23 CONSTRUCTION REVIEW

A. Work may be reviewed at any time by the Architect or Engineer.

B. Advise the Architect and/or Engineer that work is ready for review at the following times:

1. Prior to backfilling buried work.

2. Prior to concealment of work in walls and above ceilings.

3. Testing of systems and equipment.

4. When all requirements of the Contract have been completed.

1.24 EQUIPMENT NOISE AND VIBRATION

A. Equipment and systems, as defined herein, shall be quiet and free of apparent vibration while in operation.

B. Vibration shall not be apparent to the senses in occupied areas of the building. To this end, both the balancing of rotating machinery and the installation of vibration isolation at various locations are required.

C. It shall be the responsibility of this Contractor to obtain equipment that is quiet in operation as compared to other available equipment of its size, capacity, and type; to install equipment so that a minimum amount of noise and/or vibration is transmitted to the building; and to fabricate the piping systems so that noises generated in the systems are held to an absolute minimum.

D. Any additional precautions deemed necessary to provide a quiet installation shall be done as part of the work of this division, subject to review by the Engineer and without additional cost to the Owner. After the systems are in operation, it shall be the responsibility of the Contractor to make any changes to equipment or work installed that may be required to provide systems which are quiet in operation and comply with the acoustic requirements as specified herein.

E. Except in various special areas listed herein, the system noise level, in occupied spaces, shall be equal to or less than the “lowest value in the range” of the noise criteria curves for the particular space in accordance with the current edition of Applications Volume of the ASHRAE Handbook. The noise criteria curves shall be based on ANSI Standard S1.6-1984 (R-1990) octave bands and a sound pressure level in decibels referenced to 0.002 microbars. Sound levels within the occupied spaces must meet the criteria described above and with all building, wall partition, floor, ceiling plenum depth, and ceiling construction in place as they exist for the individual spaces. The attenuation through boundary construction of Equipment Rooms must be considered in selecting equipment for acceptable noise level as described herein.

F. The system noise level in the Tenant-occupied spaces of the project shall not exceed NC-35 (except as noted hereinbelow). This shall include all areas occupied by the Tenant, including areas directly under piping or any equipment.

G. Areas that shall conform to noise criteria other than NC-35 shall include the following:

1.	Board Room, Auditorium and Conference Rooms	NC-30
2.	Lobby, Toilets, Corridors, General Offices and Cafeteria	NC-40
3.	Laboratory Areas	NC-40

4.	Computer Room, Print Shop and Storage	NC-50
5.	Technology Floors and Kitchens	NC-55

1.25 FINAL REVIEW

A. At a time designated, the entire installation shall be reviewed for compliance with the Contract Drawings and specifications. The Contractor shall be available at all times during this Review.

B. The Contractor shall demonstrate prior to the Final Review that all systems and all equipment have been properly balanced and adjusted and are in compliance with the requirements of the Contract Documents. After these demonstration tests are completed satisfactorily, but prior to the Final Review field visit by the Engineer, the Contractor shall submit to the Engineer a written certification that attests to Contract Document compliance for this Project.

C. Certificates and documents required herein shall be in order and presented to the Architect and Engineer at least two (2) weeks prior to the Final Review.

D. After the Final Review, any changes or corrections noted as necessary for the work to comply with these specifications and the drawings shall be accomplished without delay in order to secure final acceptance of the work.

1.26 WARRANTY PERIOD

A. The warranty period shall be for the period from beneficial use by the Owner, in accordance with the construction schedule.

B. During the warranty period, the Contractor shall guarantee the following in a form satisfactory to the Owner:

1. All work installed will be free from any and all defects in workmanship and/or materials.

2. All apparatus will develop capacities and performance characteristics specified.

3. The systems shall operate without malfunction.

C. The Contractor shall, without cost to the Owner, remedy any defects within a reasonable time to be specified in notice from the Architect. In default thereof, the Owner may have such work done and charge all costs to the Contractor.

D. The start of the Contractor's warranty period, as defined in the General Conditions, shall commence on the issue of a “Certificate of Substantial Completion” by the Owner or the Owner's Representative for each item of material, equipment, or system.

E. The Subcontractor shall confer with the General Contractor prior to the bid date concerning the project schedule and determine if there is a need to operate any items of equipment or systems for temporary heating and/or cooling or other reasons prior to “Substantial Completion”. All required extended warranty costs for equipment, materials, and systems shall be included in the Subcontractor’s bid.

F. Provide complete documentation of all component and system tests prior to Owner acceptance and turnover of components or systems. In addition, the Owner reserves the right to review all test objectives, test plans and test cases, and witness all preoperational tests. Provide the Owner

with a comprehensive schedule detailing the preparation of testing documentation and the conduct of all component or system tests.

G. Warrant that all components, subsystems and systems will perform their specified functions from the date of turnover and commercial operation through the useful life of the system, as determined by the various equipment manufacturers and installing Contractor. In the event components fail for any reason, be responsible to repair/replace said components, and reimburse the Owner for all costs associated with the component, subsystem or system that failed to perform the specified function.

1.27 GUARANTEE

A. Submit a single guarantee stating that all portions of the work are in accordance with Contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one year from date of final acceptance by the Owner; except that where guarantees or warranties for longer terms are specified herein, such longer term shall apply. At no additional cost to Owner, within 24 hours after notification, correct any deficiencies which occur during the guarantee period, all to the satisfaction of the Owner and Architect. Require similar guarantees from his Subcontractors.

B. Guarantee that the materials and workmanship supplied under these specifications will be of the best grade, that the apparatus will be erected in a practical and first class manner, that it will be complete in operation, nothing being omitted in the way of labor and material required to make this so, although not specifically shown or mentioned herein and that it will be delivered in well working order, complete and perfect in every respect without additional cost - whether or not shown in detail on the drawings or described in detail in this specification.

C. Be responsible for all damage to or caused by the work performed under this division for a period of one (1) year from date of the acceptance of work under this Contract. Repair at no cost to Owner all such damage which occurs within 24 hours' notice thereof by the Owner. Damage which occurs prior to the completion of this work shall be repaired at once. Be responsible for any damage and repair thereof and reimburse Owner for all expense incurred thereby. Indemnify the Owner, the Architect, the Consulting Engineers and the Construction Manager against loss, liability, damage or expense, including reasonable attorneys' fees, in connection with any claim resulting from such leaks which may be asserted by tenants or any other third person.

1.28 DELIVERY, STORAGE AND HANDLING

A. Include all delivery, hauling, hoisting, shoring, and placement in the building of equipment and materials specified herein, including any equipment pre-purchased by the Construction Manager for installation by this Contractor. The Contractor shall be responsible for the timely delivery and introduction of equipment to the Project as required by the construction schedule for this Project. If any item of equipment is received prior to the time it is required, the Contractor shall be responsible for its proper storage and protection until such time as it may be required. The Contractor shall pay for all costs of demurrage or storage in a bonded warehouse.

B. If any item of equipment is not delivered to or installed at the project site in a timely manner as required by the project construction schedule, the Contractor shall be solely responsible for disassembly, re-assembly, manufacturer's supervision, shoring, general construction modifications, delays, overtime costs, etc. No additional cost or delays shall be incurred by the Owner.

PART 2 - PRODUCTS

2.1 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB's) or other hazardous materials identified by the Owner.

2.2 GENERAL

A. Refer to specific specification sections for additional equipment and system piping requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall be in accordance with the specification section pertaining to the individual equipment and system piping.

END OF SECTION

SECTION 220100

OPERATION AND MAINTENANCE OF PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all operation and maintenance instructions and manuals for the plumbing systems and equipment as indicated and scheduled on the drawings in accordance with the Construction Documents.

B. Section includes:

1. Operation and maintenance instructions.

2. Operation and maintenance manuals.

3. Recommended spare parts.

4. Service contracts.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. Each product required for the common plumbing work shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fuel Gas Code.

c. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American National Standards Institute (ANSI)

1) Rotodynamic Centrifugal Pumps (ANSI/HI 1.1-1.4)

2) Rotodynamic Vertical Pumps (ANSI/HI 2.1-2.4)

3) Rotary Pumps (ANSI/HI 3.1-3.6)

b. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

1) ASHRAE Guideline 4: Preparation of Operating and Maintenance Documentation for Building Systems.

1.4 SUBMITTALS

A. Submittals shall be furnished in accordance with the requirements of Section 22 00 00 and shall include, but not be limited to the following:

1. Two (2) copies of operation and maintenance manuals covering the complete operation and recommended maintenance procedures and intervals for each system and each piece of equipment provided by this contract as indicated and scheduled on the drawings and in accordance with the Contract Documents before Final Review of the Project. Assemble all data in a completely indexed electronic volume(s) and identify the size, model, and features indicated for each item. The media shall be submitted and subjected to the same approval process as detailed for shop drawings and samples as described hereinbefore, but shall be returned as “Reviewed”.

2. Provide spare parts data listing; source and current price of replacement parts and supplies for each item of equipment.

3. Furnish manufacturer's installation instructions indicating special procedures and installation requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Hard copies of Operation and Maintenance Manuals shall be furnished in three ring binders each with a clearly defined Table of Contents and index tabs.

B. Operation and Maintenance manuals shall include complete lubrication, cleaning, and servicing data compiled in clearly and easily understandable form. Data shall show serial numbers and model numbers of each piece or equipment, complete lists of replacement parts (including part numbers), motor ratings, and actual loads. Manuals shall include information specific to the actual equipment model installed, including all options clearly indicated.

C. {Each manual shall include the following documentation:

1. A document directory identifying each system and all associated equipment.

2. Operating procedures for each system and all associated equipment.

3. Manufacturer’s maintenance procedures supplemented by project specific information.

4. Assembly and disassembly instructions with exploded view drawings where available.

5. Parts lists and a list recommended spare parts recommended for normal service requirements.

6. Project specific wiring diagrams for each piece of equipment.

7. Trouble shooting and diagnostic procedures for each system and all associated equipment.

8. Description of alarm and trouble codes for software-based systems.

9. Performance curves and data.

10. Test reports.

11. Emergency contact information.

12. Identifying name and mark number.

13. Locations of major equipment (where several similar items are used, provide a list).

14. Complete nameplate data.

15. All set points.

PART 3 - EXECUTION

3.1 PREPARATION

A. Submit an outline of the instruction programs and instruction manuals to the Owner or Owner's representative for his approval at least two (2) weeks prior to the proposed start date of the instruction sessions.

3.2 INSTRUCTION OF OPERATING PERSONNEL

A. :

B. The instruction sessions shall be scheduled at time(s) convenient to the Owner's personnel. Instruction shall cover all equipment and systems provided under this section. Instruction shall be comprised of both classroom-type and actual hands-on operating experience.

END OF SECTION

SECTION 220500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Contractor and his Subcontractors shall provide all labor, materials, tools, scaffolding, machinery, equipment, appliances, and services necessary to complete the plumbing work under this Contract. All systems and equipment shall be complete in every respect and all items of material, equipment and labor shall be furnished and installed for a fully operational system. This Contractor shall coordinate his work with the work of the other trades so as to resolve conflicts without impeding job progress or the project construction schedule. Provide notice with the bid proposal of any concrete work required by this division that is not indicated on the Structural or Architectural Drawings or Drawings of other trades.

B. This Contractor shall examine all Contract Documents for all divisions of the specifications in order to determine the extent of work required to be completed under this division. Failure to examine all the Contract Documents for this project will not relieve this Contractor of the responsibility to perform all the work required for a complete, fully operational and satisfactory installation.

C. Provide all miscellaneous common plumbing products required for a complete plumbing installation as indicated, in accordance with the requirements of the Contract Documents.

D. Section includes:

1. Sleeves.

2. Mechanical sleeve seals.

3. Access doors.

4. Formed steel channel.

5. Escutcheons.

6. Protective pans.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. Each product required for the common plumbing work shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

    a. New York City Building Code.

    b. New York City Fuel Gas Code.

    c. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

    a. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

    b. ISO 9000:2001: Quality Management.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Product cut sheets and schedule of sleeves and mechanical sleeve seals used for the project. The schedule shall include the material, diameter, length, number of links, location and service the sleeve and sleeve seal will be provided.

2. Product cut sheets and schedule of access doors used for the project. The schedule shall include the material, size, finish type, location and purpose of installation the access door will be provided.

3. Product cut sheets of formed steel channel.

4. Product cut sheets of escutcheons. The cut sheets shall indicate the size, finish and location, which the escutcheons will be installed.

B. Product Data: Submit manufacturer's literature including general assembly.

C. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for each product and system for which they are installed.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All materials and equipment shall be fabricated by companies, whose primary business expertise is the manufacturing of commercial and industrial products of the type specified herein. The manufacturer shall have been in continuous operation in the manufacture of the products specified for a minimum of ten (10) years.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all materials of any type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

1.6 WORK INCLUDED

A. The work includes, but is not limited to, the following systems, equipment and services:

1. Plumbing fixtures and their supports.

2. Domestic hot and cold water supply piping.

3. Electric water coolers.

4. Drinking water fountains.

5. Sanitary waste piping.

6. Vent piping.

7. Electric domestic hot water heaters.

8. Provide all miscellaneous supports for Division 22 work and equipment.

9. Furnishing of shop drawings, product data and samples.

10. Furnishing of “Record Drawings”.

11. Furnishing of Contractor “Coordination Drawings”.

12. Furnishing of operating and maintenance books.

13. Miscellaneous items as required for complete and functioning systems as specified herein.

14. All systems, equipment, and services specified herein shall be furnished and installed complete and ready for use.

15. Provide all sleeves for the Plumbing work complete with seals and firestop as specified herein and as required by the Authority Having Jurisdiction.

16. Provide insulation for freeze protection, over the cable wrap type heat tracing provided by Division 26.

17. Patching or replacement of all fireproofing if it is damaged or removed during the installation of the Division 22 work.

18. Participate in and assist in the operation of the fire safety ventilation equipment as required during the performance testing and startup of the Division 28 fire detection,

alarm and communication systems. Refer to Division 28 - Fire Detection, Alarm and Communication System for additional requirements.

19. Participate in and provide equipment, materials, and labor as required to construct at the project site a complete mechanical, plumbing, and fire protection “mock up”, in or out of sequence, of one (1) typical floor and the associated Air Handling Unit Room. Refer to Division 01 for details and construction requirements. The field “mock up” shall remain in place for use in the completed building systems. The “mock up” shall be reviewed and shall serve as a model for the mechanical and plumbing installation and other similar typical floors.

20. Participate in and provide equipment, materials, and labor as required to construct at the project site a complete mechanical and plumbing Toilet Room “mock up”, in or out of sequence. The field “mock up” shall remain in place for use in the completed building systems. The “mock up” shall be reviewed and shall serve as a model for the mechanical and plumbing installation and other similar typical floor Toilet Rooms.

21. Instruments as required for operating and testing the various systems shall be furnished and installed complete as specified herein.

22. Hydrostatic testing, operational testing and adjusting of all systems.

23. Complete flushing and chemical treatment and initial water treatment for all water systems.

24. Complete all tests required by all rules, regulations, etc., of all Authorities Having Jurisdiction and prepare, complete and file all forms, tabulations, plans, etc., pertinent thereto with the referenced authorities, and accomplish such work with personnel of proper caliber, in particular, Professional Engineers, where so required.

25. Participate in and provide all labor as required for “off-hour” testing of equipment and systems if required by job conditions or by Authorities Having Jurisdiction and as required to obtain the “Temporary Certificates of Occupancy (TCO).”

26. Participate in and provide all labor as required for system commissioning including any time required for a detailed review of the commissioning process as requested by the Engineer or the Owner.

1.7 WORK OF OTHER DIVISIONS

A. Electrical connections for motors and mounting of loose motors.

B. Individual motor controllers except motor controllers furnished as integral parts of pieces of equipment.

C. Pits for sewage ejectors, sumps and pumps. However, this Contractor shall be responsible for correct dimensions, layout, coordination, etc.

D. All concrete work indicated on the Structural, Architectural, and Mechanical/Electrical Drawings.

E. Concrete equipment pads, concrete thrust blocks, and concrete fill for equipment and inertia bases. However, this Contractor shall be responsible for providing the Construction Managerwith the correct dimensions, layout, etc., for all equipment.

F. Metal architectural louvers.

G. Painting, except touch up painting and as otherwise specified herein.

H. Installing access doors in general construction.

I. Domestic water and combination domestic/fire reserve tank supporting structure.

J. Standby power generator.

K. Wiring for automatic controls and interlocks.

L. Subsurface and landscape drainage.

M. Utility mains and piping 5 feet beyond the foundation walls unless shown otherwise on the drawings.

1.8 VERIFYING EXISTING CONDITIONS

A. Before commencing work, examine all adjoining work on which this work is in any way dependent for perfect workmanship according to the intent of this specification, and report to the Construction Manager any condition, which prevents performance of first-class work. No “waiver of responsibility” for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

B. Become thoroughly familiar with actual existing conditions at the building of the present installations to which connections must be made or which must be changed or altered. The intent of the work is shown on the drawings and described hereinafter, and no consideration shall be granted by reason of lack of familiarity on the part of the Contractor with actual physical conditions at the site. Inspect each and every area affected by the total alteration of the building before submitting bid.

1.9 SUBCONTRACTS

A. Where Contract Documents require manufacturers' services, and wherever the staff of this Contractor performing the work of this section cannot adequately perform such services, this Contractor shall stipulate such performance in its contracts with its Subcontractors or Sub-Subcontractors, vendors, manufacturers, and the like, or else subsequently pay them any additional fees required therefor.

1.10 FACTORY TESTING

A. All mechanical sleeve seals and access doors shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

1.11 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and *Section 22 00 00*.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer’s installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

1.12 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Warranty period shall commence upon final acceptance by the Owner.

C. Furnish a one (1) year manufacturer's warranty for each mechanical sleeve seal and access door.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Access Doors

1. Karp Associates, Inc.
2. Milcor.
3. Williams Brothers Corp.

D. Escutcheons

1. Chicago Specialty.
2. Producers Specialty.
3. Sanitary-Dash.

E. Formed Steel Channel

1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Unistrut Corp.

F. Mechanical Sleeve Seals

1. Calpico, Inc.
2. Metraflex Co.
3. Pipeline Seal & Insulator Inc. (Link-Seal).

G. Sleeves

1. Calpico, Inc.
2. Metraflex Co.
3. Pipeline Seal & Insulator Inc. (Link-Seal).

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 SLEEVES

A. Furnish sleeves for all pipes passing through floors, walls and concrete, or concrete fireproofed beams.

B. Sleeves in concrete beams, through concrete walls, and exposed pipes penetrating floors: Schedule 40 steel pipe.

C. Provide sleeves in foundation walls and in concrete pits with anchor flange.

D. Sleeves within furred-out enclosures in floors, through partitions, steel beams and walls: 18 gauge (1.2 mm) thick galvanized steel.

2.4 MECHANICAL SLEEVE SEALS

A. Provide modular, mechanical type sleeve seals for all piping passing through waterproof concrete foundation walls, pit walls and similar construction, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between the pipe and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

B. Where mechanical sleeve seals are required but cannot be provided due to space limitations, caulk the annular space with lead and oakum.

2.5 ACCESS DOORS

A. Provide access doors as required for all concealed valves, cleanouts and other elements requiring access above ceilings or behind walls or as indicated on the drawings. The installation of all

doors will be performed under the work of another section. Coordinate the work and assume responsibility for the accessibility of all valves.

B. Provide access doors factory made, completely flush, heavy metal access doors as manufactured by Karp Associates, Inc.

C. Frames shall be a 14 gauge steel, welded with mitered corners ground smooth, anchors.

D. Doors shall be 14 gauge steel, heavy hinges flush with frame, invisible when closed, wing-type airplane catches; no bolts, screws, nuts or other loose devices required for opening of door.

E. All access doors and frames shall be given a prime coat of corrosion-resistant paint at the factory.

F. Furnish the following access doors as manufactured by Karp Associates, Inc.

1. In plaster ceilings, KARP DSC 210-PL.

2. In 3-hour masonry enclosures (pipe or duct shafts), KARP DSC-211-FRT with 1-1/2 inch vermiculite plaster fill. Metal lath lining for plaster shall be self-furring type, tack-welded to pan.

3. In non-rated masonry, KARP DSC-211.

4. In drywall construction, KARP DSC-214M.

2.6 FORMED STEEL CHANNEL

A. Provide formed steel channel as required to sufficiently support piping and equipment in accordance with the Contract Documents.

B. Formed steel channel shall be galvanized 12 gauge (2.8 mm) thick steel, with holes 1-1/2 inches (38 mm) on center.

2.7 ESCUTCHEONS

A. Provide escutcheons as required to sufficiently enclose penetrations in fire and smoke rated walls and partitions in accordance with the Contract Documents.

B. Where pipes penetrate fire or smoke rated walls provide metal escutcheons on both sides of the wall penetration.

C. Escutcheons shall be either one-piece or two-piece construction, chrome-plated brass or stainless steel.

2.8 PROTECTIVE PANS

A. Provide protective pans under individual or rack of pipes passing over critical equipment, high voltage (440V) electrical bus duct, switchgear or starting equipment.

B. Protective pans shall be *12 gauge black iron* with a 6 inch lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-Oleum paint and support with pipe hangers, and drain clear of the equipment below.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and returned to the manufacturer for replacement.

3.2 INSTALLATION

A. Installation shall be in accordance with the specification section pertaining to the individual equipment.

B. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the drawings shall be followed as closely as possible, but the right is reserved by the Architect to change locations and elevations to accommodate conditions which may arise during the progress of the work, prior to installation, without additional compensation for such changes. The responsibility for accurately laying out the work and coordinating the installation with other trades rests with this Contractor. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

C. Carry fixture connections, concealed in building construction, to points above floor, break out close to the underside or adjacent to fixture and continue exposed to fixture.

D. Piping Installation

1. Install pipes approximately as shown on the drawings and as directed during installation, as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and neatly spaced. Erect pipe risers plumb and true, and parallel with walls and other pipes and neatly spaced.

2. Keep all horizontal runs of piping, except where concealed in partitions, as high as possible and close to walls. Maintain minimum 1/8 inch fall per foot on all soil, waste and leader lines.

3. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

4. Ream all pipe smooth before installation. Do not bend, flatten, split or otherwise injure pipe.

5. Use reducing fittings, unless otherwise approved in special cases, in making reduction in size of pipe. Bushings shall not be allowed unless specifically approved.

6. Where chrome-plated piping is installed, cut and thread pipe so that no unplated pipe threads are visible when the work is completed.

7. Do not install exterior piping in water or when trench or weather conditions are unsuitable for the work, as decided by the Architect.

E. Sleeves

1. Set sleeves in position in forms. Provide reinforcing around sleeves.

2. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

3. Extend sleeves through floors *1 in. (25 mm)* above finished floor level. Caulk sleeves tight.

4. Where piping penetrates floor, ceiling or wall, close off space between pipe and adjacent work with firestopping and caulk airtight. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.

5. Sleeves passing through fire-rated floors or walls shall be sealed with an intumescent formulation similar to Metraflex Metraseal 120 FireSeal or approved.

6. Sleeves passing through foundation walls or pit walls shall be sealed utilizing a mechanical seal similar to Link-Seal or approved.

7. Install *chrome-plated steel*escutcheons at finished surfaces.

8. Set sleeves as construction progresses and secure in place during pouring of concrete.

9. Fire stopping shall be installed as specified under Section 07 84 00.

F. Mechanical Sleeve Seals

1. Mechanical sleeve seal installation shall be in accordance with the manufacturer's recommendations and as indicated on the drawings.

2. Install mechanical sleeve seals at all exterior water tight entries, foundation walls and pit walls.

G. Access Doors

1. Size access doors as required for the equipment being accessed, however access doors shall not be smaller than 16 inches by 16 inches. Install all valves to fit within the limit of the following size access doors; where two (2) or less valves are located with their bonnets within 12 inches of the face of the door and all portions of the valves are within the area defined by the opening in the door, 16 inch x 16 inch doors may be used. Where more than two (2) valves are served by a door and the bonnets are within 12 inches of the face of the door, the size of the door shall be increased so that all portions of the valves are within the area defined by the opening in the door. Where the bonnets of the valves are more than 12 inches from the face of the door, the doors shall be minimum of 20 inch x 20 inch clear opening.

2. Furnish buttons or tabs to Ceiling Contractor for setting, as approved by Architect, to indicate location of valves, cleanouts or other equipment located above removable-type ceilings where access doors are not furnished.

H. Protective Pans

1. Install protective pans within 6 inches of the underside of piping or equipment.

2. Pans shall be sized a minimum 2 inches greater in each dimension around the piping and equipment, which it's being supported under.

3. Protective pans shall be supported by hangers and supports sized sufficient to carry the weight of the pan filled with water. All hangers and supports shall be attached to the structure. Hanging protective pans from the equipment or piping above shall not be acceptable.

4. Make drain connections to the side or bottom of pan by welding or brazing and drain clear of the equipment, which the pan is protecting.

5. Perform a standing water test on the pan by filling with water to within 1 inch of the top of the lip and let stand for 30 minutes with no leakage.

I. Escutcheons

1. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings, and pipe sleeve extensions, if any. Furnish pipe escutcheons with chrome finish for occupied areas, prime paint finish for unoccupied areas.

2. Escutcheons for waterproof floors, and areas where water and condensation can be expected to accumulate shall be stainless steel or chrome plated cast brass, solid or split hinged.

3. Escutcheons for dry areas shall be chrome plated cast brass or galvanized sheet steel, solid or split hinged.

3.3 CLEANING

A. Before final connections are made and before operation of equipment and piping, thoroughly blow out, rod out, or wash out all piping at least twice, in a manner as directed and/or approved by the Architect, to remove all accumulation of dirt, chips or other deleterious material. Make all temporary connections and furnish all appliances required for the purpose of cleaning at no extra expense to the Owner.

B. Clean up all equipment and leave in condition for finish painting before acceptance.

C. Disinfect underground water mains after installation and test in accordance with AWWA Standard C-601 and requirements of the local Authorities Having Jurisdiction.

D. Disinfect interior potable water distribution system in accordance with requirements of the local Authorities Having Jurisdiction. Provide the following procedure where no prescribed method exists:

1. After the system is flushed, fill with either 50 ppm chlorine-water solution and let stand for 24 hours, or 200 ppm chlorine-water solution and let stand for 3 hours.

2. Flush system with clean potable water until no excess chlorine remains in system.

3. Repeat procedure if contamination persists after further test.

E. All pipe, fittings, valves, etc., used in the nitrogen, hydrogen, helium, oxygen, nitrous oxide and medical compressed air systems shall be factory cleaned for oxygen service and capped or sealed

in plastic and marked "For Oxygen Service". Pipe, fittings, etc., not expressly cleaned by the manufacturer shall be thoroughly cleaned of oil, grease and other contaminants as follows:

1. Wash pieces in a hot solution of sodium carbonate or trisodium phosphate mixed in the proportion of one pound to three gallons of water. Scrub and continuously agitate the part during washing. After washing, rinse thoroughly in clean hot water. Dry parts in clean nitrogen wash, bag and seal in unused plastic bags.

2. Exercise great care in the storage and handling of clean materials and the condition of tools used in cutting and reaming to prevent introduction of oil, grease and other contaminants. All contaminated material shall be recleaned.

3.4 PROTECTIVE PAINTING

A. Painting, except as specified herein or indicated otherwise, shall be done under another division. This division shall cooperate with the other divisions to determine the size of equipment, sizes and lengths of pipes, etc., to be painted.

B. Equipment and materials furnished under this section shall be factory-finished as specified. If the factory finish is damaged during shipment, storage, installation, etc., it shall be repainted by this Contractor subject to the Engineer's approval. Touch-up painting is acceptable only for minor finish damage.

C. Paint products for identification of plumbing systems shall be exterior grade, alkyd-based products.

D. Repair damaged and marred factory-painted finishes with materials and procedures to match original factory finish.

3.5 FIELD TESTS

A. Test all systems in full accordance with applicable Underwriters' and Municipal requirements.

B. Notify the Architects and Inspectors Having Jurisdiction at least 48 hours in advance of performing the required tests, so that arrangements may be made for their presence to witness the tests.

C. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architects, plumbing and other inspectors of the city, applicable Insurance Association and Public Utilities Inspectors Having Jurisdiction.

D. Repair or, if required by the Architects, replace defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Test the systems before any paint or insulation is applied.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

H. Test all fixtures for soundness, stability of support and satisfactory operation.

I. Performance Tests

1. Gravity Drainage Systems: Subject the sanitary and storm drains, waste, and vent piping inside the building to a standing water test. The standing water test shall include the entire system from the lowest to the highest point of the system. The system shall be tested to a hydrostatic pressure equivalent to at least a ten foot head of water. After filling, shut off water supply and allow it to stand two (2) consecutive hours, with no leakage.

2. Pressure Systems

a. Prior to applying the pressure test, the system shall be tested to 50 psig with compressed air or dry nitrogen for a period of ten minutes with no loss in pressure.

b. All interior water distribution systems, compressed air systems, vacuum systems, helium, hydrogen, oxygen, nitrogen, medical and specialty gas systems shall be tested to a pressure not less than 150 psig or 50 psig above the normal operating pressure, whichever is greater. Apply the test for a minimum of two (2) consecutive hours with no loss in pressure.

3. Gas Piping

a. Test the gas piping low pressure distribution system (< 1/2 psi) with a non-mercury gauge at a pressure of 3 psig for a minimum of 30 minutes with no drop in pressure.

b. Test the gas piping distribution system over 1/2 psi but less than 3 psi at a pressure of 50 psig for a minimum of 30 minutes with no loss in pressure.

c. Test the gas piping distribution system over 3 psi but less than 15 psi to a pressure of 100 psig for a minimum of 60 minutes with no loss in pressure.

d. Test the gas piping distribution system over 15 psi to a pressure equal to twice the operating pressure but not less than 100 psig for a minimum of 60 minutes with no loss in pressure.

J. Final Acceptance

1. Prior to final acceptance the Contractor shall submit all performance test reports for each test performed. The reports shall be bound in a three ring binder and submitted to the Architect, Engineer and Owner for review.

2. Final acceptance testing shall comply with the project construction schedule and shall be sufficiently in advance of the Contract completion date to permit the execution of the testing by the Contractor prior to occupancy and the close-out of the Contract.

3. Any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper and satisfactory functioning of all equipment and systems shall be completed prior to the close-out of the Contract. Re-tests shall not relieve the Contractor of completion date responsibility.

END OF SECTION

SECTION 220523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all valves required for equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Alarm devices.

2. Backflow preventer and vacuum breakers.

3. Ball valves.

4. Check valves.

5. Circuit balancing valves.

6. Plug valves.

7. Valve schedule.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. Each valve and all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fuel Gas Code.

c. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American Society of Mechanical Engineers (ASME)

1) ASME/ANSI B16.5: Pipe Flanges and Fittings.

2) ASME B16.34: Valves Flanged Threaded and Welding End.

3) ASME PTC 25: Pressure Relief Devices.

b. American Water Works Association (AWWA)

1) AWWA C500: Standard for Metal Seated Gate Valves for Water Supply Service.

2) AWWA C504: Standard for Rubber Seated Butterfly Valves.

3) AWWA C508: Standard for Swing Check Valves for Waterworks Service.

4) AWWA C510: Standard for Double Check Valve Backflow Prevention Assembly.

5) AWWA C511: Standard for Reduced Pressure Principle Backflow Prevention Assembly.

c. ASTM Society for Testing and Materials (ASTM)

1) ASTM F1508: Standard Specification for Angle Style, Pressure Relief Valves for Steam, Gas and Liquid.

d. Manufacturers Standardization Society (MSS)

1) MSS SP-6: Standard Finishes for Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2) MSS SP-25: Standard Marking System for Valves, Fittings, Flanges and Unions.

3) MSS SP-53: Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components.

4) MSS SP-55: Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components.

5) MSS SP-61: Pressure Testing Steel of Valves.

6) MSS SP-67: Butterfly Valves.

7) MSS SP-68: High Pressure Offset Seat Butterfly Valves.

8) MSS SP-70: Cast Iron Gate Valves, Flanged and Threaded Ends.

9) MSS SP-71: Cast Iron Swing Check Valves, Flanged and Threaded Ends.

10) MSS SP-72: Ball Valves with Flanged or Butt-welding Ends for General Service.

11) MSS SP-78: Cast Iron Plug Valves, Flanged and Threaded Ends.

12) MSS SP-80: Bronze Gate, Globe, Angle and Check Valves.

13) MSS SP-82: Valve Pressure Testing Methods.

14) MSS SP-85: Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

15) MSS SP-110: Ball Valves - Threaded, Socket-welding, Solder Joint, Grooved and Flared Ends.

e. National Sanitation Foundation International (NSF)

1) NSF/ANSI Standard 61: Drinking Water System Components.

f. United States Environmental Protection Agency (USEPA)

1) Safe Drinking Water Act (SDWA).

2) Reduction of Lead in Drinking Water Act (Federal Public Law 111-380).

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of valves, complete with typical mill reports.

B. Product Data: Submit manufacturer's literature including general assembly, including but not limited to the following:

1. Dimension and specification sheets.

2. Model number.

3. Pressure rating.

4. Working pressure.

5. List of materials.

6. Manufacturer's installation instructions.

C. Schedule of Valves: Submit a single well-organized schedule for all valves indicating the following:

1. Valve type/model number.

2. System type.

3. Location/floor.

4. Pressure rating.

5. Pipe size.

6. Connection method.

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer's Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All valves shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. The valve manufacturer shall provide documentation that all valves have been factory tested and performs to the performance and pressure ratings specified.

2. All valves shall be factory tested in accordance with the latest applicable standards.

3. All valves provided by this Contractor for use by Division 21 shall be FM Approved, UL Listed and approved for use in fire suppression systems.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

D. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves and weld ends.

3. Set angle, gate and globe valves closed to prevent rattling.

4. Set ball valves open to minimize exposure of functional surfaces.

5. Set butterfly valves closed or slightly open.

6. Block check valves in either closed or open position.

E. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

3. Use sling to handle large valves and rig sling to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

1.8 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a five (5) year manufacturer's warranty for all manual valves and relief valves.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Ball Valves

1. Apollo.
2. Crane.
3. Hammond.

4. Jamesbury.
5. Milwaukee.
6. NIBCO.
7. Stockham.
8. Watts.

D. Check Valves

1. Crane.
2. Hammond (I.B. Series only).
3. Flomatic Corporation.
4. Kennedy.
5. Mueller Steam Specialty.
6. Nibco.
7. Val-Matic Valve & Manufacturing Corp.
8. Walworth.

E. Circuit Balancing Valves

1. Armstrong.
2. Bell & Gossett.
3. Nibco.

F. Globe Valves

1. Crane.
2. Hammond.
3. Milwaukee.
4. Nibco.
5. Stockham.
6. Walworth.

G. Hose Bibbs

1. J. R. Smith.
2. Woodford Mfg.
3. Zurn Ind.

H. Plug Valves

1. Clow Valve Co.
2. Flowserve-Nordstrom.
3. Nibco.
4. Walworth.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. Shut-off valves, isolation valves, pressure-reducing valves and check valves shall be provided as indicated on the Construction Documents or as required by the Authorities Having Jurisdiction on the drawings, required or directed.

E. Air release valves shall be provided at the high points of all domestic hot water systems and where trapped sections of horizontal piping exist in the field due to Contractor coordination.

F. Pressure-relief valves shall be provided on each hot water pressure vessel, heat exchanger or pump discharge as specified herein. Temperature and pressure ratings for pressure-relief valves shall be appropriate for the system in which they are installed and in accordance with the requirements of the Authority Having Jurisdiction.

G. Direct acting pressure-relief valves shall be provided on pilot controls for all automatic control valves.

H. Valve pressure ratings shall not be less than indicated and as required for system pressures.

I. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

J. Valves used in potable water systems and valves supplying water for potable use shall be compliant with the Reduction of Lead in Drinking Water Act (Federal Public Law 111-380) limiting the lead content of the wetted surfaces to a weighted average of 0.25% or less.

K. Valves bodies shall be identified as lead-free by a symbol or letters “LF” casted into the body. Valve handles shall be distinctively identified by white handles with blue graphics.

L. The use of NRS gate valves and butterfly valves shall be limited to shutoff services only and only where specifically permitted by the Engineer.

M. Unless otherwise noted, all valves for shutoff and bypass service shall be ball valves, 3 in. (75 mm) and below, and gate or butterfly valves, 4 in. (100 mm) and above.

N. All end connections shall be the same as are used for fittings for 3 in. (75 mm) and below. 4 in. (100 mm) and above, valves shall be flanged.

O. Valve-End Connections

1. Flanges on iron valves shall meet ASME B16.1.

2. Flanges on steel valves shall meet ASME B16.5.

3. Flanges on bronze and/or brass valves shall meet ASME B16.24.

4. Threaded ends shall meet ASME B1.20.1.

5. Soldered lines double union ends with solder joints ASME B16.18.

P. Valve Operators

1. Provide gear operators on quarter-turn valves 5 in. (125 mm) and larger.

2. Provide lever handles on quarter-turn valves, (except plug valves) 4 in. (100 mm) and smaller.

3. Handwheels shall be provided on valves other than quarter-turn types.

4. Provide wrenches for plug valves 4 in. (100 mm) and smaller. Furnish one (1) wrench for every five (5) plug valves for each size plug-valve head.

5. Chain wheels shall be provided for attachment to valve handwheels, stems, or other operators on all valves installed more than 7 feet 0 in. (2.1 m) above floors and/or working platforms.

Q. Valves in insulated piping shall be provide with 2 in. (50 mm) stem extensions having the following features:

1. Extended operating handle of non-thermal-conductive material.

2. Extended differential measuring ports.

3. Protective sleeve that allow operation of valve and access to the measuring ports without breaking the vapor seal or disturbing insulation.

4. Memory stops that are fully adjustable after insulation is applied.

2.3 BACKFLOW PREVENTER AND VACUUM BREAKERS

A. Backflow preventers and vacuum breakers shall be provided as required by the local Authority Having Jurisdiction.

B. Atmospheric Vacuum Breakers

1. Atmospheric vacuum breakers must assure positive protection against back-siphonage in the event that pressure loss causes vacuum conditions. Poppets are to be Selcon plastic. Vacuum breakers are to be rough brass unless otherwise noted.

2. Atmospheric vacuum breakers shall be used as protection against cross-connections where the vacuum breaker is not subjected to back pressures due to pumps or gravity (open end service) and must be installed on the discharge side of last shutoff and be of non-spilling type. Install at a minimum of 6 in. (152.4 mm) above the highest overflow level, with the air inlet in a level position and a check valve in line after vacuum breaker. No valves shall be installed after vacuum breaker. They shall be rated to 150 psi (10.3

bar) working pressure and shall withstand water temperature to 110°F (43.3°C). Atmospheric vacuum breakers shall be Watts Model No. LF288A or Apollo Model No. AVB1LF.

C. Pressure Vacuum Breakers

1. Pressure vacuum breakers must be installed where subject to continuous pressure 12 in. (305 mm) above the highest outlet they are protecting. Install accessibly for periodic testing, and unit shall not become inoperative if subject to long periods under pressure. The vacuum breaker shall render positive protection against back-siphonage and incorporate a check valve and a vacuum relief with inlet and discharge shutoffs and field-testing cocks in one assembly. In sizes above 2 in. (50.8 mm), two check valves are required.

2. All valves, check valves, nipples and other fittings shall be all-bronze construction. Units 6 in. (152.4 mm) and larger must be internally epoxy coated. Vacuum breakers shall be rated to 150 psi (10.3 bar) working pressure and shall withstand water temperatures to 180°F (82.2°C) for units up to 2 in. (50.8 mm) and to 140°F (60°C) for units 3 in. to 10 in. (76.2 mm to 254 mm). The vacuum relief valve must have a spring-loaded member to assure positive opening of air inlet when back-siphonage occurs. Pressure vacuum breakers shall be Watts Model No. LF800M4QT (1/2 in. to 2 in.) (12.7 mm to 50.8 mm).

D. Double Check Valve Assembly

1. Backflow preventer, 3/4 in. (19 mm) through 4 in. (100 mm) shall consist of two (2) bronze independently operated internally spring-loaded check valves, two brass gate valves and four test cocks for field testing. Check valves must be loaded to withstand 1 psi (0.07 bar) in direction of flow. All internal parts must be readily accessible for maintenance without removing device from line, must be installed in a horizontal position and be accessible for periodic testing. Units 5 in. to 10 in. (127 mm to 254 mm) shall be of similar construction, but have “Y” type check valves and be of internally epoxy coated cast iron construction.

2. Assembly shall be Watts Model No. LF709 rated to 150 psi (10.3 bar) minimum working pressure and shall withstand water temperatures to 140°F (60°C), or as approved. Unit shall be shipped completely assembled and all valves, check valves, nipples and other fittings.

E. Reduced Pressure Backflow Preventer

1. Unit shall prevent contamination of water lines due to pressure reversal. This shall be accomplished by automatically reducing the pressure through the unit by means of the “reduced pressure principle”. Unit shall consist of two (2) “Y” pattern spring-loaded check valves, a differential pressure-relief valve having two diaphragms separated by a spacer, two shutoff valves, and test cocks for field testing. Under normal flow conditions, both check valves shall be open and the differential relief valve shall remain closed. Under backflow conditions and when one of the check valves leaks, the differential relief valve shall open and discharge to atmosphere to maintain the zone at 2.0 psi (0.15 bar) lower than inlet pressure.

2. Device shall automatically reduce the pressure in the zone” between the check valves. Should the pressure differential, normally 9 psi (0.63 bar), drop to 2.0 psi (0.15 bar), the relief valve shall open, discharge the liquid to floor or funnel drain and maintain the

proper differential. A small hole in the spacer shall bleed to atmosphere if either diaphragm is damaged, giving visual evidence or diaphragm failure. Both check valves and relief valve shall be constructed so they may be serviced without removing device from the line. Unit shall be rated to 175 psi (12 bar) working pressure at 180°F (82.2°C) water temperature. Backflow preventers 2 in. (50 mm) and smaller, Watts Model No. LF709, shall have bronze bodies and trim. 2-1/2 in. (63.5 mm) and larger shall have cast iron bodies with epoxy coating and bronze trim, Watts Model No. LF709.

F. Hose Connected Vacuum Breakers

1. Hose connected vacuum breakers must assure against back-siphonage by relieving water under pressure when hose end is closed off.

2. Unit shall be vandalproof, all brass construction, finished to match existing piping with female inlet and hose-end outlet connection. Hose connected vacuum breakers shall be Watts Model No. 8A or Apollo Model No. HBVAF2.

G. Pipeline Air Gaps

1. Pipeline air gaps must assure against back-siphonage by overflowing. Units shall be installed in water makeup lines to vessels under atmospheric pressure only. Air gap of unit must be at least twice the pipe diameter of the pipe in which it is installed.

2. Pipe material and finish of unit shall match piping system in which it is installed. Unit shall be as approved.

2.4 BALL VALVES

A. Ball valves shall be all brass or bronze construction with replaceable Teflon seat ring, two-piece union or three-piece bolted design as scheduled herein.

B. Threaded valves used in brazed or soldered piping systems shall be fitted with adapters. When brazing, three-piece design shall be used and reinforced Teflon seats must be removed prior to brazing.

C. Ball valves shall be two-piece type with adjustable stem packing using a threaded packing nut. Valves shall provide positive shutoff.

D. Drain Valves (at Riser Heels and Low Points): Ball valves to be used as drain valves at all low points in water piping. Provide a 3/4 in. (19 mm) ball valve with male threaded nipple for hose connection with 3/4 in. (19 mm) hose cap to protect hose threads and chain

E. Bronze ball valves shall be constructed as follows:

Body	Brass or bronze
Body Style	Two-piece or three-piece full port
Trim	316 stainless steel ball and stem
Seat	Reinforced Teflon (RTFE)
Body P/T Rating	600 psig (41.7 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	300 psig (20.7 bar) minimum

F. Steel ball valves shall be constructed as follows:

Body	Cast steel
Body Style	Two-piece full port
Trim	316 stainless steel ball and stem
Seat	Reinforced Teflon (RTFE)
Body P/T Rating	600 psig (41.7 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	*{300 (20.7 bar*psig minimum

2.5 BUTTERFLY VALVES

A. Resilient Seated and High Performance Butterfly valves shall be full lug type suitable for bidirectional dead-end service at rated pressure without use of downstream flange. Conforming to ANSI Class 150 or Class flange drilling as scheduled herein.

B. Stem seal shall not rely on compression between seating material and disc, but shall be accomplished by EPDM O-ring seals and have threaded upper and lower collar bushings to provide blowout proof stems and low torque operation.

C. Disc shall not be attached to stem by fasteners or locknuts. Molded-in seat material shall be EPDM and designed to prevent dislocation during closure; seating material must simultaneously act as flange gasket.

D. Valve must be factory tested and certified to seat bubble tight.

E. Gear operators shall be used on all butterfly valves provided for the Division 21 Contractor.

F. Butterfly valves provided for Division 21 shall be suitable for indoor/outdoor use, equipped with two (2) factory-mounted internal supervisory switches.

G. Resilient seated butterfly valves shall be constructed as follows:

Body	Ductile iron
Body Style	Tapped full lug or grooved
Trim	316 stainless steel stem
Disc	Aluminum bronze, bronze or stainless steel
Seat	EPDM
Body P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum
Seat P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum

H. ANSI Class 150 and Class 300 high performance butterfly valves shall be full lug type suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

I. High Performance ANSI Class 150 butterfly valves shall be constructed as follows:

Body	Cast steel
Body Style	Tapped full lug
Trim	316 stainless steel stem
Disc	Aluminum bronze, bronze or stainless steel
Seat	PTFE
Body P/T Rating	285 psig (19.6 bar) at 100°F (38°C) minimum

Seat P/T Rating	200 psig (13.5 bar) at 100°F (38°C) minimum

J. High Performance ANSI Class 300 butterfly valves shall be constructed as follows:

Body	Cast steel
Body Style	Tapped full lug
Trim	316 stainless steel stem
Disc	Aluminum bronze, bronze or stainless steel
Seat	PTFE
Body P/T Rating	720 psig (49.6 bar) at 100°F (38°C) minimum
Seat P/T Rating	700 psig (48.3 bar) at 100°F (38°C) minimum

2.6 CHECK VALVES

A. Provide check valves as required to prevent the reversal of water, air or gas flow in the plumbing systems as identified on the Construction Documents and required by the Authority Having Jurisdiction.

B. Provide non-slam swing or spring-loaded center-guided check valves for the pump discharges of all water pumps, except pumps used in circulating systems.

C. Provide swing check valves on circulating pump discharges.

D. Provide ball check or swing check valves on the cold and hot water supplies to all lavatory and pantry faucets, shower valves and mixing valves where the backflow of hot or cold water can migrate across the supplies to the fixture.

E. Provide non-slam lever weighted check valves or ball check valves on all sump and ejector discharges.

F. Check valves shall be threaded, flanged or grooved ends suitable for the system, which it is being installed.

G. Check valves shall be a horizontal swing check with renewable bronze seat and disc.

H. Valve must be factory tested and certified to seat bubble tight.

I. Spring loaded check valves shall be center guided globe type constructed as follows:

Body	Carbon steel/ductile iron
Body Style	Lug type/flanged
Trim	316 stainless steel
Spring	Stainless steel
Body P/T Rating Class 150	285 psig (19.6 bar) at 100°F (38°C) minimum
Body P/T Rating Class 300	740 psig (51 bar) at 100°F (38°C) minimum

J. Class 150 cast steel swing check valves shall be constructed as follows:

Body	Carbon steel
Body Style	Bolted cover
Disc	Stainless steel
Seat	Steel/stellite facing

Trim	Carbon steel
Ends	Flanged
Body P/T Rating	ASME B 16.34
WOG Rating	150 psig (17 bar) minimum

2.7 CIRCUIT BALANCING VALVES

A. Circuit balancing stations shall be provided on all hot water circulation risers, loops and circulating water systems as identified on the Construction Documents. Balancing stations shall consist of shut off valves, check valve and circuit balancing valve with metering port extensions as specified herein.

B. Circuit balancing valves shall be used for flow balancing, measurement, and shutoff 1/2 in. (12.5 mm) to 3 in. (75 mm) with a flow range starting at 0.5 gpm minimum.

C. Provide valves suitable for water temperatures to 180˚F (82.2°C).

D. Provide valves with integral metering test ports for connecting a portable differential pressure meter. Each meter connection shall have pressure/temperature readout points. Each valve shall have two (2) 1/4 in. (6.25 mm) NPT metering ports with integral check valves and gasketed caps located on both sides of valve seat.

E. Valves are to be of the globe style and provide multi-turn, 3600 adjustment with a micrometer type indicator located on valve handwheel. Valve handwheel shall have hidden memory stop feature that shall provide a means for locking the valve position after the system is balanced. Quarter turn valves are not acceptable.

F. Balancing valves 1/2 in. (12.5 mm) through 2 in. (50 mm) shall have valve body and stem that is dezincification resistant bronze or brass alloy with high strength resin handwheel and sleeve. Valves shall have minimum of four (4) full 360 degree handwheel turns and have ±5% accuracy scale from 25% open to 100% full open. Circuit balancing valves shall be Bell & Gossett Circuit Setter Plus CB-1SLF.

G. Circuit balancing valves shall be installed at least five (5) pipe diameters down-stream from any fitting and pumps. Two (2) pipe diameters downstream from the valve should be free of any fittings. When installed, easy and unobstructed access to the valve handwheel and metering ports for adjustment and measurement are to be provided. Mounting of valve in piping must prevent sediment build-up in metering ports.

H. Provide a differential pressure test kit to be furnished to the owner. Test kit shall include standard tubing kit, tubing manifold, bypass flushing valve, isolation valves, pressure probes in a plastic carrying case for ease of storage at facility. Test kit shall be similar to Bell & Gossett Circuit Setter Plus Kit.

2.8 GLOBE VALVES

A. Globe valves used for circuit balancing shall be all bronze body and trim, provided with memory locking stops.

B. Globe valves 2-1/2 in. (65 mm) and smaller shall be Class 150 bronze valves providing positive shutoff.

C. Bronze globe valves shall be constructed as follows:

Body	Bronze
Body Style	Screw in bonnet rising stem
Trim	Bronze
Disc	Bronze
Packing	Asbestos free
Ends	Threaded or solder
WOG Rating	300 psig (20.7 bar) minimum
Body P/T Rating	ASME B 16.34
WOG Rating	200 psig (13.8 bar) minimum

2.9 HOSE BIBBS AND HYDRANTS

A. Hose Bibbs

1. All interior single hose bibbs for use on hot and cold water service shall be Woodford Mfg. Model No. 24 with vacuum breaker and 3/4 in. (19 mm) hose end faucets with male pipe thread for connection to exposed piping or female threaded flanged connection for piping concealed in wall construction.

2. For all locations requiring a freezeless single hose bibb for use on hot and cold water service, shall be Woodford Mfg. Model No. 16 freezeless wall faucet with vacuum breaker and 3/4 in. (19 mm) hose end faucets with male pipe thread for connection to exposed piping or female threaded flanged connection for piping concealed in wall construction.

B. Non-Freeze Ground Hydrants: Freezeless ground hydrants shall be Woodford Mfg. “Anti-Siphon Freezeless Yard Hydrants” Model No. Y95, or as approved, cast brass, antisiphon, freezeless yard hydrant with Model 50H backflow preventer and tamper proof hinged door lock.

C. Roof Hydrants: Freezeless roof hydrants shall be Woodford Mfg. “Freezeless Roof Hydrant” Model No. RHY2, or as approved, cast brass, automatic draining with integral backflow preventer, 3/4 in. (19 mm) hose connection, well seal and EPDM boot to cover well seal. Provide a 2 degree shim for installation on pitched roofs as needed.

D. Wall Hydrants: Freezeless wall hydrants shall be Woodford Mfg. “Automatic Draining Freezeless Wall Faucet” Model No. 65, or as approved, cast brass, antisiphon, nonfreeze wall hydrants with bronze sleeve, within custom enclosure as detailed by the Architect for the exterior Ground Floor locations shown on the drawings.

2.10 PLUG VALVES

A. Plug valves shall be top entry types that provide bidirectional positive shutoff.

B. Class 125 Valves shall be constructed as follows:

Body	Cast iron
Body Style	One-piece port
Plug	Nickel plated
Seat	Welded nickel
Body P/T Rating	175 psig (12 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	*175 psig (12 bar*minimum

2.11 VALVE SCHEDULE

A. Provide valves for the plumbing systems as specified herein and in accordance with the schedule below.

Service	Size	Fig. #	Type	Material
Hot and Cold Water	*1/4 in. to 3 in.*	*Nibco T-113-LF*	*NRS Gate, Threaded*	*Bronze B-62*
	1/4 in. to 3 in.	*Nibco S-113-LF*	*NRS Gate, Soldered*	*Bronze B-62*
	1/4 in. to 2 in.	*Nibco T-585-66-LF*	*Full Port Ball 2-Piece Style, Threaded*	*Bronze B-584*
Drain Valves	*At system low points*	*Nibco 585-70-66-HC-LF*	*Ball with hose cap and chain*	*Bronze B-584*
Gas	*3/4 in. - 1-1/2 in.* *> 1-1/2 in.*	*Walworth 2911* *Walworth 1796*	*Plug*	*IBBM*
Compressed Air and Vacuum	*1/2 in. - 2 in.*	*Nibco CS-595-YX-66-EC*	*3 Piece Ball*	*Bronze body with 316SS Trim*
Circuit Balancing	*1/2 in. - 3 in.*	*Apollo 121TLF or Bell & Gosset CB-1TLF*	*Globe, Threaded*	*Bronze, Rising Stem*

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Install shutoff valves, isolation valves and/or balancing at connections to each piece of equipment, arranged and installed with unions or flanges to allow service, maintenance, and equipment removal without system shutdown.

B. High performance butterfly valves or gate valves shall be provided on the discharge of all pumps.

C. The use of butterfly valves is limited to shutoff services only and only where permitted by the Construction Documents. Butterfly and ball valves will not be permitted in those services, which require balancing or throttling.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above center of pipe in a position that allows full stem movement. Butterfly valves may be installed with stem horizontal to allow support for the disc and the cleaning action of the disc.

F. All water piping connections to equipment shall include all necessary isolation valves, air vent valves, drain connections, balancing valves and the automatic valves arranged as detailed on the drawings.

G. All valve installations shall be in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

H. Valves in finished portions of the building, except in mechanical equipment rooms, or where otherwise indicated on the Drawings shall be concealed and provided with access doors.

I. All piping shall be carefully graded so as to eliminate traps and pockets. Where water traps cannot be avoided, provide drain valves.

J. All valves throughout the building shall be thoroughly and substantially supported with approved hangers and support devices.

K. All valves shall be installed according to the Local Authority rules and an inspection certificate furnished.

L. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Balanced Check Valves (center-guided): In horizontal or vertical position, with stem upright and plumb.

M. Install pressure-relief valves as required by code, where shown on the drawings and/or in the following locations:

1. In each step of each pressure-reducing station.

2. Both the shell and tube side of all steam-to-water heat exchangers.

3. The hot water discharge of each hot water heater, pre-heater and heater exchanger.

N. Relief piping shall be sized according to outlet size of relief valve.

O. The pressure drop between the protected vessel and/or pipe shall not be greater than 3% of the set pressure.

P. Elbows on the discharge of pressure-relief valves shall be supported to withstand reaction forces and the weight of the piping.

3.3 CLEANING

A. Before final connections are made and before operation of all valves, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all valves in condition suitable for finish painting, before final acceptance.

3.4 INSPECTION AND STARTUP SERVICE

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that material composition is suitable for service, and that it is free from defects and damage.

E. Defective valves shall be replaced with new valves.

F. Verify that pressure settings for all relief valves and pressure-reducing valves are correct.

3.5 FIELD TESTS

A. Integrated Test

1. Verify that all valves have been properly lubricated and left ready for operation.

2. All alarms (BMS, fire alarms, etc.) shall be tested to fulfill satisfactory operating conditions. Verify proper operation of electrical safety interlocks and limit switches.

3.6 ADJUSTING AND BALANCING

A. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

B. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

C. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

D. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

E. The building fire alarm system devices shall be properly adjusted and left in good working condition.

F. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

G. Where required, adjust pressure setting of all relief valves and pressure-reducing valves as necessary prior to being put into service.

H. Adjust valve stops to ensure positive shutoff.

END OF SECTION

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all hangers, supports and anchors required for piping and equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. The Division 22 Subcontractor shall assume complete responsibility for the anchoring of the equipment, piping systems, specified hereinafter to the concrete foundation pads, to the concrete inertia bases, and to the supporting structural steel and concrete beams.

C. Section includes:

1. Pipe hangers and supports.

2. Attachments to structure.

3. Formed steel channel supports and accessories.

4. Concrete pads for equipment.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All hangers and supports, including all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fuel Gas Code.

c. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American Society of Mechanical Engineers

1) ASME B31.1: Power Piping.

2) ASME B31.9: Building Services Piping.

b. ASTM International

1) ASTM A 36: Standard Specification for Carbon Structural Steel.

2) ASTM A 47: Standard Specification for Ferritic Malleable Iron Castings.

3) ASTM A 48: Standard Specification for Gray Iron Castings.

4) ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5) ASTM A 240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

6) ASTM A 283: Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

7) ASTM A 536: Standard Specification for Ductile Iron Castings.

8) ASTM A 575: Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

9) ASTM A 668: Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.

10) ASTM A 1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

11) ASTM B 633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

12) ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials.

13) ASTM E 119: Method for Fire Tests of Building Construction and Materials.

14) ASTM E 814: Test Method of Fire Tests of Through Penetration Firestops.

15) ASTM F 708: Standard Practice for Design and Installation of Rigid Pipe Hangers.

c. American Welding Society

1) AWS D1.1: Structural Welding Code - Steel.

d. FM Global

1) FM - Approval Guide, A Guide to Equipment, Materials & Services Approved by Factory Mutual Research for Property Conservation.

e. Manufacturers Standardization Society of the Valve and Fittings Industry

1) MSS SP 58: Pipe Hangers and Supports - Materials, Design and Manufacturer.

2) MSS SP 77: Guidelines for Pipe Support Contractual Relationships.

3) MSS SP 89: Pipe Hangers and Supports - Fabrication and Installation Practices.

4) MSS SP 90: Guidelines on Terminology for Pipe Hangers and Supports.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Provide shop drawings indicating system layout with location showing critical dimensions, sizes, pipe hanger and support locations and detail of trapeze hangers.

2. Method of attachment to and load imposed on building structures by hangers, anchors, supports, guides and supplemental steel shall be submitted for review and approved by the project Architect and Structural Engineer.

3. Shop drawings indicating support methods, point loadings to the building structure and hanger locations shall be submitted for review sufficiently in advance of concrete pouring schedules to permit evaluation, critique and any necessary changes to hanging and support methods.

B. Product Data: Submit manufacturer’s literature including general assembly,

1. Hangers and Supports: Submit manufacturer’s catalog data including load capacity and sizing schedules specific to this project.

2. Inserts: Submit manufacturer’s catalog data including load capacity.

C. Design Data: Indicate load-carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load-carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit sizing methods and calculations sealed by a Professional Engineer

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer’s Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

1. Hangers and Supports: Submit special procedures and assembly of components.

2.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All hangers, rods, supports and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

1.8 COORDINATION

A. Coordinate with other trades to use common means of support. Submit for approval all pertinent design data relating to the support as well as verification of the responsibility for the support.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a five (5) year manufacturer's warranty for all pipe hangers and supports.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Anchors and Inserts (Wedge Type)

1. Allfasteners
2. DeWalt.
3. Hilti.
4. ITW Red Head.
5. MKT Fastening, LLC.
6. Simpson Strong-Tie.

D. Anchors and Inserts (Adhesive Type)

1. Allfasteners
2. DeWalt.
3. Hilti.
4. ITW Red Head.
5. Simpson Strong-Tie.

E. Formed Steel Channel Supports

1. Allfasteners
2. Anvil International.
3. Cooper B-Line.
4. Carpenter & Patterson.
5. Empire Industries, Inc.
6. Erico - Caddy.
7. Hilti.
8. National Pipe Hanger Corporation.
9. PHS Industries, Inc.
10. Piping Technology and Products.
11. Thomas & Betts - Kindorf.
12. Tolco Inc.

F. Pipe Hangers, Supports and Guides

1. Allfasteners.
2. Anvil International.

3. Cooper - B-Line.
4. Carpenter & Patterson.
5. Empire Industries, Inc.
6. Erico - Caddy.
7. Hilti.
8. National Pipe Hanger Corporation.
9. PHS Industries, Inc.
10. Piping Technology and Products.
11. Thomas & Betts - Kindorf.
12. Tolco Inc.
13. Witch Co.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 PIPE HANGERS AND SUPPORTS

A. Provide suitable and substantial hangers and supports for all piping and equipment. Hangers and supports shall be of the type, size and spacing specified or as required by the Authority Having Jurisdiction.

B. Comply with maximum load ratings with consideration for allowable stresses prescribed by ASME B31.1 or MSS SP-58.

C. Pipe hangers, anchors, supports and guides shall be manufactured, selected, fabricated and installed in accordance with MSS SP-58, MSS SP-69 and MSS SP-89.

D. Provide supports, guides and anchors that do not transmit unacceptable vibration to building structure.

E. The support systems shall provide for, and control, the free or intended movement of the piping, including its movement in relation to that of connected equipment.

F. In addition to the short-term frame shortening anticipated during the initial construction period, all systems shall be installed with provisions to accommodate long-term frame shortening

equivalent to 1/16 in. (1.6 mm) per foot in addition to any expansion and/or contraction of the systems as a result of thermal changes.

G. Provide for vertical adjustments after installation of supported material and during commissioning, where feasible, to ensure pipe is at design elevation and slope.

H. Select hangers and supports to perform under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses being introduced into piping system and connected equipment.

I. Where piping is required to be seismically restrained, the yoke on clevis hangers and/or roller hangers shall be reinforced to prevent the yoke from deforming. In the case of clevis hangers providing nuts on the inside and outside of the threaded rod connecting the yoke and clevis is acceptable.

J. Anchorage shall be provided to restrain drainage piping from axial movement. Piping sizes greater than 4 in. (100 mm), restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two (2) pipe sizes. Braces, blocks, rodding and other suitable methods as specified by the coupling manufacturer shall be utilized.

K. Piping subject to shock loads, such as thrust or water hammer, shall include shock absorbing and sway suppressing devices of approved design and construction.

L. Provide drawings indicating pipe loads, including method of suspension and hanger location, and submit them for approval prior to proceeding with installation. Provide all the supplementary steel required to support, guide and anchor piping within shafts, Mechanical Equipment Rooms and all the other floors.

M. Particular care shall be taken to support all pipes in a manner approved by the Architect, including the providing of supplementary steel, if required.

N. Where insulation is provided, protect the insulation, the length of the sleeve with a galvanized 20 gauge shield (360 deg.).

O. Support vertical risers from the building construction by means of pipe clamps at every floor. Provide channels of approved sizes where pipe clamps are too short to connect to the building construction.

P. Provide rigid support sway bracing for all horizontal piping 4 in. (100 mm) and larger and piping which is supported greater than 2 ft. (610 mm) from the slab above, measured from the top of the pipe.

Q. Provide additional support for all sanitary and storm house drain offsets consisting of riser clamps and threaded rod to anchor all fittings in the horizontal offset. This method of anchoring and support shall be provided in addition to the sway bracing described in the paragraph above.

R. Finishes

1. Hangers and clamps for uninsulated copper pipes shall be coated with copper-colored epoxy paint and an additional PVC coating.

2. Hangers, anchors, inserts, supports and guides (swivel ring, split ring, roller, wrought pipe clamp, or adjustable wrought clevis-type hangers, roller supports, floor stands, wall

brackets, etc.) installed within the building shall be hot dipped galvanized in accordance with ASTM A123 or stainless steel.

3. All hangers, supports, inserts, etc., utilized to support piping below the slab on grade or buried shall be stainless steel.

4. Strut channels installed indoors shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90.

5. Hangers, anchors, supports, guides and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123 or stainless steel. All hanger hardware shall be hot-dip galvanized or stainless steel. Zinc-plated hardware shall not be acceptable for outdoor or corrosive use.

S. Hangers

1. Pipes 2 in. (50 mm) and smaller shall be supported with one of the following:

   a. Adjustable steel swivel ring (band type) hanger.

   b. Malleable iron split ring hanger.

   c. Adjustable steel clevis hanger.

2. Pipes 2-1/2 in. (63.5 mm) and larger shall be supported with one of the following:

   a. Adjustable steel swivel ring (band type) hanger.

   b. Adjustable steel clevis hanger.

3. Insulated pipes shall be supported adjustable steel clevis hangers and pre-insulated sheet metal insulation shields.

T. Trapeze Hangers

1. Shall be constructed of one of the following:

   a. 12 gauge roll-formed 1-5/8 in. (40 mm) by 1-5/8 in. (40 mm) minimum structural steel channel.

   b. Two (2) structural steel channels secured together with 1/2 in. (12.5 mm) or 3/4 in. (20 mm) steel pipe sections.

2. Pipes shall be secured to trapeze by one of the following methods:

   a. Uninsulated Pipe: 2-piece pipe straps with thermoplastic elastomeric liner sized for outside diameter of pipe.

   b. Insulated Pipe: 2-piece pipe straps sized for outside diameter of pipe and insulation using insulation shields.

U. Floor and/or Roof Supports

1. Shall be one of the following:

   a. Adjustable pipe saddles and nipples welded or screwed to steel base stands secured to floor or roof.

   b. Adjustable roller stands with base plates secured to floor or roof.

2. Pipes shall be secured to supports by one of the following methods:

   a. Uninsulated Pipe: 2-piece pipe straps with thermoplastic elastomeric liner sized for outside diameter of pipe.

   b. Insulated Pipe: 2-piece pipe straps sized for outside diameter of pipe and insulation using insulation shields.

V. Accessories

1. Pipe protection saddles shall be formed from carbon steel, 1/8 in. (3 mm)_minimum thickness, sized for insulation thickness.

2. Preinsulated shields shall be 180 degree, 18 gauge minimum galvanized sheet metal, minimum 12 in. (305 mm) long, with high density water-repellant Kaylo insulation, foam glass or high-density polyisocyanurate inserts minimum thickness to match outside diameter of the insulated pipe.

2.4 ATTACHMENTS TO STRUCTURE

A. All piping shall be carried by pipe hangers and supports attached to building structure. All supports and restraints requiring connections to steel-plated building construction shall be welded to steel plating.

B. Method of attachment to and load imposed on building structures by hangers, anchors, supports, guides and supplemental steel shall be submitted for review.

C. In no case shall hangers be supported by means of vertical expansion bolts.

D. Powder and power-actuated devices, grip nails, and/or expansion nails shall NOT be permitted.

E. Structural Steel Attachments

1. Center-loaded beam clamps or welded beam attachments shall be used where piping is to be suspended from building steel. Clamp shall be forged steel or malleable iron with cross bolts sized as required to fit beams and selected on the basis of load configuration and load to be supported.

2. Where allowed by Structural Engineer, C-clamps with locknuts, cup point set screws and retaining straps shall be used. Top flange C-clamps shall be used when attaching a hanger rod to the top flange of structural shapes. Set screw torque shall be in accordance with manufacturer’s recommendation.

F. Concrete Inserts

1. Cast-in-place continuous or spot concrete inserts shall be used where applicable.

2. Continuous inserts shall be made of 12 gauge, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs./ft. in concrete.

3. Spot inserts shall be constructed of one of the following:

    a. Malleable iron or pressed steel having a space for rods of all sizes. All inserts for pipes 3 in. (75 mm) and larger in size shall be installed with a reinforcing rod 5/8 in. (16 mm) in diameter, run through a slot in the insert specifically provided for this purpose.

    b. Internally threaded machined steel insert with large, flanged heads suitable for installation on wood forms and/or formed metal decking.

G. Post Installed Anchors

1. Contractor shall submit each anchor's ICC-ES report to the Structural Engineer of the project for review.

    a. Anchors shall be installed in accordance with the manufacturer's ICC-ES report and published installation instructions.

    b. All post-installation anchors shall be listed in the manufacturer's ICC-ES report for use in cracked concrete.

2. Contractor shall review the structural composition of all concrete slabs where post-installation anchors will be used and only anchor models/types approved for use in the specific structural slab type shall be permitted, in accordance with the manufacturer's ICC-ES report and per approval of the project's Structural Engineer.

3. Each post-installation anchor shall be sized for the worst-case operating loads imposed to the structure.

4. Post-installed anchors may be installed in the vertical position under any of the following conditions:

    a. When used in concrete having gravel or crushed stone aggregate to support pipes 4 inches or less in diameter.

    b. When post-installed anchors are alternated with hangers connected directly to the structural members, such as trusses and girders, or to the sides of concrete beams to support pipe 5 inches and larger.

    c. When post-installed anchors are spaced not over 10 ft. apart to support pipes 4 inches or larger.

5. Post-installed anchors shall not be used in ceilings of gypsum or other similar soft material.

6. Post-installed anchors shall not be used in cinder concrete, except for branch lines where the post-installed anchors are alternated with through-bolts or hangers attached to beams.

7. Where through-bolts or hangers attached to beams is not feasible, the Contractor is responsible for providing hangers certified by a registered Professional Engineer capable of complying with the following:

   a. These points of support shall be adequate to support the system.

   b. Hanger components shall be ferrous.

   c. Detailed calculations shall be submitted, when required by the reviewing authority, showing stresses developed in hangers, piping, and fittings and safety factors allowed.

8. Where periodic/continuous Special Inspections are required, coordinate with the Special Inspector prior to and during the installation of anchors.

2.5 FORMED STEEL CHANNEL SUPPORTS AND ACCESSORIES

A. Formed steel channel supports shall be capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3 requirements.

B. Channel shall be made of minimum 12-gauge ASTM A570 Grade 33 steel electro galvanized after fabrication. Channel sections may be formed by single or factory welded multiple sections of any of the following:

1. 1-5/8 in. (41.25 mm) x 1-5/8 in. (41.25 mm) channel.

2. 2-7/16 in. (62 mm) x 1-5/8 in. (41.25 mm) channel.

3. 3-1/4 in. (82.5 mm) x 1-5/8 in. (41.25 mm) channel.

C. Grip/Lock nuts shall be made of 3/8 in. (10 mm) thick case hardened mild steel bars electro galvanized after fabrication.

D. All angle brackets connectors and washers shall be made of 1/4 in. (6.35 mm) steel plate electro galvanized after fabrication.

2.6 CONCRETE PADS FOR EQUIPMENT

A. Pumps for the service listed below shall be installed on reinforced concrete pads with minimum thickness as specified below and designed for support of the pump and pump elbows as listed hereinafter. The following pumps and equipment require this type of installation:

1. Domestic water house pumps.

2. Domestic water booster pumps.

3. Cooling tower make-up pumps.

4. Grey water supply pumps.

5. Domestic hot water heaters.

6. Hot water storage tanks.

7. Pneumatic tanks.

8. Water filtration pumps.

9. Laboratory air compressors.

10. Laboratory vacuum pumps.

B. Concrete pads for various pieces of equipment will be furnished under another section. Pads shall be provided in all Equipment Rooms. This shall include floor mounted equipment, equipment mounted on legs and pipe support stands. Equipment pads shall generally conform to the shape of the piece of equipment it serves with a minimum 3 in. (75 mm) margin around the equipment and supports.

C. General equipment pads shall be a minimum of 4 in. (100 mm) high, with all external corners bull-nosed to a tooled radius.

D. Shop Drawings stamped “REVIEWED” shall be used for dimensional guidance in sizing pads and anchor bolt locations.

E. Furnish and install hot-dipped galvanized anchor bolts for all equipment placed on concrete equipment pads, inertia blocks, or on concrete slabs.

F. Bolts shall be of the size and number recommended by the manufacturer of the equipment and as required for seismic restraint. Anchor bolts shall be located by means of suitable templates.

G. When equipment is placed on vibration isolators, the equipment shall be secured to the isolator and the isolator secured to the floor, pad, or supported as recommended by the vibration isolation manufacturer.

H. Wherever vibration isolation devices and/or concrete inertia blocks are specified, these items shall in all cases be mounted upon or above the concrete pads.

I. Pumps with vibration isolation devices shall be bolted and grouted to a spring supported concrete inertia base reinforced as required

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Hanger, rods, supports and accessories shall be installed in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

B. Furnish and install all necessary supports for equipment furnished under this section. To meet the varying conditions in each case, these supports shall consist of pipestands, steel angle or strap hangers, saddles, brackets, as required for a complete installation.

C. All such supports shall have substantial flanges bolted to floor construction; hangers shall be supported from the framing as described hereinabove. Supports shall be properly located with reference to any supporting pads, legs of the equipment carried and must be distributed as not to bring any undue strains to the equipment.

D. All hanger and support details shall be submitted for review and approval.

E. Guarantee that the work, as installed under this section of the specifications, will not result in the transmission of objectionable noise or vibration to any occupied parts of the building, and take full responsibility for any necessary modifications of this equipment, or of the foundations and supports for the same, necessary to secure this result.

F. Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom beam flanges.

G. Proper care and ventilation should be given when welding galvanized components.

H. Clamps on Riser Piping

1. Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

2. Bolt tightening torques shall be to industry standards.

3. Cast Iron Pipes: Install clamp below joint.

4. Steel Pipes: Clamp is fitted preferably below coupling or welded pipe lug.

5. Clamps on riser piping shall maintain the insulation and vapor barrier as piping passes through the support.

I. Support from Structural Members: Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

J. Field welding of supports should be done by qualified welders using qualified welding procedures.

K. Support cast iron bell and spigot and No-Hub pipe and fittings with a minimum of two (2) hangers per each length of pipe. The maximum hanger spacing shall be in accordance with the hanger spacing schedule herein below. Hangers shall be installed on each side of joint. Where an excessive number of fittings are installed between hangers, provide additional hangers, channel supports or reinforcing as required. Securely anchor fittings to the building construction at changes of direction to eliminate all horizontal movement.

L. Horizontal piping shall be supported in accordance with the following schedules:

SINGLE ROD SUPPORT - STEEL AND CAST IRON PIPE		
Pipe Size	Maximum Hanger Spacing	Rod Size
1 to 2 inches (25 mm to 50 mm)	10 feet 0 inches (3,048 mm)	3/8 inch (10 mm)
2-1/2 and 3 inches (63 mm to 75 mm)	12 feet 0 inches (3,658 mm)	1/2 inch (12.5 mm)
4 to 5 inches (100 mm to 125 mm)	12 feet 0 inches (3,658 mm)	5/8 inch (16 mm)
6 to 10 inches (150 mm to 250 mm)	12 feet 0 inches (3,658 mm)	3/4 inch (20 mm)
DOUBLE ROD SUPPORT		
Pipe Size	Maximum Hanger Spacing	Rod Size
6 to 8 inches (150 mm to 200 mm)	12 feet 0 inches (3,658 mm)	1/2 inch (12.5 mm)
10 to 12 inches (250 mm to 300 mm)	12 feet 0 inches (3,658 mm)	5/8 inch (16 mm)

SINGLE ROD SUPPORT - COPPER PIPE		
Pipe Size	Maximum Hanger Spacing	Rod Size
1 to 1-1/4 inches (25 mm to 32 mm)	7 feet 0 inches (2,133 mm)	3/8 inch (10 mm)
1-1/2 to 3 inches (37 mm to 75 mm)	8 feet 0 inches (2,438 mm)	1/2 inch (12.5 mm)

M. Maximum hanger spacing may not be exceeded; however, actual installed spacing will depend on location of structural framing and floor slab construction. Where building construction does not permit the above spacing, provide additional steel supports.

N. Install lock nuts at the bottom of all hanger rods.

O. Vertical pipe risers shall be supported independently of connected horizontal piping.

P. Support vertical risers from the building construction by means of pipe clamps, Grinnell Model No. 261, at every story height;

Q. Where hangers cannot be supported from building framing, they may be supported from concrete inserts, subject to the approval of the Structural Engineer. Furnish, locate and set such inserts and make sure that such inserts are in place when the concrete is poured.

R. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

S. Smaller pipes may be suspended from cross-pieces of pipe or steel angles, which, in turn, shall be hung from building concrete construction by means of rods and inserts. The intention is to provide supports which, in each case, shall be amply strong and rigid for the load, but which shall not weaken or unduly stress the building construction.

T. Provide approved roller supports, floor stands, wall brackets, etc., for all lines running near the floor or near walls, which can be properly supported or suspended by the floors or walls. Pipelines near walls may also be hung by hangers carried from approved wall brackets at a higher level than the pipe.

U. No piping shall be hung from other piping or ductwork. In no case shall hangers be supported by means of vertical expansion bolts.

V. Hangers for piping shall support the pipe without piercing the insulation. Pre-insulated pipe shields shall be used to protect the insulation on pipes. It is the intent that the insulation shields shall bear only on the insulation, which is of such density that the insulation will not be compressed, crushed or deformed.

3.3 CLEANING

A. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all hangers and supports in condition suitable for finish painting, before final acceptance.

B. Touch up, repair or replace damaged products before Substantial Completion.

3.4 INSPECTION AND STARTUP SERVICE

A. Inspect each hanger, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

3.5 FIELD TESTS

A. Performance Test: All hanger and support devices and components shall be tested in accordance with the latest applicable industry standards.

3.6 ADJUSTING AND BALANCING

A. Adjust all pipe hangers, miscellaneous supports and equipment supports to equalize load for the piping and equipment they carry and to ensure that rods are vertical under operating conditions.

B. Hangers at equipment shall be adjusted to ensure that there are no loads imposed on the equipment by the piping connected to the equipment.

C. Hangers and Supports

1. Ensure that rod is vertical under operating conditions.

2. Equalize loads for all piping and equipment supports.

D. Adjustable Clevis

1. Tighten hanger load nut securely to ensure proper hanger performance.

2. Tighten upper nut after adjustment.

E. Beam Clamps: Tighten all set screws and lock nuts.

F. Riser Clamps

1. Ensure all riser clamps are securely resting on the concrete slab or kindorf after system is tested and pressurized.

2. Tighten riser clamp nuts after vertical adjustments are made.

END OF SECTION

SECTION 220700

PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all insulation required for piping and equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Accessories.

2. Adhesives and sealants.

3. Pipe insulation.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. The following specification sections apply to all work herein:

1.3 REFERENCES

A. All insulating products and accessories shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York. .

a. New York City Building Code.

b. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

1) ASHRAE 90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings.

b. ASTM International

1) ASTM B209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

2) ASTM C177: Standard Test Method for Steady-state Heat Flux Measurements and Thermal Transmission Properties by Means of Guarded-Hot-Plate Apparatus.

3) ASTM C335: Standard Test Method for Steady-state Heat Transfer Properties of Horizontal Pipe Insulation.

4) ASTM C411: Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

5) ASTM C533: Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

6) ASTM C547: Standard Specification for Mineral Fiber Pipe Insulation.

7) ASTM C552: Standard Specification for Cellular Glass Thermal Insulation.

8) ASTM C585: Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing.

9) ASTM C612: Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

10) ASTM C871: Standard Test Methods for Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate and Sodium Ions.

11) ASTM C1136: Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

12) ASTM E84: Standard Test Methods for Surface Burning Characteristics of Building Materials.

13) ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials.

c. Greenguard Environmental Institute.

d. Manufacturers Standardization Society of the Valve and Fittings Industry

1) MSS SP 69: Pipe Hangers and Supports - Selection and Application.

2) MSS SP 89: Pipe Hangers and Supports - Fabrication and Installation Practices.

e. National Fire Protection Association (NFPA)

1) NFPA 255: Standard Method of Test of Surface Burning Characteristics of Building Materials.

f. Underwriters Laboratories, Inc.

1) UL 723: Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of materials indicating the type of system which it is installed, insulation type, insulation jacket, thickness for each pipe size and each type of equipment.

B. Product Data: Submit manufacturer's literature including general assembly, for each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness, and type of insulation jacket.

C. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

D. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for the system.

1. In addition, provide detailed installation procedures for the following:

a. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

b. Application of insulation at elbows, fittings, specialties and flanges for each type of insulation.

c. Application of field-applied jackets.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. Reserved.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

D. Store tapes, adhesives, mastics, cements, and insulation materials in ambient conditions acceptable to and in accordance with the recommendations of the manufacturer.

E. Store products and materials off floors on raised platforms to protect from water damage.

F. Products and materials, which have been exposed to water damaged shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Reserved.

1.9 UNIT PRICES

A. Reserved.

1.10 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a one (1) year manufacturer's warranty for all insulation products.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Accessories

1. Buckaroos, Inc.

2. Insul-Shield.
3. Pipe Shields, Inc.
4. Thermal Pipe Shields, Inc.
5. Value Engineered Products, Inc.

D. Adhesives and Sealants

1. Benjamin Foster Company.
2. Centiva.
3. Duro Dyne.
4. Elgen.
5. ITW TACC.

E. Pipe Insulation and PVC Covers

1. Certain Teed Corp.
2. Johns-Manville (Zeston).
3. Knauf Insulation.
4. Owens-Corning.
5. Proto Corporation.
6. Speedline Corporation.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. Insulation materials furnished shall meet the minimum thickness requirements of ASHRAE Standard 90.1 - Energy Efficient Design of New Buildings.

E. All thermal and acoustical insulation jackets, facings, membrane, adhesives, mastics, coatings and accessory materials shall be tested in compliance with the latest versions of ASTM E-84, MSS SP-69, NFPA 255 and/or UL 723 procedures.

F. All materials shall comply with the requirements of NFPA 90A and shall be listed and labeled by Underwriters Laboratories, Inc. for a fire hazard classification, not to exceed the following:

1. Insulation installed indoors: Flame Spread 25, Smoke Developed 50.

2. Insulation installed outdoors: Flame Spread 75, Smoke Developed 150.

G. The rating for insulation with factory-applied jackets or facings shall be on a composite basis of insulation, jacket or facing, and the adhesive used to adhere the jacket or facing to the insulation.

H. Materials and products required for work of this section shall not contain asbestos, formaldehyde, lead, mercury or mercury compounds, polychlorinated biphenyls (PCB's) or other hazardous materials.

I. All insulation shall contain a minimum of 50% post-consumer recycled material.

J. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 parts per million (ppm) when tested according to ASTM C 871.

K. Insulation for fittings, valves, flanges, and accessories shall maintain the same thermal conductivity as the adjacent pipe insulation.

L. Shipping containers for insulation and accessory materials shall be labeled to indicate conformance to the fire hazard classification.

M. All vapor barriers shall be completely sealed against moisture penetration.

2.3 ACCESSORIES

A. Pipe protection saddles shall be formed from carbon steel, 1/8 in. (3 mm) minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 in. (305 mm) shall have a center support rib.

B. Pre insulated shields shall be 180 degree, 18 gauge minimum galvanized sheet metal with high density water repellant Kaylo insulation, foam glass or high-density polyisocyanurate inserts minimum thickness to match outside diameter of the insulated pipe.

C. Pre insulated shields shall be no less than the following lengths:

Pipe Size	Shield Length
3/4 in. to 2-1/2 in. (63.5 mm to 19 mm)	10 in. (254 mm)
3 in. to 6 in. (150 mm to 75 mm)	12 in. (305 mm)
8 in. to 10 in. (254 mm to 203 mm)	16 in. (405 mm)
12 in. (305 mm) and over	22 in. (555 mm)

2.4 ADHESIVES AND SEALANTS

A. Provide adhesives and sealants conforming to the requirements of ASTM C 916, ASTM E 84 and UL 273.

B. Adhesives and sealants shall be listed and labeled by Underwriters Laboratories, Inc. for a fire hazard classification, not to exceed the following:

1. Flame Spread 25
2. Fuel Contribution 50
3. Smoke Developed 50

2.5 PIPE INSULATION

A. Pipe insulation shall be molded fiber glass one-piece insulation with white Kraft, fiber glass reinforced, and aluminum foil laminated, All-Service Jacket (ASJ). Pipe insulation shall be capable of continuous service at a pipe temperature of 450°F (232° C) without oxidation or burnout of binders or the development of odors or smoke by any constituent of the material. Physical characteristics shall be as follows:

1. Minimum Density: 4 lbs/cu.ft. (64 kg/cu.m).

2. Thermal Conductivity: 0.23 Btu-in./hr/ft2 /°F (0.033 W/m at 24°C).

3. Maximum Service Temperature: 850°F (454°C).

4. Jacket Vapor Permeability: 0.02 perms.

5. Jacket Puncture Resistance: 50 units (Beach).

B. Pipe fittings and valves shall be insulated with pre-molded fiber glass sections and pre-molded thermoplastic covers for the sizes manufactured. For other types and sizes, fittings and valves shall be insulated with radially mitered segments of pipe covering secured in place with 16 gauge copper-plated, annealed steel wire. Pre-molded (PVC) fitting covers shall be suitable for same service temperature as pipe insulation.

C. Install a vapor barrier on fittings, valves and flanges consisting of open weave glass cloth applied with BF 30-35 adhesive and finished with a flooding brush coat of the same adhesive.

D. Insulation exposed to weather shall be provided with a weatherproof jacket of corrugated aluminum with a 3 in. lap that will shed water. Fittings, valves and flanges shall be weatherproofed with a weatherproof mastic reinforced with a glass cloth membrane and further coated with mastic.

E. All lavatories, including, but not limited to, the Core Toilet Rooms, Break Rooms, Locker Rooms and other areas within the building, shall be provided with ADA-compliant under-sink pipe covers as manufactured by TRUEBRO lps Corp. “Lav Guard 2 E-Z Series” waste and supply covers Model No. 102 E-Z or 402W “original” series.

F. Insulation for piping systems shall be furnished and installed in accordance with the following schedule:

Service	Pipe Size	Temp	Thickness
Cold Water Mains and Branches	1-1/4 in. (32 mm) and below	450°F (232°C)	1 in. (25 mm)
Cold Water Mains and Branches	1-1/2 in. (38 mm) and above	450°F (232°C)	1 in. (25 mm)
Cold Water Risers (including pump discharge)	All	450°F (232°C)	1 in. (25 mm)
Cold Water Fixture Branches (in pipe spaces and above ceilings)	1-1/4 in. (32 mm) and below	450°F (232°C)	1 in. (25 mm)

Service	Pipe Size	Temp	Thickness
Cold Water Fixture Branches (in pipe spaces and above ceilings)	1-1/2 in. (38 mm) and above	450°F (232°C)	1 in. (25 mm)
Hot Water and Hot Water Circulation Mains and Branches	1-1/4 in. (32 mm) and below	450°F (232°C)	1 in. (25 mm)
Hot Water and Hot Water Circulation Mains and Branches	1-1/2 in. (38 mm) and above	450°F (232°C)	1 in. (25 mm)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Installation of all insulation, pre-molded fiber glass insulation and thermoplastic covers for fittings and the use of adhesives and sealants shall be in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

B. Before applying insulation, all surfaces shall be free of dust, grease and foreign matter. Insulation shall not be applied to any piping and equipment until required pressure testing has been completed and the system approved for tightness.

C. Where a vapor seal must be maintained, insulation shall be applied with a continuous, unbroken moisture and vapor retarder.

D. All pipe insulation shall be continuous through walls, ceiling and/or floor openings.

E. Install multiple layers of insulation with longitudinal and circumferential joints staggered.

F. Pipe Insulation

1. Pipe insulation sections shall be firmly butted together at all joints with jacket laps and joint butt strips pulled tight and smooth. Longitudinal joints shall have a minimum 2 in. (50 mm) overlap. Butt joint strips shall be a minimum of 3 in. (75 mm) wide.

2. Insulation for fittings, valves, flanges, and accessories shall maintain the same thermal conductivity as the adjacent pipe insulation.

3. Valves, expansion joints and other specialties requiring periodic servicing or inspection shall be insulated with factory fabricated removable and reusable covers.

4. Flanges shall be insulated with built-up sleeves of pipe covering overlapping the adjacent pipe insulation.

G. Piping within mechanical equipment rooms, in addition to the insulation and jacket specified, all piping, including fittings, flanges and valves, shall be covered with a 30 mil (0.8 mm) thick thermoplastic jacket.

H. Hot service piping shall be insulated in accordance with the following:

1. Insulation jacket laps and joint butt strips shall be taped on 4 in. (100 mm) centers with flare-type staples and secured with aluminum bands on 18 in. (380 mm) centers with one band over each joint butt strip.

2. Voids around fittings and valves and at flanges shall be filled with insulation and covered with premolded thermoplastic covers.

3. Insulation on hot pipes 4 in. (100 mm) and larger shall be protected from hangers by pipe protection saddles attached to the pipe and filled with pipe insulation or insulating cement. Saddles shall not be permanently attached to the pipe hanger or support.

4. Insulation on hot pipes smaller than 4 in. (100 mm) shall be supported on factory-assembled thermal protection shields.

I. Cold service piping shall be insulated in accordance with the following:

1. Insulation jacket laps and joint butt strip shall be sealed with lap-sealing adhesive. At all fittings, valves and at intervals of every 5 sections of straight run pipe insulation, apply a vapor barrier coating, 1/16 in. (1.7 mm) thick, to all butt joints and on the bore of the pipe insulation for a minimum of 2 in. (50 mm) from the joint. Position insulation and press firmly into place, making certain that a complete unbroken seal is obtained.

2. Insulation shall be protected from hangers by a 180 degree galvanized steel shield on the outside of the insulation and vapor barrier. A half-section of waterproof, high-density insulation of the same thickness as the pipe insulation, and full length of the shield, shall be used to support the weight of the pipe at the shield. Factory-assembled thermal protection shields may also be used.

3.3 CLEANING

A. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all insulation in suitable condition, before final acceptance.

B. Touch-up, repair or replace damaged insulation, insulation jackets and vapor barriers before final acceptance.

3.4 INSPECTION AND STARTUP SERVICE

A. Reserved.

3.5 FIELD TESTS

A. Reserved.

3.6 ADJUSTING AND BALANCING

A. Upon completion of insulation, hangers for piping, and supports for equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping and equipment on the insulation that it is provided with.

END OF SECTION

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all domestic water piping required for the project as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Materials of piping systems.
2. Miscellaneous accessories.
3. Pipe joints and fittings.
4. System material schedule.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, *25,* 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All domestic water piping shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York..
    a. New York City Building Code.
    b. New York City Plumbing Code.
2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:
    a. American Society of Mechanical Engineers
        1) ASME B16.15: Cast Bronze Threaded Fittings
        2) ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.
        3) ASME B16.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

4) ASME B16.23: Cast Copper Alloy Solder Joint Drainage Fittings DWV.

5) ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tubes.

6) ASME B16.29: Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings DWV.

7) ASME B31.9: Building Services Piping.

8) ASME Section IX: Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

b. American Society of Sanitary Engineers

1) ASSE 1010: Performance Requirements for Water Hammer Arresters.

2) ASSE 1018: Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied.

c. ASTM International

1) ASTM A312: Specification for Seamless and Welded Austenitic Stainless Steel Pipes.

2) ASTM A778: Specification for Welded Unannealed Austenitic Stainless Steel Tubular Products.

3) ASTM B42: Specification for Seamless Copper Pipe, Standard Sizes.

4) ASTM B43: Specification for Seamless Red Brass Pipe, Standard Sizes.

5) ASTM B75/B75M: Standard Specification for Seamless Copper Tube.

6) ASTM B88/B88M: Standard Specification for Seamless Copper Water Tube.

7) ASTM B251: Specification for General Requirements for Wrought Seamless Copper and Copper Alloy Tube.

8) ASTM B302: Specification for Threadless Copper Pipe, Standard Sizes.

9) ASTM B447: Specification for Welded Copper Tube.

10) ASTM B813: Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.

11) ASTM B828: Standard Specification for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

12) ASTM F1476: Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

d. American Water Works Association

1) AWWA C104: Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.

2) AWWA C110: Standard for Ductile-Iron and Gray-Iron Fittings, 3 Inches through 48 Inches, for Water.

3) AWWA C115: Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Fittings.

4) AWWA C151: Standard for Ductile-Iron Pipe Centrifugally Cast for Water.

5) AWWA C153: Standard for Ductile-Iron Compact Fittings for Water Service.

e. American Welding Society

1) AWS A5.8: Specification for Filler Metals for Brazing and Braze Welding.

f. Manufacturers Standardization Society

1) MSS SP6: Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2) MSS SP9: Spot Facing for Bronze, Iron and Steel Flanges.

3) MSS SP43: Wrought Stainless Steel Butt-welding Fittings.

4) MSS SP44: Steel Pipe Line Flanges.

5) MSS SP-73: Brazing Joints for Copper and Copper Alloy Pressure Fittings.

6) MSS SP-83: Steel Pipe Unions Socket-Welding and Threaded.

7) MSS SP-97: Forged Carbon Steel Branch Outlet Fittings-Socket Welding, Threaded and Butt-welding Ends.

8) MSS SP104: Wrought Copper Solder Joint Pressure Fittings.

9) MSS SP106: Cast Copper Alloy Flanges and Flanged Fittings (Class 125, 150 and 300).

10) MSS SP 123: Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube.

g. National Sanitation Foundation

1) NSF Standard 61: Drinking Water System Components.

h. Plumbing and Drainage Institute

1) PDI WH201: Water Hammer Arresters.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of pipe and fitting materials, complete with typical mill reports.

2. Schedule of pipe and fitting materials identifying the system and location, which the products are intended to be used.

3. Pipe cleaning certification.

4. Copper, brass, stainless steel and ductile iron pipe and fittings.

5. Cut or roll grooved couplings and fittings.

6. Threaded brass or bronze fittings.

7. Copper, brass, stainless steel and ductile iron pipe flanges and gaskets.

8. Schedule of locations where water hammer arresters shall be installed.

9. Schedule of locations where trap primer valves shall be installed.

B. Product Data: Submit manufacturers literature including general assembly, for each type of product indicated. Include all piping, fittings, water hammer arresters, trap primer valves, mechanical couplings, flanges, solder, materials of construction and dimensional characteristics.

C. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

D. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for all products submitted.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A Materials Safety Data Sheet (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

F. To ensure uniformity and compatibility of piping components in grooved in piping system all grooved products and grooving tools must be the products of a single manufacturer.

G. The manufacturer of grooved piping fittings shall provide on-site training for Contractor's field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

H. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All piping, fittings, flanges, couplings and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. All pipe, fittings, mechanical couplings, flanges and accessories shall be tested in accordance with the latest applicable industry standards before accepting delivery at the jobsite.

2. All water hammer arresters, trap primer valves and accessories shall be tested in accordance with the latest applicable industry standards before accepting delivery at the job site.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

D. Store all products and materials off floors on raised platforms to protect from water damage.

E. Products and materials, which have been exposed to water damage shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Certain materials will be furnished, installed, or furnished and installed, under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general Construction Drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

E. Should the Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Contractor to coordinate, protect and schedule his work with other trades in accordance with the construction sequence.

B. Architectural drawings shall be checked for ceiling height requirements.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a one (1) year manufacturer's warranty for the entire domestic water system.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Copper Pipe, Tube and Fittings

1. American Brass Co.
2. Bridgeport Brass.
3. Chase Brass.
4. Elkhart Products Corp.
5. Lewin Matheis.

6. Mueller Industries
7. Phelps Dodge.
8. Reading Tube Corp.
9. Revere.
10. Wolverine Tube Co.

D. Trap Primer Valves

1. Precision Plumbing Products.
2. Watts Regulator.
3. Sioux Chief.

E. Water Hammer Arresters

1. Precision Plumbing Products.
2. Watts Regulator.
3. Sioux Chief.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. All piping materials, fittings and couplings shall be of Unites States origin and manufactured in accordance with the latest applicable standards for its intended use.

E. All trap primer valves and water hammer arresters shall be manufactured in accordance with the latest applicable standards for its intended use.

2.3 MATERIALS OF PIPING SYSTEMS

A. Use the following materials in the various piping systems, in accordance with the Construction Documents.

B. Pressure Copper Tubing (P.C.T.): Copper Tubing shall be seamless drawn or extruded tubing Type “L” or “K” as scheduled, hard temper in accordance with ASTM Specification B42 and or ASTM Specification B88/B88M.

2.4 MISCELLANEOUS PIPING ACCESSORIES

A. Trap Primers

1. Furnish and install trap primer valves for all floor drains, which are subject to evaporation and as identified on the Construction Documents.

2. Provide trap primer distribution unit in at least 5 feet (0.5 m) when supplying floor drains requiring trap priming.

3. Interior trap primer piping shall be Type L copper tubing as scheduled.

4. Buried piping below the slab on grade or encased in concrete shall be Type K copper tubing, insulated in rubber foam insulation or installed in split tile conduit as scheduled herein below.

5. Trap primer valves shall be manufactured by Precision Plumbing Products, Inc. as listed below:

a. Automatic Pressure Type Trap Primer for up to two (2) floor drains shall be Model No. PR-500 Prime Rite or PRO1-500.

b. Automatic Pressure Type Under-Lav Trap Primer shall be Model No. PRO1-ULP500.

c. Electronic TRAP PRIMER for four (4) to thirty (30) floor drains shall be Model No. PT Series Prime Time Electronic Trap Priming Manifold. The number of outlets shall be coordinated based on the number of floor drains served.

B. Water Hammer Arresters

1. The Contractor shall install sufficient water hammer arresters throughout the system to prevent pulsation, vibration and water hammer.

2. Furnish and install water hammer arresters on the following:

a. Hot and cold domestic water branches to every fixture or group of fixtures with quick-closing valves.

b. Top of each domestic hot and cold riser.

c. Each heat exchanger and hot water heater.

d. Domestic water booster pumps.

e. Boiler water makeup supplies.

f. Cooling tower water makeup supplies.

g. Humidification water makeup supplies (CRAC units).

h. Individual branch water lines to clothes washers, dishwashers, pot washers, glass washers, laundry machines and/or equipment controlled by solenoid valves, electrically operated ball valves and other quick-closing valves.

3. All water hammer arresters shall conform to ASSE 1010 and/or PDI WH201 specifications.

4. Water hammer arresters shall be provided in accordance with the Authority Having Jurisdiction and in accordance with the Construction Documents.

5. Water hammer arresters shall be sized and selected per ASSE 1010 and/or PDI Standard WH201, and shall have adequate displacement volume to dissipate the kinetic energy generated by the domestic water piping system.

6. Install all water hammer arresters in the vertical position.

2.5 PIPE JOINTS AND FITTINGS

A. All fittings shall be of a type, which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends.

B. Use the following materials in the various piping systems, in accordance with Article 2.7 - System Material Schedule and the Construction Documents.

C. Pressure Copper Tubing (P.C.T.)

1. Solder Fittings for Use with P.C.T. shall be wrought or cast brass fittings in accordance with ASME B16.18 or ASME B16.22.

2. Soldered joints for copper tubing shall be made with 95-5 (tin and antimony) solder in accordance with ASTM Specification B32. No other solder is to be used for any purpose on the job.

3. Solder must meet the requirements of the Federal Safe Drinking Water Act and NSF Standard 61.

4. Fittings for P.C.T. or brass pipe where brazed joints are required shall be bronze fittings or wrought copper fittings designed for use with the scheduled pipe or tubing in accordance with ASME B16.18 and ASME B16.22.

D. Flanges and Flanged Fittings

1. The pressure-temperature rating of the pipe flanges shall match the pressure-temperature rating of the flanges on the equipment to which the piping connects.

2. Flanges for stainless steel piping shall be Class 150, forged one-piece raised face weld neck steel flanges. Slip-on flanges will not be accepted.

3. Copper piping flanges shall be Class 150, slip-on bronze flanges.

4. Flanged fittings for D.I.W.P. shall be in accordance with AWWA C-115.

5. Flanges and flanged fittings for bronze pipe shall be of the required working pressure, as scheduled.

6. Do not use cast iron screw-on flanges in pump discharge piping. For this service, use cast steel, ductile iron or copper flanges.

E. Elbows

1. All elbows shall be of long radius pattern except where space conditions do not permit.

2. Copper elbows shall be full-flow type wrought copper in accordance with ASTM B-75 alloy C12200. Fittings for 5 in. (125 mm) and 6 in. (150 mm) copper pipe shall be cast bronze in accordance with ASTM B-584-7 requirements.

F. Gaskets: Gaskets used in domestic cold, hot water systems shall be Grade “E” EPDM rated for a maximum temperature of 230°F (110°C) and maximum pressure of 400 psig (27.5 bar).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify existing conditions prior to starting work.

C. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto.

D. Wherever this Contractor’s work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to ensure that all Contractors have the information necessary to properly install all the necessary connections and equipment. Identify all work items in an approved manner in order that the Ceiling Trade may know where to install access doors and panels.

E. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

3.2 INSTALLATION

A. All piping and materials shall be as specified herein and shall be installed in accordance with the latest industry standards, per the manufacturer’s recommendations, and as indicated on the drawings.

B. All piping shall be made up and installed in a manner that permits expansion and contraction caused by changes in temperature and pressure. This shall be accomplished by the use of expansion loops as required and as shown on the drawings, and by installation of supports that will permit the movement of the pipe without undue stress, and by any other precautions that might be deemed necessary by the Engineer.

C. Run and arrange piping approximately as indicated on the Construction Documents and as coordinated with other trades.

D. Install piping as neatly spaced, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes.

E. Erect all risers plumb and true, parallel with walls and other pipes.

F. Ream all pipe smooth before installation. Do not bend, split, flatten nor otherwise injure pipe.

G. The Contractor shall provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

H. The Contractor shall provide all water hammer arresters necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

I. The Contractor shall provide all trap primers for floor drains necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

J. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

K. It is the responsibility of this Contractor for accurately laying out the work. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

L. No piping shall pass over high voltage (440V) electrical bus duct or switchgear equipment. Where required, provide protective pans under or over individual pipes and construct the pans of 16 gauge stainless steel with a 6 in. (150 mm) lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-O-Leum paint and support with pipe hangers and drain clear of the equipment below.

M. Route piping in an orderly manner parallel and perpendicular to walls maintaining gradient and headroom without interfering with use of space or taking more space than necessary. Whenever practical group piping at common elevations.

N. Furnish and install sleeves for pipe passing through roofs, partitions, walls and floors. Piping penetrating roofs must maintain integrity of roof assembly.

O. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

P. Provide clearance in hangers and from structure and other equipment for installation and access to water hammer arresters and trap primers.

Q. Install valves in accordance with the specifications and provide access where valves and fittings are not accessible. Coordinate size and location of access doors with valves.

R. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

S. All trap primers shall be of the sizes indicated and shall be routed as indicated on the drawings, or as required, to prevent trap evaporation of floor drains.

T. All water hammer arresters shall be of the sizes indicated according to the manufacturer's requirements and shall be installed as required by the Authority Having Jurisdiction, as indicated on the drawings, or as required to avoid water hammer in the system due to quick-closing devices, equipment and solenoid valves.

U. All piping shall be carefully graded so as to eliminate traps and pockets. Provide means for drainage by valved connections with pipe plugs for water traps.

V. A gate or ball valve shall be installed on each domestic hot and/or cold water riser and for each branch off the riser.

W. Piping exposed in all rooms shall be installed as nearly as possible parallel with or at right angles to the building walls. Install all pipe straight and true. Springing or forcing piping into place will not be permitted unless specifically called for. Install piping in such a manner as to prevent strain on equipment connections. Install piping in such a manner as to eliminate all static and dynamic conditions of loading on equipment connections.

X. Piping in finished portions of the building, except in mechanical equipment rooms or where otherwise indicated on the Drawings, shall be concealed.

Y. Install unions or flanges at all equipment connections and elsewhere as indicated on the Drawings. Unions shall be of the same pressure rating as the respective piping system and shall be of the ground joint type.

Z. All piping shall be of the sizes indicated and shall be routed as indicated on the Drawings, or as required, to serve all equipment and systems.

AA. Provide valves and drain valves on branches to wall hydrants and sill cocks.

BB. Pitch all piping to low points. Provide all low points and any pockets caused by changes in elevation required by structural or other interferences with 1/2 in. (13 mm) drain valve capped with a screwed nipple. Provide drain valves at the base of all risers.

CC. Where hot and cold water supply pipes connect to a combination supply fitting with a shutoff valve on its discharge, or the combination supply fitting is equipped with manual or thermostatic mixing valve, equip each hot and cold water supply pipe with composition disc, swing check valve ahead of the supply fitting.

DD. Install approved type of vacuum breakers and/or check valves or backflow preventers, as herein specified, on all equipment and fixture connections required by code, indicated on the drawings, as specified, or as required for the proper functioning of the equipment. Provide all hose threaded faucets and serrated tips with vacuum breakers.

EE. Brazed Piping

1. Filler metal shall conform with the requirements of the latest edition of ANSI/AWS A5.8 Specifications for Brazing Filler Metal with the following classifications: BCuP-2, BCuP-3, BCuP-4, BCuP-5, BAg-5 or BAg-7.

2. Flux shall be compatible with the materials brazed and with the filler metal used and shall conform to the requirements of the latest edition of ANSI/AWS A5.31 Specifications for fluxes for Brazing and Braze Welding. All flux residue must be removed after joint is completed.

3. Brazing shall be performed in accordance with the Copper Tube Handbook of the Copper Tube Development Association as well as the latest edition of ANSI/AWS B2.2 Standard for Brazing Procedure and Performance and ANSI/AWS C3.4 Specifications for Torch Brazing.

4. All joints shall be made by personnel meeting the requirements of ASME Boiler Pressure Vessel Code, Section IX.

FF. Soldered Piping

1. Filler metal shall conform with the requirements of the latest edition of ASTM B 32 Specifications for Solder Metal.

2. All joints, except for refrigerant piping, shall be made with 95% tin and 5% antimony solder, having a melting point of not less than 460°F (238°C). Refrigerant piping joints shall be made with silver solder.

3. All soldered joints shall be thoroughly cleaned before the application of the solder. Flux shall be compatible with the materials brazed and with the filler metal used and shall conform with the requirements of the latest edition of ASTM B 813 Specifications for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Tube. All flux residue must be removed after joint is completed.

4. Soldered joints shall be assembled in accordance with the Copper Tube Handbook of the Copper Tube Development Association and ASTM B 828 Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

5. All soldered joints for tubing larger than 2 in. (50 mm) in size shall be made with the simultaneous application of two or three blow torches.

3.3 CLEANING

A. During construction, properly cap all lines, so as to prevent the entrance of sand, dirt, etc. Each system of piping shall be blown through after completion (for the purpose of removing grit, dirt, sand, etc., from coils and piping), for as long a time as required to thoroughly clean the apparatus.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all domestic water piping and appurtenances in suitable condition, before final acceptance.

C. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting to prevent obstruction and damage.

D. Protect the system against freezing in cold weather.

E. The Contractor shall furnish all required pipe cleaning chemicals, chemical feed equipment, materials, and labor necessary to sterilize the domestic water piping as herein specified. In addition, the Contractor shall permanently install necessary chemical injection fittings complete with stop valves, etc.

F. After each hydrostatic leak testing procedure is complete, drain the system until empty. Liquid for hydrostatic testing of domestic water systems shall be clean domestic water from the municipal water supply.

G. All domestic water piping and tanks shall be thoroughly flushed.

H. Upon completion of the flushing operation, samples shall be tested by a Department of Health recognized laboratory. If samples show bacterial contamination, sterilize the potable water system in accordance with the New York City Plumbing Code, Chapter 6, Section PC610.

I. Under no circumstances shall the Contractor permit the use of any portion of the domestic water system until it has been properly sterilized and certified same by the local water department or the Authorities Having Jurisdiction.

J. A minimum of two (2) weeks' notice shall be given to the Engineer and Owner prior to testing and sterilization.

3.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations, and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all piping, hangers, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

D. Inspect all water hammer arresters and trap primers for installation according to the manufacturer's instructions.

E. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

F. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

G. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

H. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

3.5 FIELD QUALITY CONTROL

A. Quality control must comply with Section 01 40 00 - Quality Requirements *and* Section 01 73 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

3.6 FIELD TESTS

A. Performance Test

1. Allow sufficient time to perform all tests, adjustments, necessary to place the various systems in final operation condition, verify performance requirements and check all safety devices. Labor and instruments, required for various tests shall be provided. See that all manufacturers' representatives necessary to check and adjust various systems are present with sufficient labor to perform all this work without delay. All test data shall be recorded on suitable forms and submitted to the Owner for approval.

2. A qualified representative of the equipment manufacturer shall be present at the test. The Engineer may witness tests, if he so desires. The Contractor shall notify the Engineer and Owner in writing, at least two (2) weeks prior to the day of the test.

3. Test all systems before any paint is applied, piping is insulated, furred in or otherwise covered.

4. Test all systems in full accordance with applicable Municipal requirements, but in no case shall the system be tested at less than 150 psig (10.5 bar) hydrostatic pressure or 50 psig (3.5 bar) above the normal operating pressure, whichever is greater. Apply the test for a minimum of two (2) consecutive hours with no loss in pressure. Prior to applying the hydrostatic test, the system shall be tested with 50 psig (3.5 bar) compressed air for a period of ten minutes with no loss in pressure.

5. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

B. Integrated Test

1. Reserved.

C. Final Acceptance Test

1. The Owner and/or the Owner's representatives will make final check of all systems only after the Contractor has completed and returned to the Owner or Owner's representatives all recorded test data, together with letter that his work is to the best of his knowledge 100% complete. Field performance tests will be required by the Owner and/or the Owner's representatives at this time to verify performance and workmanship, and to make final system component adjustments.

2. Points and areas for recheck shall be selected by the Owner's representative.

3. Measurements and tests shall be same as the original test procedures.

4. After satisfactory passing of the field tests and after all necessary adjustments have been made, test the complete systems for a minimum of seven (7) days under regular operating conditions or as long as may be required to establish compliance with Contract Documents.

5. The Contractor shall demonstrate to the Engineer and the Owner, prior to acceptance by the Owner, that all systems and/or equipment has been balanced and adjusted properly, and that the system and/or equipment is in compliance with the Contract Documents.

6. Test all trap primer valves for proper operation and filling of floor drain traps before final acceptance by the Owner.

7. Test all water hammer arresters to ensure there is no pulsation or water hammer in the system due to equipment operation and other quick-closing devices before final acceptance by the Owner.

D. Commissioning: Owner or Commissioning Agent shall witness all hydrostatic tests.

3.7 ADJUSTING AND BALANCING

A. Upon completion of piping, hangers for piping and at equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping or the equipment that it is connected to.

B. Securely tighten clevis hanger load nuts first to ensure proper hanger performance. Tighten top nut after adjustment.

C. All equipment, valves, quick closing devices and the like shall be adjusted in accordance with manufacturers' recommendations to function properly with capacities required and/or specified.

D. Adjust all fixture stops so that flush valves, faucets, equipment and other fixtures work quietly and efficiently before final acceptance by the Owner.

E. Adjust circulating system balancing valves so that the system is properly balanced and design temperatures are maintained under closed system conditions, before final acceptance by the Owner.

END OF SECTION

SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all sanitary waste, vent and indirect waste piping required for the project as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Material of piping systems.

2. Pipe joints and fittings.

3. Specialty pipe fittings.

4. System material schedule.

5. Traps.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All sanitary waste, vent and indirect waste piping shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American Society of Mechanical Engineers

1) ASME A112.3.1: Stainless Steel Drainage Systems for Sanitary DWV, Storm and Vacuum Applications, Above and Below Ground.

2) ASME B16.1: Cast Iron Pipe Flanges and Flanged Fittings.

3) ASME B16.3: Malleable Iron Threaded Fittings.

4) ASME B16.4: Gray Iron Threaded Fittings.

5) ASME B16.5: Pipe Flanges and Flanged Fittings.

6) ASME B16.12: Cast Iron Threaded Drainage Fittings.

7) ASME B16.15: Cast Bronze Threaded Fittings.

8) ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.

9) ASME B16.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

10) ASME B16.23: Cast Copper Alloy Solder Joint Drainage Fittings DWV.

11) ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tubes.

12) ASME B16.29: Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings DWV.

13) ASME B31.9: Building Services Piping.

14) ASME Section IX: Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

b. ASTM International

1) ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2) ASTM A74: Standard Specification for Cast Iron Soil Pipe and Fittings.

3) ASTM A888: Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary, Storm Drain, Waste and Vent Piping Applications.

4) ASTM B42: Specification for Seamless Copper Pipe, Standard Sizes.

5) ASTM B43: Specification for Seamless Red Brass Pipe, Standard Sizes.

6) ASTM B75/B75M: Standard Specification for Seamless Copper Tube.

7) ASTM B88/B88M: Standard Specification for Seamless Copper Water Tube.

8) ASTM B251: Specification for General Requirements for Wrought Seamless Copper and Copper Alloy Tube.

9) ASTM B302: Specification for Threadless Copper Pipe, Standard Sizes.

10) ASTM B306: Standard Specification for Copper Drainage Tube (DWV).

11) ASTM B813: Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.

12) ASTM B828: Standard Specification for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

13) ASTM C564: Standard Specification for Rubber Gaskets for Joining Cast Iron Soil Pipe and Fittings.

14) ASTM C1277: Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

15) ASTM C1540: Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

c. American Welding Society

1) AWS A5.8: Specification for Filler Metals for Brazing and Braze Welding.

2) AWS D1.1: Structural Welding Code - Steel.

d. Cast Iron Pipe Institute

1) CISPI 301: Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary, Storm Drain, Waste and Vent Piping Applications.

2) CISPI 310: Standard Specification for Couplings in use with Hubless Cast Iron Soil Pipe and Fittings for Sanitary, Storm Drain, Waste and Vent Piping Applications.

e. Manufacturers Standardization Society

1) MSS SP-6: Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2) MSS SP-9: Spot Facing for Bronze, Iron and Steel Flanges.

3) MSS SP-43: Wrought Stainless Steel Butt-welding Fittings.

4) MSS SP-44: Steel Pipe Line Flanges.

5) MSS SP-73: Brazing Joints for Copper and Copper Alloy Pressure Fittings.

6) MSS SP-83: Steel Pipe Unions Socket-Welding and Threaded.

7) MSS SP-97: Forged Carbon Steel Branch Outlet Fittings-Socket Welding, Threaded and Butt-welding Ends.

8) MSS SP-104: Wrought Copper Solder Joint Pressure Fittings.

9) MSS SP-106: Cast Copper Alloy Flanges and Flanged Fittings (Class 125, 150 and 300).

10) MSS SP-123: Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube.

f. National Sanitation Foundation

1) NSF Standard 61: Drinking Water System Components.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of pipe and fitting materials, complete with typical mill reports.

2. Schedule of pipe and fitting materials identifying the system and location, which the products are intended to be used.

3. Copper, brass, stainless steel, cast iron and ductile iron pipe and fittings.

4. Heavy duty no-hub couplings and gaskets for cast iron soil pipe.

5. Cut or roll-grooved couplings and fittings.

6. Threaded brass or bronze fittings.

7. Copper, brass, stainless steel, cast iron and ductile iron pipe flanges and gaskets.

B. Product Data: Submit manufacturer's literature including general assembly, for each type of product indicated. Include all piping, fittings, mechanical couplings, flanges, solder and dimensional characteristics.

C. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

D. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for all products submitted.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

B. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

C. Make every effort to furnish all piping material from one manufacturer.

D. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A Materials Safety Data Sheet (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

E. To ensure uniformity and compatibility of piping components in grooved in piping system all grooved products and grooving tools must be the products of a single manufacturer.

F. The manufacturer of grooved piping fittings shall provide on-site training for Contractor's field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

G. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All piping, fittings, flanges, couplings and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. All pipe, fittings, mechanical couplings, flanges and accessories shall be tested in accordance with the latest applicable industry standards before accepting delivery at the jobsite.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

D. Store all products and materials off floors on raised platforms to protect from water damage.

E. Products and materials, which have been exposed to water damage shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Certain materials will be furnished, installed, or furnished and installed, under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general construction drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

E. Should the Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

F. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Contractor to coordinate, protect and schedule his work with other trades in accordance with the construction sequence.

G. Architectural drawings shall be checked for ceiling height requirements.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a one (1) year manufacturer's warranty for the entire sanitary waste, drainage and venting system.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Copper Pipe, Tube and Fittings

1. American Brass Co.
2. Bridgeport Brass.
3. Chase Brass.
4. Elkhart Products Corp.

5. Lewin Matheis.
6. Mueller Industries.
7. Phelps Dodge.
8. Reading Tube Corp.
9. Revere.
10. Wolverine Tube Co.

D. Cast Iron Pipe and Fittings

1. ABI Foundry Company.
2. Charlotte Pipe & Foundry.
3. Tyler Pipe & Foundry.

E. No-Hub Heavy Duty Couplings

1. Husky Heavy Duty Couplings.
2. Mission Heavy Weight Couplings.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the Work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. All pipe material shall be as specified herein and shall be installed as specified. The Contractor shall submit to the Engineer for review a list of the proposed manufacturers of pipe and fittings.

E. All piping materials, fittings and couplings shall be of Unites States origin and manufactured in accordance with the latest applicable standards for its intended use.

2.3 MATERIALS OF PIPING SYSTEMS

A. Use the following materials in the various piping systems, in accordance with Article 2.7 - System Material Schedule and the Construction Documents.

B. Cast Iron No-Hub (C.I.N.H.)

1. Cast Iron Hubless Pipe shall be standard weight coated cast iron hubless pipe manufactured from gray cast iron with a tensile strength not less than 21,000 psi, in accordance with ASTM Specification A74 and CISPI 301.

2. Each length shall be marked with the size, weight per foot and manufacturer's name clearly cast or stamped on each length.

3. Pipe shall be manufactured by a member of the Cast Iron Soil Pipe Institute (CISPI).

C. Cast Iron Soil Pipe (C.I.S.P.)

1. Cast Iron Soil Pipe shall be service weight coated cast iron soil pipe, hub and spigot type manufactured from gray cast iron with a tensile strength not less than 21,000 psi, in accordance with ASTM Specification A74.

2. Each length shall be marked with the size, weight per foot and manufacturer's name clearly cast or stamped on each length.

3. Pipe shall be manufactured by a member of the Cast Iron Soil Pipe Institute (CISPI).

D. Non-Pressure Copper Tubing (N.P.C.T.)

1. Indirect waste copper tubing shall be seamless drawn or extruded tubing Type "L" or "K" as scheduled or hard temper DWV copper drainage tubing.

2. Seamless drawn or extruded tubing shall be in accordance with ASTM Specification B42 and or ASTM Specification B88*/B88M*.

3. Non-pressure hard temper Type DWV copper drainage tubing shall be furnished in 20 foot straight lengths, in accordance with ASTM Specification B306.

2.4 PIPE JOINTS AND FITTINGS

A. All fittings shall be of a type, which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends.

B. Use the following materials in the various piping systems, in accordance with construction documents.

C. Cast Iron No-Hub (C.I.N.H.)

1. Cast iron no-hub fittings shall be standard weight coated cast iron hubless drainage fittings manufactured from gray cast iron with a tensile strength not less than 21,000 psi, in accordance with ASTM Specification A74 and CISPI 301.

2. Cast iron no-hub fittings shall be joined with "Heavy Duty" no-hub couplings constructed of a shielded coupling.

3. Couplings shall be constructed of Type 304 stainless steel with 305 stainless steel worm drive screws and comply with ASTM Specification C1540.

4. The gasket material shall be neoprene and conform to ASTM Specification C564,

5. The coupling assembly shall be torqued to manufacturer's specified requirements.

6. Heavy duty no-hub couplings shall be Husky "Heavy Duty" SD4000 coupling.

D. Cast Iron Soil Pipe (C.I.S.P.)

1. Cast iron soil pipe fittings shall be service weight, coated cast iron bell and spigot type manufactured from gray cast iron with a tensile strength not less than 21,000 psi, in accordance with ASTM Specification A74.

2. Cast iron soil fittings shall be joined by elastomeric compression gaskets.

3. Gaskets shall be Tyler "TY-Seal" neoprene elastomeric compression type gaskets conforming to ASTM Standard C564.

E. Non-Pressure Copper Tubing (N.P.C.T.)

1. Solder Fittings for Use with N.P.C.T. shall be wrought, cast brass or DWV drainage fittings in accordance with ASME B16.18, ASME B16.22, ASME B16.23 or ASME B16.29.

2. Soldered joints for copper tubing shall be made with 95-5 (tin and antimony) solder in accordance with ASTM Specification B32. No other solder is to be used for any purpose on the job.

3. Fittings for N.P.C.T. or brass pipe where brazed joints are required shall be bronze fittings or wrought copper fittings designed for use with the scheduled pipe or tubing in accordance with ASME B16.18, ASME B16.22, ASME B16.23 or ASME B16.29.

2.5 SYSTEM MATERIAL SCHEDULE

Service	Size	Pipe Type	Weight	Fitting Type
Sanitary and Vent Branch Piping	2 in. (50 mm) through 10 in. (250 mm)	Cast Iron No-Hub	Service Weight	Heavy Duty No-Hub Couplings
Indirect Waste Branches (DWV)	All	Seamless Drawn Copper Tube	Type L	Wrought Copper - Soldered

2.6 TRAPS

A. Sanitary Systems

1. Traps greater than 2 in. (50 mm) used in the sanitary system shall be cast brass, cast iron and/or galvanized cast iron, one-piece pattern, 3 in. (75 mm) minimum seal, of the same material and coating and/or finish as the piping system in which they are installed.

2. All traps buried in earth shall be cast iron, one-piece pattern with a 3 in. (75 mm) minimum seal.

3. Traps less than 2 in. (50 mm), not buried in earth shall be cast brass.

4. Fixture traps shall be cast brass one-piece “P” traps with 2 in. (50 mm) minimum trap seal and gasketed cleanout plugs made of machined bar stock.

5. Locate traps per code requirements.

6. Floor drain traps for use with pressurized waste discharge shall be cast iron and/or galvanized cast iron, one-piece pattern, 3 in. (75 mm) minimum seal, of the same material and coating and/or finish as the piping system in which they are installed. Each trap shall be provided with additional support consisting of unistrut or kindorf, two (2) hanger rods, and be supported from the slab above.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify existing conditions prior to starting work.

C. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto.

D. Wherever this Contractor’s work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to ensure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items in an approved manner in order that the Ceiling Trade may know where to install access doors and panels.

E. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

3.2 INSTALLATION

A. All piping and materials shall be as specified herein and shall be installed in accordance with the latest industry standards, per the manufacturer’s recommendations, and as indicated on the drawings.

B. Run and arrange piping approximately as indicated on the construction documents and as coordinated with other trades.

C. Install piping as neatly spaced, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes.

D. Erect all risers plumb and true, parallel with walls and other pipes.

E. Ream all pipe smooth before installation. Do not bend, split, flatten nor otherwise injure pipe.

F. The Contractor shall provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

G. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

H. It is the responsibility of this Contractor for accurately laying out the work. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

I. No piping shall pass over high voltage (440V) electrical bus duct or switchgear equipment. Where required, provide protective pans under or over individual pipes and construct the pans of 16 gauge stainless steel with a 6 in. (150 mm) lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-O-Leum paint and support with pipe hangers and drain clear of the equipment below.

J. Route piping in an orderly manner parallel and perpendicular to walls maintaining gradient and headroom without interfering with use of space or taking more space than necessary. Whenever practical group piping at common elevations.

K. Furnish and install sleeves for pipe passing through roofs, partitions, walls and floors. Piping penetrating roofs must maintain integrity of roof assembly.

L. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

M. All piping shall be carefully sloped so as to eliminate traps and pockets.

N. Piping exposed in all rooms shall be installed as nearly as possible parallel with or at right angles to the building walls. Install all pipe straight and true. Springing or forcing piping into place will not be permitted unless specifically called for. Install piping in such a manner as to prevent strain on equipment connections. Install piping in such a manner as to eliminate all static and dynamic conditions of loading on equipment connections.

O. Piping in finished portions of the building, except in mechanical equipment rooms or where otherwise indicated on the Drawings, shall be concealed.

P. All piping shall be of the sizes indicated and shall be routed as indicated on the Drawings, or as required, to serve all equipment and systems.

Q. Fixtures shall be vented as indicated on the drawings and as required by local codes.

R. In each change of direction of soil and waste piping, provide a clean-out plug connected to same with Y fittings and 45° ell made flush with floor or wall.

S. In all horizontal straight runs more than 50 feet (15.25 m) of length, provide at least one clean-out for each 50 feet (15.25 m) of length.

T. Where pipe is buried, cleanouts shall be brought up flush with floor or grade unless otherwise shown on the drawings. The locations of all clean-outs shall be verified with the Architect.

U. All cleanouts shall be of the same size as the pipe up to and including pipe 4 inches in diameter.

V. Provide access doors in general construction for clean-outs installed in concealed locations.

W. All back vents shall be taken off as near traps as possible and permitted by code.

X. All drainage lines shall have at least the minimum slope toward the main sewer as required by the local plumbing code. Pipe must be so laid that the slope will be continuous. Permission shall be secured from the engineer before proceeding with any work where existing conditions prevent the installation at the minimum grade specified.

Y. The sewage and drainage work shall be complete and ready for use including all reducers, increases, special flanges and fittings, where required between the piping work and fixtures.

Z. All horizontal pipe throughout the building, including that in pipe spaces and attics, shall be thoroughly and substantially supported from the building construction by means of approved expansion ring hangers or clevis hangers at each joint. Hangers shall be spaced in accordance with Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

AA. All pipe shall be straight and have uniform fall.

BB. All vertical pipes shall be substantially supported at each floor level with approved steel or iron riser clamps.

CC. Provide sway bracing for all sanitary house drain piping which is supported greater than 2 ft. (0.6 m) from the slab above, measured from the top of the pipe.

DD. Provide additional rod and banding at each joint for all sanitary house drain offsets consisting of riser clamps and threaded rod to anchor all fittings in the horizontal offset. This method of anchoring and support shall be provided in addition to the sway bracing described in the paragraph above.

EE. Bell and Spigot Piping

1. Bell and spigot piping shall be joined with elastomeric compression gaskets as specified.

2. Joints shall be cleaned free from dirt, mud, sand, gravel or foreign materials.

3. The gasket shall be folded and inserted into the hub completely, with the flange of the gasket remaining outside of the hub.

4. Lubricate the joint and compress the piping into the joint so the spigot end of the pipe bottoms out in the hub.

FF. Hubless Cast Iron Piping

1. Hubless cast iron piping shall be joined with heavy duty no-hub couplings as specified.

2. Joints shall be cleaned free from dirt, mud, sand, gravel or foreign materials.

3. The gasket shall be installed on one end of the pipe or fitting and the stainless steel clamp and shield on the other end.

4. Firmly seat the pipe or fitting ends against the center stop of the gasket and slide the shield into position over the gasket.

5. The stainless steel bands shall be tightened using a calibrated torque wrench set to the manufacturer's recommended settings. Bands shall be in sequence according to the manufacturer's recommendations.

GG. Soldered Piping

1. Filler metal shall conform with the requirements of the latest edition of ASTM B 32 Specifications for Solder Metal.

2. All joints, except for refrigerant piping, shall be made with 95% tin and 5% antimony solder, having a melting point of not less than 460°F (238°C). Refrigerant piping joints shall be made with silver solder.

3. All soldered joints shall be thoroughly cleaned before the application of the solder. Flux shall be compatible with the materials brazed and with the filler metal used and shall conform with the requirements of the latest edition of ASTM B 813 Specifications for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Tube. All flux residue must be removed after joint is completed.

4. Soldered joints shall be assembled in accordance with the Copper Tube Handbook of the Copper Tube Development Association and ASTM B 828 Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

5. All soldered joints for tubing larger than 2 inches (50 mm) in size shall be made with the simultaneous application of two (2) or three (3) blow torches.

3.3 CLEANING

A. During construction, properly cap all lines, so as to prevent the entrance of sand, dirt, etc. Each system of piping shall be blown through after completion for as long a time as required to thoroughly clean the apparatus.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all sanitary piping and appurtenances in suitable condition, before final acceptance.

C. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting to prevent obstruction and damage.

D. Protect the system against freezing in cold weather.

E. After each hydrostatic leak testing procedure is complete, drain the system until empty. Liquid for hydrostatic testing of sanitary systems shall be clean domestic water from the municipal water supply.

3.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations, and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all piping, hangers, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

D. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Notify the Architect and Inspectors having jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these Specifications for such equipment.

3.5 FIELD TESTS

A. Performance Test

1. Allow sufficient time to perform all tests, adjustments, necessary to place the various systems in final operation condition, verify performance requirements and check all safety devices. Labor and instruments, required for various tests shall be provided. See that all manufacturers' representatives necessary to check and adjust various systems are present with sufficient labor to perform all this work without delay. All test data shall be recorded on suitable forms and submitted to the Owner for approval.

2. A qualified representative of the equipment manufacturer shall be present at the test. The Engineer may witness tests, if he so desires. The Contractor shall notify the Engineer and Owner in writing, at least two (2) weeks prior to the day of the test.

3. Test all systems before any paint is applied, piping is insulated, furred in or otherwise covered.

4. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors having jurisdiction.

5. Hubless Cast Iron and Bell and Spigot Cast Iron

a. Subject the drains, waste, and vent piping inside the building to a water test. The water test shall include the entire system from the lowest point to the highest pipe above the roof.

b. Water test shall be made in accordance with all local requirements.

c. The system shall be tested to a hydrostatic pressure equivalent to at least a 10 foot (3 m) head of water.

d. After filling, shut off water supply and allow it to stand two (2) hours, under test, during which time there shall be no loss or leakage.

6. Drainage Piping with Mechanical or Welded Joints

a. Subject the drainage piping to a hydrostatic test, but in no case shall the system be tested at less than 150 psig (10.5 bar) hydrostatic pressure where mechanical or welded joints are installed.

b. Apply the test for a minimum of two (2) consecutive hours with no loss in pressure.

c. Prior to applying the hydrostatic test, the system shall be tested with 50 psig (3.5 bar) compressed air for a period of ten minutes with no loss in pressure.

B. Final Acceptance Test

1. The Owner and/or the Owner's representatives will make final check of all systems only after the Contractor has completed and returned to the Owner or Owner's representatives all recorded test data, together with letter that his work is to the best of his knowledge 100% complete. Field performance tests will be required by the Owner and/or the Owner's representatives at this time to verify performance and workmanship, and to make final system component adjustments.

2. Points and areas for recheck shall be selected by the Owner's representative.

3. Measurements and tests shall be same as the original test procedures.

4. After satisfactory passing of the field tests and after all necessary adjustments have been made, test the complete systems for a minimum of seven (7) days under regular operating conditions or as long as may be required to establish compliance with Contract Documents.

5. The Contractor shall demonstrate to the Engineer and the Owner, prior to acceptance by the Owner, that all systems and/or equipment has been balanced and adjusted properly, and that the system and/or equipment is in compliance with the Contract Documents.

C. Commissioning: Owner or Commissioning Agent shall witness all hydrostatic tests.

3.6 ADJUSTING AND BALANCING

A. Upon completion of piping, hangers for piping and at equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping or the equipment that it is connected to.

B. Securely tighten clevis hanger load nuts first to ensure proper hanger performance. Tighten top nut after adjustment.

END OF SECTION

SECTION 222000

FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all natural gas piping required for the project as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

a. Alarm devices.

b. Material of piping systems.

c. Miscellaneous accessories.

d. Pipe joints and fittings.

e. System material schedule.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All natural gas piping shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fuel Gas Code.

c. New York City Plumbing Code.

2. Reference Standards: All pipe, valves, fittings and accessories shall be designed, manufactured and tested in accordance with the applicable industry standards, including the following:

a. American Society of Mechanical Engineers

1) ASME A13.1: Scheme for the Identification of Piping Systems.

2) ASME B1.20.1: General Purpose Pipe Threads.

3) ASME B16.1: Gray Iron Pipe Flanges and Flanged Fittings.

4) ASME B16.3: Malleable Iron Threaded Fittings.

5) ASME B16.4: Gray Iron Threaded Fittings.

6) ASME B16.20: Metallic Gaskets for Pipe Flanges.

7) ASME B16.25: Buttwelding Ends.

8) ASME B31.1: Power Piping.

9) ASME B36.10/10M: Welded and Seamless Wrought Steel Pipe.

b. ASTM International

1) ASTM A53/53M: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2) ASTM A106: Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

c. American Water Works Association

1) AWWA C111: Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

d. Manufacturers Standardization Society

1) MSS SP6: Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

e. National Fire Protection Association (NFPA)

1) NFPA 54: National Fuel Gas Code.

2) NFPA 72: National Fire Alarm Code.

3) NFPA 101: Life Safety Code.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the conditions of the Contract, Division 01 and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of pipe and fitting materials, complete with typical mill reports.

2. Schedule of pipe and fitting materials identifying the system and location in which the products are intended to be used.

3. Pipe cleaning certification.

4. Steel pipe, fittings, pipe flanges and gaskets.

B. Product Data: Submit manufacturer's literature, including general assembly, for each type of product indicated. Include all piping, fittings, flanges and dimensional characteristics.

C. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

D. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for all products submitted.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

F. Welders' Certificate: Submit welders' certification of compliance with ASME Section IX and AWS D1.1 prior to proceeding with any welding.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

F. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A Materials Safety Data Sheet (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

G. All welded gas piping shall be subject to special inspection in accordance with the New York City Building Code.

H. The Contractor must maintain on site current copies of each welder or welding operator's Procedure Qualification Record.

I. All welds shall bear the identifying number, letter or symbol of the welder or welding operator.

J. Maintain one (1) copy of the approved submittals for each product on site.

1.6 FACTORY TESTING

A. All piping, fittings, flanges and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. All pipe, fittings, flanges and accessories shall be tested in accordance with the latest applicable industry standards before accepting delivery at the job site.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

D. Store all products and materials off floors on raised platforms to protect from water damage.

E. Products and materials, which have been exposed to water damage shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Certain materials will be furnished, installed, or furnished and installed under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general construction drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

E. Furnish and set all sleeves for passage of pipes through structural masonry and concrete walls and floors and elsewhere as required for proper protection of each pipe passing through building surfaces. Coordinate this work with the Construction Manager in order to expedite and properly perform this work.

F. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this section shall be coordinated through the Construction Manager and must be approved by the Structural Engineer.

G. Should the Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

H. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Contractor to coordinate, protect and schedule his work with other trades in accordance with the construction sequence.

I. Architectural drawings shall be checked for ceiling height requirements.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a one (1) year manufacturer's warranty for the entire natural gas piping system.

C. Warranty period shall commence upon final acceptance by the Owner.

D. PRODUCTS

1.10 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a letter of equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Emergency Gas Shutoff Valves

1. ASCO.

2. Fisher Regulator.

3. Maxon Corp.

4. Sensus Corp.

D. Pressure Regulators

1. Fisher Regulator.

2. Maxitrol Co.

3. Sensus Corp.

E. Overpressure Protection Devices

1. Fisher Regulator.

2. Maxitrol Co.

3. Sensus Corp.

F. Steel Pipe and Fittings

1. Allied Pipe & Tube.

2. Anvil International.

3. U.S. Steel

4. Wheatland Pipe.

1.11 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. All piping materials, fittings and flanges shall be of Unites States origin and manufactured in accordance with the latest applicable standards for its intended use.

E. All natural gas piping and equipment shall be identified in accordance with ASME A13.1 and Section 22 05 53 - Identification for Plumbing Piping and Equipment.

F. Branch piping taken off of a riser shall not be taken off with less than a 2-elbow swing.

G. A sediment trap or drip leg shall be installed downstream of each appliance shutoff valve as close to the inlet of the appliance as practical.

1.12 ALARM DEVICES

A. Provide all alarm devices directly connected to equipment and piping required for a complete system and for the transmission of local alarms to the building management and fire alarm system.

B. Switches shall be normally open or closed type in order to conform with the alarm system to which they are connected.

C. All interconnecting electrical wiring will be furnished under Division 26.

D. Provide the following alarm switches for the natural gas piping system:

1. High-pressure alarm for each pressure regulator.

2. High-pressure alarm for each backpressure regulator or relieving device.

3. High-pressure alarm and position monitoring for each emergency gas shutoff valve.

4. High-pressure alarm and position monitoring for each automatic gas shutoff valve.

1.13 MATERIALS OF PIPING SYSTEMS

A. Use the following materials in the various piping systems, in accordance with Article 2.7 - System Material Schedule and the Construction Documents.

B. Steel Piping

1. Steel pipe shall be seamless or welded steel pipe in accordance with the latest issue of ASTM A53, A106 or ASME B36.10M.

2. Pipe shall be Schedule 40, black steel pipe as scheduled.

3. Each length shall be hydrostatically tested at the mill and the producer's certification of said tests shall be furnished.

4. Pipe working pressures, test pressures and finish shall be as scheduled or as indicated on the construction documents.

5. Piping exposed to weather or used for direct burial in earth shall be provided with a protective coating that is corrosion resistant or be mill wrapped black steel piping suitable for the environment, which it is installed.

1.14 MISCELLANEOUS PIPING ACCESSORIES

A. Emergency Gas Shutoff Valves

1. Furnish and install emergency gas shut off valves as required to stop the flow of gas to an appliance, equipment room or area as indicated on the construction documents and as required by the Authorities Having Jurisdiction.

2. All emergency gas shutoff valves shall be able to be remote and manually controlled as well as supervised by either the building management system or fire alarm system.

3. All gas shutoff valves shall be constructed of a material and pressure rating compatible with the piping system and shall be capable to be mounted in any orientation.

4. An emergency gas shutoff valve shall be provided on the gas supply outside of any room containing equipment or appliances utilizing gas at a pressure of 15 psig (1 bar) or above.

5. The emergency gas shutoff valve shall be controlled from a break-glass station outside of the room served and from the gas detection system monitoring the room.

6. The emergency shutoff valve shall be capable of transmitting the position of the valve (open or closed) to the building management and/or fire alarm system.

7. A gas detection system shall activate the emergency gas shutoff valve to stop the gas flow to the affected area.

8. Manual bypasses shall not be permitted.

9. Emergency gas shutoff valves shall be manufactured by Maxon Valve Corp. with the following requirements:

a. The valve shall be an eletro-mechanical gas shutoff valve constructed of cast iron in accordance with ASTM A126, carbon steel in accordance with ASTM A216 or stainless steel in accordance with ASTM A351.

b. Valve body seals shall be Buna-N or Viton O-rings.

c. The valve seat and disc shall be constructed of 316 stainless steel.

d. All emergency shutoff valves shall be normally closed, energized open and electrically actuated from a 115} volt AC, 60 Hz power source.

e. The motor and actuator shall be mounted in a NEMA 4X enclosure.

f. The emergency gas shutoff valve shall be standard flow capacity, manual resettable, normally closed suitable with Class I Division 2 area classification, Maxon Corp. Model No. SMM12.

1.15 PIPE JOINTS AND FITTINGS

A. All fittings shall be of a type, which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends.

B. Use the following materials in the various piping systems, in accordance with Article 2.7 - System Material Schedule and the Construction Documents.

C. Carbon Steel and Malleable Iron Fittings

1. Joints between lengths of carbon steel and black steel piping shall be threaded or welded as scheduled herein below or on the Construction Documents.

2. Make threaded joints with the use of utility compound or teflon tape applied to male threads only. The use of cotton thread, lampwick or filler shall not be acceptable.

3. Threaded fittings shall have tapered thread in accordance with ASME B1.20.1.

4. Threaded fittings larger than 3 inches (75 mm) shall not be permitted.

5. Welded steel fittings shall be 45 degree mill or machine beveled edges for welding. Fittings may be butt or socket welded.

D. Flanges

1. The pressure-temperature rating of the pipe flanges shall match the pressure-temperature rating of the piping system and the equipment to which the piping connects.

2. Flanges used in the gas piping distribution shall comply with ASME B16.1, B16.20, AWWA C111 or MSS SP-6 specifications.

3. Flanges for steel piping shall be Class 150 forged flat faced, weld neck steel flanges or cast-iron flanges with threaded ends. Slip-on flanges will not be accepted.

E. Unions

1. Unions shall be permitted for equipment connections only for pipe 2 inches (50 mm).

2. Steel piping unions shall be Class 150 threaded end steel with ground brass taper or spherical joints.

F. Elbows

1. All elbows shall be of long radius pattern except where space conditions do not permit.

2. Welding elbows shall be 45 degree mill beveled or machine beveled.

G. Tees

1. Welding tees shall be 45 degree mill beveled or machine beveled.

2. In systems where outlet is two (2) pipe sizes smaller than the size of main welding, tees may be omitted and “Weld-o-lets”, saddles or shaped cut end connections provided.

3. “Weld-o-lets” must be used on risers where horizontal branches tap into risers at each floor. Socket "Weld-o-lets" and/or socket tees shall not be permitted.

H. Gaskets

1. Gaskets used in the gas distribution system shall be metal or non-asbestos fiber rated for a maximum temperature of 230°F (110°C) and maximum pressure of 400 psig (27.5 bar).

2. Full-faced gaskets shall be used with cast-iron flanges.

1.16 SYSTEM MATERIAL SCHEDULE

Service	Size	Material	Weight	Joints
Natural Gas (up to 1/2 psig)	3/4 inch (19 mm) through 3 inch (75 mm)	Black Steel	Schedule 40	Threaded
	4 inch (100 mm) and Greater	Black Steel	Schedule 40	Socket or Butt Welded
Natural Gas (Greater than 1/2 psig)	3/4 inch (19 mm) through 3 inch (75 mm)	Black Steel	Schedule 40	Socket or Butt Welded
	4 inch (100 mm) and larger	Black Steel	Schedule 40	Butt Welded

PART 2 - EXECUTION

2.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

2.2 INSTALLATION

A. All piping and materials shall be as specified herein and shall be installed in accordance with the latest industry standards, per the manufacturer's recommendations, and as indicated on the drawings.

B. All piping shall be made up and installed in a manner that permits expansion and contraction caused by changes in temperature and pressure.

C. Run and arrange piping approximately as indicated on the construction documents and as coordinated with other trades.

D. All natural gas piping and equipment shall be identified in accordance with ASME A13.1. Provide ANSI standard pipe markers for the piping system. They shall be factory fabricated, flexible, semi rigid heavy duty vinyl preformed to fit around the pipe. The name of the service shall be in black letters not less than 1" high. Markers shall be provided on 20 foot centers and not less than 1 per room.

E. Branch piping taken off of a riser shall not be taken off with less than a 2-elbow swing.

F. Install piping as neatly spaced, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes.

G. Erect all risers plumb and true, parallel with walls and other pipes.

H. Ream all pipe smooth before installation. Do not bend, split, flatten nor otherwise injure pipe.

I. The Contractor shall provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

J. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

K. It is the responsibility of this Contractor for accurately laying out the work. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

L. Route piping in an orderly manner parallel and perpendicular to walls maintaining gradient and headroom without interfering with use of space or taking more space than necessary. Whenever practical group piping at common elevations.

M. Furnish and install sleeves for pipe passing through roofs, partitions, walls and floors. Piping penetrating roofs must maintain integrity of roof assembly.

N. Provide clearance in hangers and from structure and other equipment for access to valves and fittings.

O. Install valves in accordance with the specifications and provide access where valves and fittings are not accessible. Coordinate size and location of access doors with valves.

P. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

Q. Do not install underground piping when bedding is wet or frozen.

R. A lubricated plug valve shall be installed on each gas riser, each branch off the riser and branch line serving appliances and equipment.

S. Piping exposed in all rooms shall be installed as nearly as possible parallel with or at right angles to the building walls. Install all pipe straight and true. Springing or forcing piping into place will not be permitted unless specifically called for. Install piping in such a manner as to prevent strain on equipment connections. Install piping in such a manner as to eliminate all static and dynamic conditions of loading on equipment connections.

T. Piping in finished portions of the building, except in mechanical equipment rooms or where otherwise indicated on the Drawings, shall be concealed.

U. All piping shall be of the sizes indicated and shall be routed as indicated on the Drawings, or as required, to serve all equipment and systems.

V. Welded Piping

1. All welded joints (except pipe welded end-to-end) shall be made by the use of flanges, caps, elbows, branch outlets and tees. Cut samples shall be submitted for approval if directed. All such fittings, etc., shall be of a type which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends. "Weld-o-lets" may be used where standard fittings of required sizes are not available and elsewhere as approved. All job welding shall be done by the electric arc welding process in accordance with the following:

2. Joints shall be 45 degree mill beveled or machine beveled.

3. All scale and oxide shall be removed with hammer, chisel, file and/or grinding wheel. Bevel shall be left smooth and clean.

4. Pipe lengths must be lined up straight with abutting pipe ends concentric.

5. Both conductors from the welding machine shall be extended to locations at which welding work is being done. The leads from welding machine to location of welding work shall be held together in an approved manner and then taped so as to prevent induced current in structural steel, in piping or in other metals within the building. The ground lead shall be connected to length of pipe with suitable clamp in such manner that welding current will not flow through joints in pipe, structural steel of building or steel pipe supports.

6. Weld metal must be thoroughly fused with base metal at all sections and must exhibit complete penetration to weld root. Welds shall be of sound metal, free from laps, slag inclusion or other defects.

7. Welders shall be certified by the National Certified Pipe Welding Bureau of the Mechanical Contractors Association of America or by ASME Section 9. Welders shall possess and maintain current Procedure Qualification Records for the service for which they are employed and on which they work.

8. All welds shall bear the identifying number, letter or symbol of the welder or welding operator.

2.3 CLEANING

A. During construction, properly cap all lines, so as to prevent the entrance of sand, dirt, etc. Each system of piping shall be blown through after completion (for the purpose of removing grit, dirt, sand, etc., from coils and piping), for as long a time as required to thoroughly clean the apparatus.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all natural gas piping and appurtenances in suitable condition, before final acceptance.

C. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting to prevent obstruction and damage.

D. Protect the system against freezing in cold weather.

E. After each pressure testing procedure is complete, purge the system until empty.

F. All natural gas piping shall be thoroughly prior to putting into service.

G. Under no circumstances shall the Contractor permit the use of any portion of the natural gas system until it has been properly purges and certified same by the Authorities Having Jurisdiction.

H. A minimum of two (2) weeks' notice shall be given to the Engineer and Owner prior to testing.

I. Gas piping system shall be purged outdoors where the design operating gas pressure is greater than 2 psig (0.14 bar).

2.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations, and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all piping, hangers, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

D. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

H. All welded gas piping shall be subject to special inspection as required by the Authorities Having Jurisdiction.

2.5 FIELD QUALITY CONTROL

A. Quality control must comply with Section 01 40 00 - Quality Requirements and Section 01 73 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Welding Quality Control

1. An independent testing agency shall observe the fitting-up and making of welds as prescribed in ASME B31.1 and ASME B31.9 as applicable.

2. The inspection and testing protocol requirements shall be as follows for all welded gas piping supplying gas at pressures less than 5 psig:

a. Both shop-made welds and field-made welds shall be subjected to random visual inspections during setup and at various stages of completing the weld.

2.6 FIELD TESTS

A. Performance Test

1. Allow sufficient time to perform all tests, adjustments, necessary to place the various systems in final operation condition, verify performance requirements and check all safety devices. Labor and instruments, required for various tests shall be provided. See that all manufacturers' representatives necessary to check and adjust various systems are present with sufficient labor to perform all this work without delay. All test data shall be recorded on suitable forms and submitted to the Owner for approval.

2. A qualified representative of the equipment manufacturer shall be present at the test. The Engineer may witness tests, if he so desires. The Contractor shall notify the Engineer and Owner in writing, at least two (2) weeks prior to the day of the test.

3. Test all systems before any paint is applied, piping is insulated, furred in or otherwise covered.

4. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

5. Pressure testing shall be conducted as specified below:

a. The piping shall be filled with air or inert gas, and the source of pressure shall be isolated before the pressure readings are made. All test duration time periods are to be measured after stabilization of testing medium.

b. Fresh water may be used as the test medium only where the required test pressure exceeds 100 psig (6.9 bar).

c. Test the completed gas piping with distribution pressures up to 1/2 psig (0.034 bar) with a non-mercury gauge at a pressure of 3 psig (0.20 bar) for a minimum of 2 hours with no drop in pressure.

d. Test the completed gas piping with distribution pressures over 1/2 psig (0.034 bar) through 5 psig (0.34 bar) with a non-mercury gauge at a pressure of 50 psig (3.4 bar) for a minimum of 2 hours with no drop in pressure.

e. Test the completed gas piping with distribution pressures over 5 psig (0.34 bar) through 15 psig (1.0 bar) with a non-mercury gauge at a pressure of 100 psig (6.9 bar) for a minimum of 2 hours with no drop in pressure.

f. Test the completed gas piping with distribution pressures over 15 psig (1.0 bar) with a non-mercury gauge at a pressure of twice the maximum allowable pressure, but no less than 100 psig (6.9 bar) for a minimum of 2 hours with no drop in pressure.

g. Where the test pressure exceeds 125 psig (8.6 bar), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.

h. All factory coated and wrapped pipe shall be pressure tested at a minimum of 90 psig (6.2 bar).

B. Final Acceptance Test

1. The Owner and/or the Owner's representatives will make final check of all systems only after the Contractor has completed and returned to the Owner or Owner's representatives all recorded test data, together with letter that his work is to the best of his knowledge 100% complete. Field performance tests will be required by the Owner and/or the Owner's representatives at this time to verify performance and workmanship, and to make final system component adjustments.

2. Points and areas for recheck shall be selected by the Owner's representative.

3. Measurements and tests shall be same as the original test procedures.

4. After satisfactory passing of the field tests and after all necessary adjustments have been made, test the complete systems for a minimum of seven (7) days under regular operating conditions or as long as may be required to establish compliance with Contract Documents.

5. The Contractor shall demonstrate to the Engineer and the Owner, prior to acceptance by the Owner, that all systems and/or equipment has been balanced and adjusted properly, and that the system and/or equipment is in compliance with the Contract Documents.

C. Commissioning: Owner or Commissioning Agent shall witness all pressure tests.

2.7 ADJUSTING AND BALANCING

A. Upon completion of piping, hangers for piping and at equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping or the equipment that it is connected to.

B. Securely tighten clevis hanger load nuts first to ensure proper hanger performance. Tighten top nut after adjustment.

C. All equipment, valves, and the like shall be adjusted in accordance with manufacturer recommendations to function properly with capacities required and/or specified.

END OF SECTION

SECTION 224200

COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all plumbing fixtures and accessories herein specified and as indicated on the drawings, complete with all appurtenances required for a complete and operating fixture performance in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Fixture supports.

2. Lavatories.

3. Service sinks.

4. Sinks.

5. Showers.

6. Urinals.

7. Water closets.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All plumbing fixtures and accessories shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American National Standards Institute (ANSI)

1) A117.1: Accessible and Usable Buildings and Facilities.

b. American Society of Mechanical Engineers (ASME)

1) A112.6.1M: Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use.

2) A112.18.1: Plumbing Fixture Fittings.

3) A112.18.2: Plumbing Waste Fittings.

4) A112.18.3: Performance Requirements for Backflow Prevention Devices and Systems in Plumbing Fixture Fittings.

5) A112.19.1: Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures.

6) A112.19.2: Vitreous China Plumbing Fixtures.

7) A112.19.3: Stainless Steel Plumbing Fixtures.

8) A112.19.4: Porcelain Enameled Formed Steel Plumbing Fixtures.

9) A112.19.5: Trim for Water-Closet Bowls, Tanks, and Urinals.

10) A112.19.6: Hydraulic Performance Requirements for Water Closets and Urinals.

11) A112.19.9: Non-vitreous Ceramic Plumbing Fixtures.

12) A112 19.10: Dual Flush Devices for Water Closets.

13) A112.19.14: Six Liter Water Closets Equipped with a Dual Flushing Device.

14) A112.19.16: Terrazzo Plumbing Fixtures.

15) A112.19.19: Vitreous China Non water Urinals.

c. American Society of Sanitary Engineers (ASSE)

1) ASSE 1001: Performance Requirements for Atmospheric Type Vacuum Breakers.

2) ASSE 1010: Performance Requirements for Water Hammer Arresters.

3) ASSE 1011: Performance Requirements for Hose Connection Vacuum Breakers.

4) ASSE 1016: Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations.

5) ASSE 1017: Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems.

6) ASSE 1037: Performance Requirements for Pressurized Flushing Devices (Flushometers) for Plumbing Fixtures.

7) ASSE 1069: Performance Requirements for Automatic Temperature Control Mixing Valves.

8) ASSE 1070: Performance Requirements for Temperature Limiting Devices.

d. American Society of Sanitary Engineers (ASTM)

1) ASTM B152: Standard Specification for Copper Sheet, Strip, Plate and Rolled Bar.

2) ASTM D4068: Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water Containment Membrane.

3) ASTM D4551: Standard Specification for Polyvinyl Chloride (PVC) Plastic Flexible Concealed Water Containment Membrane.

e. Americans With Disabilities Act (ADA)

1) ADA Standard 28 CFR 35.151: New Construction and Alterations.

2) ADA Standard 28 CFR 36 Subpart D: New Construction and Alterations.

f. National Sanitation Foundation

1) NSF/ANSI Standard 61: Drinking Water System Components.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim and finishes.

2. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

3. Manufacturer’s Installation Instructions: Submit installation methods and procedures, support details and connection requirements for the system.

4. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

5. Mounting details and mounting requirements, as well as limitation details and any other special requirements, shall be listed on these drawings.

6. Operation and maintenance manuals, including replacement and spare parts lists and maintenance procedures.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years' documented experience.

B. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

C. Make every effort to furnish all plumbing fixtures, faucets and accessories from one manufacturer.

1. If fixtures, faucets or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

D. Furnish all equipment, materials and accessories new and free from defects.

E. Electrical components and devices shall be listed as defined in NFPA 70, by a testing agency acceptable to the authorities having jurisdiction, and shall be marked for intended use.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible and free from defects.

1.6 FACTORY TESTING

A. All plumbing fixtures shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

B. Prior to shipment, plumbing fixture manufacturer shall perform quality assurance tests to include checks for compliance with the specifications and applicable reference standards.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

D. Store all plumbing fixtures and associated components off floors on raised platforms to protect from water damage.

E. Plumbing fixtures and associated components that have been exposed to water damage shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Coordinate the installation of work in this section with the following sections:

1. Division 04 - Masonry
2. Division 09 - Finishes

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00 - Common Work Results for Plumbing.

Furnish a one (1) year manufacturer's warranty for each and all fixtures.

B. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements as set forth in the Construction Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a letter of equivalency certifying the products are equivalent in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Construction Documents will be revised to reflect the substitution.

2.2 GENERAL REQUIREMENTS

A. All plumbing fixtures shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper function of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Plumbing fixtures that are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair including, but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, recommissioning of the equipment, etc.

D. All fixtures shall be free from imperfections, true as to line, angles, curves and color, smooth, watertight, and complete in every respect.

E. All fixtures specified shall be of the best quality, nonabsorbent and discolored. Warped or otherwise imperfect fixtures shall not be accepted.

F. All fixtures shall be furnished by one (1) manufacturer unless otherwise specified.

G. All fixtures shall be certified to NSF 61 standards for drinking water system components.

Fixtures shall meet ADA requirements for their intended use where identified on the Construction Documents and in accordance with the New York City Building Code.

I. All exposed fittings shall be chrome-plated cast brass with set screw escutcheons. Escutcheons shall be brass, chrome-plated over nickel plate with brushed chrome finish. Any hanger nuts visible shall likewise be chrome-plated over nickel plate.

J. Provide chrome-plated cast brass traps with cleanout plugs, unless otherwise noted.

K. All toilet accessories will be furnished under the Division 01, but this Contractor shall review the list of accessories and furnish all labor and incidental material required to install those items considered “plumber’s work” by local unions.

2.3 FIXTURE SUPPORTS

A. Support all of the specified plumbing fixtures securely in a neat workmanlike manner on approved carriers or supports.

B. The method of support for each fixture shall be as listed hereinbelow, except where fixture designations on the drawings indicate modifications.

C. The figure space numbers used hereinafter are those of Zurn Industries Inc. unless otherwise noted, and are used as identification of the types, quality and features desired. Refer to Article 2.1 - Acceptable Manufacturers for the approved list of manufacturers as listed within this specification.

D. Zurn Industries, Inc. model numbers have been used to designate the type and quality of the fixture supports required. Equivalent supports may be substituted as manufactured by others listed herein above in Article 2.1 - Acceptable Manufacturers.

E. Lavatories

1. Support lavatories on Zurn Industries Series Z1231 concealed arm chair carrier, single or double as required, with block base supports bolted to slab, steel pipe uprights, adjustable sleeves to receive arms and adjustable alignment truss.

2. Concealed arms shall be provided with leveling screws, locking device and shall be designed to receive cast brass chrome-plated threaded escutcheons.

3. Slab-type lavatories shall be furnished with extra-heavy cast brass chrome-plated threaded escutcheons between the fixture and the wall. The escutcheon shall be screwed on the adjustable sleeve or arm.

4. Where required or identified on the Construction Documents, substitute the basic lavatory installation with Zurn Industries Series Z1253 wall-mounted carrier for single lavatory installation. Carrier shall have individual back plates and adjustable front plate and in all other respects shall be as hereinbefore specified.

F. Urinals

1. Support urinals on concealed wall carriers Zurn Industries Series 1222 wall urinal carrier with block base supports bolted to slab, top plate to have threaded bolts with nuts for fastening to the fixture hanger, lower plate for supporting bearing bolts to keep lower part of fixture free of walls, steel pipe uprights, adjustable sleeves and adjustable alignment truss.

2. Where required or identified on the Construction Documents, substitute the basic urinal installation with concealed wall carriers securely fastened to Zurn Industries Series Z1258 continuous steel fishplates, 4 inch x 1/8 inch x the length of the battery of urinals. The fishplates shall bear the weight on the back of the wall and shall have long through-bolts with extended threads, nuts and washers for fastening to the wall hangers.

G. Water Closets

1. Wall-hung water closets shall be supported by a concealed metal carrier that is attached to the building structural members so that strain is not transmitted to the closet connector or any other part of the plumbing system. The carrier shall conform to ASME A112.6.1M or ASME A112.6.2.

2. Support water closets on Zurn Industries Series Z1203 horizontal combined chair carrier and adjustable wall closet fittings. The basic installation shall be horizontal unless otherwise note on the Construction Documents.

3. The carrier shall include a corrosion-resistant pipe nipple and adjustable nosepiece with closet gasket, studs, hardware and chrome-plated cap nuts necessary to secure the fixture to the support.

4. The carrier shall have a monolithic faceplate with removable incremented sections at bottom and fitted with adjustable, reversible feet, bolted to the slab, so the carrier shall not depend on the wall construction for support.

5. The fittings shall be cast iron with a 2 inch vent connection, single or double, left or right hand as required for the location in which it is installed.

6. The combined carrier fitting shall allow 4 inches of vertical adjustment.

7. Where required or identified on the construction documents substitute the basic horizontal water closet installation with a vertical, single or double, chair carrier Zurn Ind. Series Z1204. The vertical installation shall include all requirements of the basic installation specified herein above.

H. All fixtures shall be per the fixture schedule on the drawings.

2.4 LAVATORIES

A. Lavatories shall conform to ASME A112.19.1, ASME A112.19.2, ASME A112.19.3, ASME A112.19.4 or ASME A112.19.9.

B. Each lavatory shall be provided with a 1-1/4 in. (32 mm) perforated grate drain and tailpiece. A strainer, pop-up stopper, crossbar or other device shall be provided for each lavatory.

C. Each lavatory shall be provided with a set of commercial-grade 3/8 in. (9.5 mm) chrome-plated brass supplies with loose key angle stops and set screw escutcheons, McGuire Manufacturing Model No. 170LK. Flexible water connectors shall not be permitted.

D. Each lavatory shall be provided with a one-piece, 1-1/4 in. (32 mm) x 1-1/2 in. (38 mm) chrome-plated brass P-trap with cleanout plug and cast brass 1-1/2 in. (38 mm) escutcheons with set screws as manufactured by McGuire Manufacturing Co.

E. When a master mixing valve is not used on the hot water distribution system, tempered water shall be delivered through a water temperature limiting device that conforms to ASSE 1016 or ASSE 1070.

2.5 SINKS

A. Sinks shall conform to ASME A112.19.1, ASME A112.19.2, ASME A112.19.3, ASME A112.19.4 or ASME A112.19.9.

B. When a master mixing valve is not used on the hot water distribution system a local point of use inline thermostatic mixing valve conforming to ASSE 1016 or ASSE 1070 shall be provided.

C. Each sink shall be provided with waste outlets a minimum of 2 inches (51 mm) in diameter.

D. Each sink waste outlet shall be provided with a strainer or crossbar shall be provided to restrict the clear opening of the outlet.

E. Each sink shall be provided with a set of commercial grade 3/8 in. (9.5 mm) chrome-plated brass supplies with loose key angle stops and set screw escutcheons, McGuire Manufacturing Model No. 170LK. Flexible water connectors shall not be permitted.

F. Each sink shall be provided with a one-piece 1-1/2 in. (38 mm) x 2 in. (50 mm) brass P-trap with cleanout plug and cast brass 2 in. (50 mm) escutcheons with set screws as manufactured by McGuire Manufacturing Co.

G. Faucets and fixture fittings shall conform to ASME A112.18.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify walls and floor finishes are prepared and ready for installation of fixtures.

C. Verify electric power is available and of correct characteristics.

D. Confirm millwork is constructed with adequate provision for installation of countertop lavatories and sinks.

E. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

F. Verify cabinets and counters for suitable conditions where fixtures shall be installed.

3.2 INSTALLATION

A. Install work in accordance with the New York City Building Code, ADA and other applicable standards in accordance with the Authorities Having Jurisdiction.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

D. Provide chrome-plated rigid supplies to fixtures with loose key stops, reducers and escutcheons.

E. Install supply lines and fittings for every plumbing fixture so as to prevent backflow.

F. Install all plumbing fixtures and associated components level and plumb.

G. Install and secure fixtures in place with wall supports, wall carriers and bolts.

H. Seal fixtures to wall and floor surfaces with sealant or grout as specified, color to match fixture.

I. Refer to architectural drawings for special mounting heights and fixture spacing.

J. After final installation of plumbing fixtures and trim, clean fixtures and trim, adjust trim, and ensure that fixtures and trim are operational. Replace trim that does not perform satisfactorily.

K. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons, if required, to conceal protruding fittings.

L. Fixtures shall be set level and in proper alignment with reference to adjacent walls.

M. A water closet, urinal or lavatory shall not be set closer than 15 inches (381 mm) from its center to any side wall, partition, vanity or other obstruction, or closer than 30 inches (762 mm) center-to-center between water closets, urinals or adjacent fixtures.

N. There shall be at least a 21 inch (533 mm) clearance in front of the water closet or urinal to any wall, fixture or door. Water closet compartments shall not be less than 30 inches (762 mm) wide or 60 inches (1,524 mm) deep. There shall be at least a 21 inch (533 mm) clearance in front of a lavatory to any wall, fixture or door.

3.3 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures used for temporary facilities for permanent use unless approved in writing by the Owner.

3.4 CLEANING

A. During construction, properly protect all plumbing fixtures so as to prevent the entrance of sand, dirt, etc. Each plumbing fixture shall be thoroughly cleaned after completion (for the purpose of removing grit, dirt, sand, etc., from coils and piping), for as long a time as required to thoroughly clean the fixtures.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all plumbing fixtures appurtenances in suitable condition, before final acceptance.

C. Remove faucet spouts, strainers, remove sediment and debris, and reinstall strainers and spouts.

D. Remove sediment and debris from drains.

E. Plumbing fixtures shall be installed so as to afford easy access for cleaning both the fixture and the area around the fixture.

F. Under no circumstances shall the Contractor permit the use of plumbing fixture until it has been properly cleaned and the system certified same by the local water department or the Authorities Having Jurisdiction.

G. A minimum of two (2) weeks' notice shall be given to the Engineer and Owner prior to testing and sterilization.

3.5 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all plumbing fixtures and accessories for proper installation according to the manufacturer's instructions.

D. Repair or, if required by the Architect, replace defective work with new work without extra charge to the Owner. Repeat tests as directed until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

3.6 FIELD TESTING

A. Performance Test

1. Allow sufficient time to perform all tests and adjustments necessary to place the various systems in final operation condition and verify performance requirements. Labor and instruments required for various tests shall be provided. See that all manufacturers' representatives necessary to check and adjust various systems are present with sufficient labor to perform all this work without delay. All test data shall be recorded on suitable forms and submitted to the Owner for approval.

2. Test all plumbing fixtures to confirm the fixture performs in accordance with the manufacturer's data sheet.

B. Integrated Test

1. Reserved.

C. Final Acceptance Test

1. The Owner and/or the Owner's representatives will make final check of all systems only after the Contractor has completed and returned to the Owner or Owner's representatives all recorded test data, together with a letter that his work is 100% complete to the best of his knowledge. Field performance tests shall be required by the Owner and/or the Owner's representatives at this time to verify performance and workmanship, and to make final system component adjustments.

2. Points and areas for recheck shall be selected by the Owner's representative.

3. Measurements and tests shall be same as the original test procedures.

4. After satisfactory passing of the field tests and after all necessary adjustments have been made, test the complete systems for a minimum of seven (7) days under regular operating conditions or as long as may be required to establish compliance with Contract Documents.

5. The Contractor shall demonstrate to the Engineer and the Owner, prior to acceptance by the Owner, that all systems and/or equipment has been balanced and adjusted properly, and that the system and/or equipment is in compliance with the Contract Documents.

D. Commissioning: Owner or Commissioning Agent shall witness all hydrostatic tests.

3.7 ADJUSTING AND BALANCING

A. Upon completion of fixture installation, each fixture shall be adjusted to ensure proper operation.

B. All equipment, valves, quick-closing devices and the like shall be adjusted in accordance with manufacturers' recommendations to function properly with capacities required and/or specified.

C. Adjust stops or valves for intended water flow rate for proper flow without splashing, noise or overflow.

D. Replace washers and seals of leaking and dripping spouts and stops.

END OF SECTION

SECTION 224500

EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all emergency plumbing fixtures required for the project as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Emergency eye wash stations.

2. Emergency eye/face wash stations.

3. Emergency safety showers.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those Divisions on which work in this Division may be dependent.

1.3 REFERENCES

A. Each emergency fixture and all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including but not limited to the following.

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American National Standards Institute (ANSI)

1) A112.18.1: Plumbing Fixture Fittings.

2) A112.19.3: Stainless Steel Plumbing Fixtures.

3) A117.1: Accessible and Usable Buildings and Facilities.

4) Z358.1: American National Standard for Emergency Eyewash and Shower Equipment.

b. American Society of Mechanical Engineers (ASME)

1) A112.18.1: Plumbing Supply Fittings.

2) A112.18.2: Plumbing Waste Fittings.

c. American Society of Sanitary Engineers (ASSE)

1) ASSE 1071: Temperature Actuated Mixing Valves for Plumbed Emergency Equipment.

d. Americans With Disabilities Act (ADA)

1) ADA Standard 28 CFR 35.151: New Construction and Alterations.

2) ADA Standard 28 CFR 36 Subpart D: New Construction and Alterations.

e. National Sanitation Foundation

1) NSF Standard 42: Drinking Water Treatment Units - Aesthetic Effects.

2) NSF Standard 53: Drinking Water Treatment Units - Health Effects.

3) NSF Standard 61: Drinking Water System Components and Annex G.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Include flow rates, dimensions and capacities for each fixture.

2. Operation and maintenance data.

B. Product Data: Submit manufacturer's literature, including general assembly and maintenance manual.

Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

B. Manufacturer's Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Select combinations of fixtures and trim, mixing valves, fittings and other components that are compatible.

F. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All fixtures shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

B. The fixture manufacturer shall provide documentation for compliance with ANSI Z358.1 standards for emergency use.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer’s rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

D. Store all products and materials off floors on raised platforms to protect from water damage.

E. Products and materials that have been exposed to water damage shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Certain materials shall be furnished, installed, or furnished and installed under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general Construction Drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Coordinate the installation of work in this section with the following sections:

1. Division 04 - Masonry
2. Division 09 - Finishes

WARRANTY

E. Comply with the requirements of Division 01 and Section 22 00 00.

F. Furnish a one (1) year manufacturer's warranty for the emergency fixture operation.

G. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a letter of equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the contract documents will be revised to reflect the substitution.

C. Emergency Eye Wash Stations

1. Encon Safety Products.
2. Guardian Equipment.
3. Speakman.
4. Water Saver Faucet Co.

D. Emergency Eye/Face Wash Stations

1. Encon Safety Products.
2. Guardian Equipment.
3. Speakman.
4. Water Saver Faucet Co.

E. Emergency Safety Showers

1. Encon Safety Products.
2. Guardian Equipment.
3. Speakman.
4. Water Saver Faucet Co.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the Work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment that are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair including, but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. All fixtures shall be free from imperfections, true as to line, curves and color, smooth, watertight, and compete in every aspect.

E. All emergency fixtures shall conform to all local and federal guidelines for emergency/safety equipment use, including ANSI/ISEA Z358.1 standards.

F. All fixtures shall be furnished by one (1) manufacturer unless otherwise specified.

G. Emergency fixtures shall meet ADA requirements for their intended use where identified on the Construction Documents.

H. All exposed fittings shall be chrome-plated cast brass with set screw escutcheons. Escutcheons shall be brass, chrome-plated over nickel plate with brushed chrome finish. Any hanger nuts visible shall likewise be chrome-plated over nickel plate.

I. Emergency fixtures including, but not limited to, eye washes, eye/face washes, drench hose units, emergency showers and safety stations shall be located within ten (10) seconds, approximately 55 ft. (16.7 m), walking time from the location of the hazard.

J. Each emergency fixture shall be highly visible and located within an area that is well lighted.

K. Water delivered by the emergency fixture shall be tepid water in the range of 60°F - 100°F (15°C - 38°C). Water shall be delivered by the circulating tepid water system or by using a local emergency temperature mixing valve in compliance with ASSE 1071.

2.3 EMERGENCY EYE WASH STATIONS

A. Provide eye wash stations where chemicals may be used, as indicated on the Construction Documents and as specified hereinbelow.

B. Provide eye wash stations with the following characteristics and as identified on the Construction Documents and specified hereinbelow:

1. Emergency eye washes stations shall be wall-mounted with stainless steel 11-1/2 in. (292 mm) bowl with 1-1/4 in. (32 mm) NPT female outlet.

2. Each eye wash station shall have two (2) spray heads with flip-top dust covers, internal flow control and filter.

3. The emergency eye wash station shall have a 1/2 in. (13 mm) chrome-plated brass stay-open ball valve with Teflon seals.

4. Emergency eye wash stations shall be capable of delivering controlled, low-velocity tepid water to rinse eyes and face without being injurious to the user.

5. Emergency eye wash stations shall deliver 0.4 gpm (1.5 lpm) of tepid water for a minimum of 15 minutes.

6. Outlet spray heads shall be positioned between 33 in. (838 mm) and 45 in. (1,143 mm) from the floor and at least 6 in. (150 mm) from the wall or nearest obstruction.

7. Emergency eye wash stations shall have heavy-duty cast aluminum wall bracket with a corrosion-resistant powder coated finish.

C. EW-1 Emergency Eye Wash Stations shall be Water Saver Faucet Co. Model EW814 with stainless steel bowl, two (2) side by side mounted spray heads and flip top dust covers.

2.4 EMERGENCY EYE/FACE WASH STATIONS

A. .

B. Prefix numbers identify and locate the fixtures on the drawings relative to the fixtures described herein.

C. Provide eye/face wash stations where chemicals may be used, as indicated on the Construction Documents and as specified hereinbelow.

D. Provide eye/face wash stations with the following characteristics and as identified on the Construction Documents and specified hereinbelow:

1. Emergency eye/face wash stations shall be wall-mounted with *stainless steel* 11-1/2 in. (292 mm) bowl with 1-1/4 in. (32 mm) NPT female outlet.

2. Each eye/face wash station shall have two (2) spray heads with flip-top dust covers, internal flow control and filter.

3. The emergency eye/face wash station shall have a 1/2 in. (13 mm) chrome-plated brass stay-open ball valve with Teflon seals.

4. Emergency eye/face wash stations shall be capable of delivering controlled, low-velocity tepid water to rinse eyes and face without being injurious to the user.

5. Emergency eye wash stations shall deliver 3.0 gpm (11.5 lpm) of tepid water for a minimum of 15 minutes.

6. Outlet spray heads shall be positioned between 33 in. (838 mm) and 45 in. (1143 mm) from the floor and at least 6 in. (150 mm) from the wall or nearest obstruction.

7. Emergency eye wash stations shall have heavy-duty cast aluminum wall bracket with a corrosion-resistant powder-coated finish.

E. EFW-1 Emergency Eye Wash Stations shall be Water Saver Faucet Co. Model *EW750 with stainless steel bowl* two (2) side-by-side mounted spray heads and flip-top dust covers.

2.5 EMERGENCY SAFETY SHOWERS

A. Prefix numbers identify and locate the fixtures on the drawings relative to the fixtures described herein.

B. Provide emergency safety showers where chemicals may be used, as indicated on the Construction Documents and as specified hereinbelow.

C. Provide emergency safety showers with the following characteristics and as identified on the Construction Documents and specified hereinbelow:

1. Emergency safety showers shall be ceiling- or floor-mounted as specified hereinbelow with a 10 in. (292 mm) stainless steel showerhead, located between 82 in. (2,083 mm) and 96 in. (2,438 mm) above the floor.

2. The emergency safety shower shall have a 1 in. (25 mm) IPS brass stay-open ball valve with a stainless steel panic bar or accessible actuator located no higher than 69 in. (1,733 mm) above the floor.

3. Where provided, the emergency shower enclosure shall be a minimum of 34 in. (864 mm) diameter.

4. Emergency safety showers shall be capable of delivering tepid water of 20 in. (508 mm) diameter measured 60 in. (1,524 mm) above the floor to rinse the entire body without being injurious to the user.

5. Emergency safety showers shall deliver 20 gpm (75.5 lpm) of tepid water for a minimum of 15 minutes.

6. All exposed piping and escutcheons shall be stainless steel.

D. ES-5 Emergency Safety Shower with recessed ceiling-mounted showerhead and exposed stainless steel pull rod shall be WaterSaver Faucet Co. ES629*.*

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify walls and floor finishes are prepared and ready for installation of fixtures.

3.2 INSTALLATION

A. Install work in accordance with the New York City Building Code, ADA and other applicable standards in accordance with the Authorities Having Jurisdiction.

B. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

Emergency fixture installation shall be in accordance with the manufacturer's recommendations and the authorities having jurisdiction.

D. Install all plumbing fixtures and accessories level and plumb.

E. Install and secure fixtures in place with wall supports, carriers and bolts.

F. Refer to architectural drawings for special mounting heights and fixture spacing.

3.3 CLEANING

A. During construction, properly protect all fixtures to prevent the entrance of sand, dirt, etc. Each fixture shall be thoroughly cleaned after completion (for the purpose of removing grit, dirt, sand, etc., from coils and piping), for as long a time as required to thoroughly clean the fixtures.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all fixture appurtenances in suitable condition before final acceptance.

C. Remove strainers, remove sediment and debris, and reinstall strainers and spouts.

D. Under no circumstances shall the Contractor permit the use of the emergency fixture until it has been properly cleaned and the system certified as such by the local water department or the Authorities Having Jurisdiction.

E. A minimum of two (2) weeks' notice shall be given to the Engineer and Owner prior to testing and sterilization.

3.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all emergency fixtures and accessories for proper installation according to the manufacturer's instructions.

D. Repair or, if required by the Architect, replace defective work with new work without extra charge to the Owner. Repeat tests as directed until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

3.5 FIELD TESTS

A. Performance Test

1. Allow sufficient time to perform all tests and adjustments necessary to place the various systems in final operation condition, verify performance requirements, and check all safety devices. Labor and instruments required for various tests shall be provided. See that all manufacturers' representatives necessary to check and adjust various systems are present with sufficient labor to perform all this work without delay. All test data shall be recorded on suitable forms and submitted to the Owner for approval.

2. Test all emergency fixtures to confirm the fixture performs in accordance with the manufacturer's data sheet and ANSI Z358.1 guidelines.

B. Integrated Test

1. Reserved.

C. Final Acceptance Test

1. The Owner and/or the Owner's representatives will make a final check of all systems only after the Contractor has completed and returned to the Owner or Owner's representatives all recorded test data, together with a letter that his work is 100% complete to the best of his knowledge. Field performance tests shall be required by the Owner and/or the Owner's representatives at this time to verify performance and workmanship, and to make final system component adjustments.

2. Points and areas for recheck shall be selected by the Owner's representative.

3. Measurements and tests shall be same as the original test procedures.

4. After satisfactory passing of the field tests and after all necessary adjustments have been made, test the complete systems for a minimum of seven (7) days under regular operating conditions or as long as may be required to establish compliance with Contract Documents.

5. The Contractor shall demonstrate to the Engineer and the Owner, prior to acceptance by the Owner, that all systems and/or equipment has been balanced and adjusted properly, and that the system and/or equipment is in compliance with the Contract Documents.

D. Commissioning: Owner or Commissioning Agent shall witness all hydrostatic tests.

3.6 ADJUSTING AND BALANCING

A. Upon completion of fixture installation, each fixture shall be adjusted to ensure proper operation.

B. All equipment, valves, stay-open devices and the like shall be adjusted in accordance with manufacturers' recommendations to function properly with capacities required and/or specified.

END OF SECTION

SECTION 226653

LABORATORY CHEMICAL WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all chemical waste and vent piping required for the project as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Material of piping systems.

2. Pipe joints and fittings.

3. Specialty pipe fittings.

4. System material schedule.

5. Traps.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All chemical waste and vent piping shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. ASTM International

1) ASTM A518: Standard Specification for Corrosion Resistant High Silicon Iron Castings.

2) ASTM A861: Standard Specification for High-Silicon Iron Pipe and Fittings.

3) ASTM C564: Standard Specification for Rubber Gaskets for Joining Cast Iron Soil Pipe and Fittings.

4) ASTM D2657: Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.

5) ASTM D3222: Standard Specification for Unmodified Polyvinylidene Fluoride Molding Extrusion and Coating Materials.

6) ASTM D3311: Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns.

7) ASTM D4101: Standard Specification for Polypropylene Injection and Extrusion Materials.

8) ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.

9) ASTM F1290: Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings.

10) ASTM F1412: Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems.

11) ASTM F1673: Standard Specification for Polyvinylidene Fluoride (PVDF) Corrosive Waste Drainage Systems.

b. Cast Iron Pipe Institute

1) CISPI 301: Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary, Storm Drain, Waste and Vent Piping Applications.

c. Underwriters Laboratories

1) UL 723: Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of pipe and fitting materials, complete with typical mill reports.

2. Schedule of pipe and fitting materials identifying the system and location with which the products are intended to be used.

3. Acid-resistant cast iron, polypropylene and polyvinylidene pipe, fittings and couplings.

B. Product Data: Submit manufacturer's literature including general assembly, for each type of product indicated. Include all piping, fittings, couplings and dimensional characteristics.

C. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

D. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for all products submitted.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all piping material from one manufacturer.

E. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A Materials Safety Data Sheet (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

F. To ensure uniformity and compatibility of piping components in the acid waste and vent piping system, all clamp-free electrofusion welded products and tools must be the products of a single manufacturer.

G. The manufacturer of the acid waste and vent pipe fittings shall provide on-site training for Contractor's field personnel by a factory-trained representative in the proper use of electrofusion welding tools, application of electrical coils or tools, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

H. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All piping, fittings and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. All pipe, fittings and accessories shall be tested in accordance with the latest applicable industry standards before accepting delivery at the jobsite.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

D. Store all products and materials off floors on raised platforms to protect from water damage.

E. Products and materials that have been exposed to water damage shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Certain materials will be furnished, installed, or furnished and installed, under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to insure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general construction drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

E. Furnish and set all sleeves for passage of pipes through structural masonry and concrete walls and floors and elsewhere as required for proper protection of each pipe passing through building surfaces. Coordinate this work with Construction Manager in order to expedite and properly perform this work.

F. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this section shall be coordinated through the Construction Manager and must be approved by the Structural Engineer.

G. Should the Contractor neglect to perform preliminary work, and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

H. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Contractor to coordinate, protect and schedule his work with other trades in accordance with the construction sequence.

I. Architectural drawings shall be checked for ceiling height requirements.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a one (1) year manufacturer's warranty for the entire acid waste and venting system.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Polypropylene Pipe and Fittings (PP)

1. Charlotte Pipe & Foundry.
2. George Fischer Pipe.
3. Harvel Plastics Inc.
4. Orion Fittings.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the Work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment that are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. All pipe material shall be as specified herein and shall be installed as specified. The Contractor shall submit to the Engineer for review a list of the proposed manufacturers of pipe and fittings.

E. All piping materials, fittings and couplings shall be of Unites States origin and manufactured in accordance with the latest applicable standards for its intended use.

2.3 MATERIALS OF PIPING SYSTEMS

A. Use the following materials in the various piping systems, in accordance with Article 2.6 - System Material Schedule and the Construction Documents.

B. Polypropylene Pipe (PP)

1. Polypropylene pipe shall be manufactured of flame-retardant Schedule 40 or 80 pipe as scheduled and manufactured conforming to ASTM F1412.

2. The pipe shall be supplied in 10 ft. (3 m) lengths.

3. The polypropylene material shall conform to ASTM D4101.

4. Each length shall be marked with the size, schedule and manufacturer's name clearly cast or stamped on each length.

2.4 PIPE JOINTS AND FITTINGS

A. All fittings shall be of a type that maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends.

B. Use the following materials in the various piping systems, in accordance with Article 2.6 - System Material Schedule and the Construction Documents.

C. Polypropylene Pipe (PP)

1. Polypropylene pipe fittings for the acid waste and venting system shall be constructed of flame-retardant polypropylene and manufactured to Schedule 40 or 80 dimensions conforming to ASTM F1412.

2. Fittings shall be joined using the electrofusion or electro-socket fusion system conforming to ASTM D2657.

3. Fitting layout shall conform to ASTM D3311 and F1412.

4. All polypropylene material used for construction of the fittings shall conform to ASTM D4101.

Service	Size	Pipe Type	Weight	Fitting Type
Acid Waste Branches	2 in. through 8 in. (50 mm through 200 mm)	*Polypropylene (PP)*	*Schedule 80*	*Socket Fusion*

2.5 SYSTEM MATERIAL SCHEDULE

2.6 TRAPS

A. Chemical Waste Drainage Systems

1. All traps used in the acid waste system shall be deep seal type with a minimum trap seal of 2-1/2 inches (63 mm).

2. All traps buried in earth shall be acid-resistant silicon cast iron, one-piece pattern with a 3 in. (75 mm) minimum seal.

3. Fixture traps shall be one-piece "P" traps with 2 in. (50 mm) minimum trap seal and gasketed cleanout plugs made of machined bar stock.

4. Fixture traps with bottom outlet drain plugs, not less than 1-1/2 inch (37.5 mm) diameter with acid-resisting gasket and clamped or bolted cap.

5. Locate traps per code requirements.

6. Floor drain traps for use with pressurized waste discharge in the acid waste system shall be one-piece pattern, 3 in. (75 mm) minimum seal, of the same material and coating and/or finish as the piping system in which they are installed. Each trap shall be provided with additional support consisting of unistrut or kindorf, two (2) hanger rods, and be supported from the slab above.

7. Traps for Polypropylene Piping Systems (PP): Traps shall be deep seal, flame-retardant and manufactured to Schedule 40 dimensions conforming to ASTM F1412. Fittings shall be joined using the electrofusion or the electro-socket fusion system conforming to ASTM D2657. The polypropylene material shall conform to ASTM D4101.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify existing conditions prior to starting work.

C. Carefully check space requirements with other trades to insure that all material can be installed in the spaces allotted thereto.

D. Wherever this Contractor's work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to insure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items in an approved manner in order that the Ceiling Trade may know where to install access doors and panels.

3.2 INSTALLATION

A. All piping and materials shall be as specified herein and shall be installed in accordance with the latest industry standards, per the manufacturer's recommendations, and as indicated on the Drawings.

B. Run and arrange piping approximately as indicated on the construction documents and as coordinated with other trades.

C. Install piping as neatly spaced, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes.

D. Erect all risers plumb and true, parallel with walls and other pipes.

E. Ream all pipe smooth before installation. Do not bend, split, flatten nor otherwise injure pipe.

F. The Contractor shall provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

G. Do not install pipes or other apparatus in a manner that interferes with the full swing of the doors.

H. It is the responsibility of this Contractor for accurately laying out the work. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

I. No piping shall pass over high voltage (440V) electrical bus duct or switchgear equipment. Where required, provide protective pans under or over individual pipes and construct the pans of 16 gauge stainless steel with a 6 in. (150 mm) lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-O-Leum paint and support with pipe hangers, and drain clear of the equipment below.

J. Route piping in an orderly manner parallel and perpendicular to walls maintaining gradient and headroom without interfering with use of space or taking more space than necessary. Whenever practical group piping at common elevations.

K. Furnish and install sleeves for pipe passing through roofs, partitions, walls and floors. Piping penetrating roofs must maintain integrity of roof assembly.

L. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

M. All piping shall be carefully sloped so as to eliminate traps and pockets.

N. Piping exposed in all rooms shall be installed as nearly as possible parallel with or at right angles to the building walls. Install all pipe straight and true. Springing or forcing piping into place will not be permitted unless specifically called for. Install piping in such a manner as to prevent strain on equipment connections. Install piping in such a manner as to eliminate all static and dynamic conditions of loading on equipment connections.

O. Piping in finished portions of the building, except in mechanical equipment rooms or where otherwise indicated on the Drawings, shall be concealed.

P. All piping shall be of the sizes indicated and shall be routed as indicated on the Drawings, or as required, to serve all equipment and systems.

Q. Fixtures shall be vented as indicated on the drawings and as required by local codes.

R. In each change of direction of soil and waste piping, provide a clean-out plug connected to same with Y fittings and 45° ell made flush with floor or wall.

S. In all horizontal straight runs more than 50 feet (15.25 m) of length, provide at least one clean-out for each 50 feet (15.25 m) of length.

T. Support acid waste piping to laboratory benches and sinks from the floor on approved saddles or from the slab above (pipes at ceiling) on hangers with saddles. Support piping in a manner that will prevent sagging. Schedule 80 and 40 waste lines size 2 in. (50 mm) and less shall be supported on 4 ft. (1,219 mm) centers, and size 3 in. (75 mm) and greater shall be supported on 5 ft. (1,524 mm) centers. Continuous support may be used in lieu of saddles throughout the system, consisting of a channel or angle of sufficient strength to permit support on 8 ft. (2,438 mm) centers.

U. Where pipe is buried, cleanouts shall be brought up flush with floor or grade unless otherwise shown on the Drawings. The locations of all clean-outs shall be verified with the Architect.

V. All cleanouts shall be of the same size as the pipe up to and including pipe 4 inches in diameter.

W. Provide access doors in general construction for clean-outs installed in concealed locations.

X. All back vents shall be taken off as near traps as possible and permitted by code.

Y. All chemical drainage lines shall have at least the minimum slope toward the main sewer as required by the local plumbing code. Pipe must be so laid that the slope will be continuous. Permission shall be secured from the engineer before proceeding with any work where existing conditions prevent the installation at the minimum grade specified.

Z. The chemical drainage work shall be complete and ready for use including all reducers, increases, special flanges and fittings, where required between the piping work and fixtures.

AA. All horizontal pipe throughout the building, including that in pipe spaces and attics, shall be thoroughly and substantially supported from the building construction by means of approved expansion ring hangers or clevis hangers at each joint. Hangers shall be spaced in accordance with Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

BB. All pipe shall be straight and have uniform fall.

CC. All vertical pipes shall be substantially supported at each floor level with approved steel or iron riser clamps.

DD. Provide additional rod and banding at each joint for all acid waste drainage main offsets consisting of riser clamps and threaded rod to anchor all fittings in the horizontal offset. This method of anchoring and support shall be provided in addition to the sway bracing described in the paragraph above.

EE. Electrofusion and Socket Fused Piping

1. Polypropylene and polyvinylidene fluoride piping shall be joined with by electrofusion or socket fusion welding as specified.

2. Installation shall be in accordance with the manufacturer’s installation methods and instructions.

3. Joints shall be cleaned free from dirt, mud, sand, gravel or foreign materials.

4. Make all pipe cuts square and true using a pipe cutter designed for plastic piping.

5. Make certain that the electrofusion or socket fusion tool has the proper attachments installed and is set to the proper temperature settings. In cold weather applications (below 50°F [10°C]), all joints shall be preheated prior to performing a standard fusion cycle.

6. Using emery cloth, abrade the pipe and fitting area that will be fused.

7. Firmly seat the pipe and fitting ends against the stop of the coupling or socket.

8. Once both sides of the coupling and pipe or fitting is properly seated, connect the electrofusion or socket fusion tool.

9. Activate the fusion cycle or the preheat cycle in cold weather and fuse joints for the proper time required based on the size of piping and manufacturer's recommendations.

10. Fused joints shall not be stressed until joint is fully cooled.

3.3 CLEANING

A. During construction, properly cap all lines, so as to prevent the entrance of sand, dirt, etc. Each system of piping shall be blown through after completion for as long a time as required to thoroughly clean the apparatus.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all chemical drainage piping and appurtenances in suitable condition, before final acceptance.

C. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting to prevent obstruction and damage.

D. Protect the system against freezing in cold weather.

E. After each hydrostatic leak testing procedure is complete, drain the system until empty. Liquid for hydrostatic testing of chemical drainage systems shall be clean domestic water from the municipal water supply.

3.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations, and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all piping, hangers, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

D. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Notify the Architect and Inspectors having jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these Specifications for such equipment.

3.5 FIELD TESTS

A. Performance Test

1. Allow sufficient time to perform all tests, adjustments, necessary to place the various systems in final operation condition, verify performance requirements and check all safety devices. Labor and instruments, required for various tests shall be provided. See that all manufacturers' representatives necessary to check and adjust various systems are present with sufficient labor to perform all this work without delay. All test data shall be recorded on suitable forms and submitted to the Owner for approval.

2. A qualified representative of the equipment manufacturer shall be present at the test. The Engineer may witness tests, if he so desires. The Contractor shall notify the Engineer and Owner in writing, at least two (2) weeks prior to the day of the test.

3. Test all systems before any paint is applied, piping is insulated, furred in or otherwise covered.

4. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors having jurisdiction.

5. Bell and Spigot Acid-Resistant Cast Iron

a. Subject the acid waste, and vent piping inside the building to a water test. The water test shall include the entire system from the lowest point to the highest pipe above the roof.

b. Water test shall be made in accordance with all local requirements.

c. The system shall be tested to a hydrostatic pressure equivalent to at least a 10 foot (3 m) head of water.

d. After filling, shut off water supply and allow it to stand two (2) hours, under test, during which time there shall be no loss or leakage.

6. Acid Drainage Piping with Electro-Fusion Welded Joints

a. Subject the acid waste, and vent piping inside the building to a water test. The water test shall include the entire system from the lowest point to the highest pipe above the roof.

b. Water test shall be made in accordance with all local requirements.

c. The system shall be tested to a hydrostatic pressure equivalent to at least a 10 foot (3 m) head of water.

d. After filling, shut off water supply and allow it to stand two (2) hours, under test, during which time there shall be no loss or leakage.

B. Integrated Test

1. Reserved.

C. Final Acceptance Test

1. The Owner and/or the Owner's representatives will make final check of all systems only after the Contractor has completed and returned to the Owner or Owner's representatives all recorded test data, together with letter that his work is to the best of his knowledge 100% complete. Field performance tests will be required by the Owner and/or the Owner's representatives at this time to verify performance and workmanship, and to make final system component adjustments.

2. Points and areas for recheck shall be selected by the Owner's representative.

3. Measurements and tests shall be same as the original test procedures.

4. After satisfactory passing of the field tests and after all necessary adjustments have been made, test the complete systems for a minimum of seven (7) days under regular operating conditions or as long as may be required to establish compliance with Contract Documents.

5. The Contractor shall demonstrate to the Engineer and the Owner, prior to acceptance by the Owner, that all systems and/or equipment has been balanced and adjusted properly, and that the system and/or equipment is in compliance with the Contract Documents.

D. Commissioning: Owner or Commissioning Agent shall witness all hydrostatic tests.

3.6 ADJUSTING AND BALANCING

A. Upon completion of piping, hangers for piping and at equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping or the equipment that it is connected to.

B. Securely tighten clevis hanger load nuts first to ensure proper hanger performance. Tighten top nut after adjustment.

END OF SECTION

SECTION 230512
GENERAL PROVISIONS FOR HVAC WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinated with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK INCLUDED

A. Work Included:
1. The work includes providing all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all Heating, Ventilating and Air Conditioning Work as shown on the Drawings and hereinafter specified, including, but not limited to the following:
   a. Aeroseal of the existing main supply ductwork serving the 3rd floor.
   b. Speeding up the supply fan in existing air handling unit AC-4A.
   c. Balancing the entire AC-4A ductwork distribution.
   d. Replacing all existing manual volume dampers on the 3rd floor with digital VAV terminals and controls. (Alternate price).
   e. All motor starters and controllers for equipment furnished by this Contractor. Packaged type units shall be furnished completely prewired with panels mounted on the units as specified. All other motor starters and controllers will be turned over to the Electrical Contractor for installation and wiring.
   f. Hi Plume exhaust Fans.
   g. Finned tube radiation and convectors.
   h. Provide isolation valves where tying new piping into the existing system. Refer to the valves specifications for the proper valve type for the service. Refer to the Drawings for the pipe/valve size. In addition to the isolation valves at the tie-in points, also provide a balancing valve on the supply side for chilled water, chilled glycol/brine, condenser water and heating/reheat hot water system tie-ins.
   i. Hot water specialties such as air vents, etc.
   j. Accessories such as V-belt drives, flow measuring devices, draft gauges, machinery guards, thermostats, pressure gauges.
   k. Piping, fittings, and valves.
   l. Sheet metal ductwork and accessories such as dampers, access doors, etc.
   m. Registers, grilles and diffusers.
   n. Acoustical duct lining.
   o. Pipe and ductwork insulation.
   p. Variable air volume terminals with hot water reheat coils.
   q. Temperature Control: A complete system of temperature control shall be installed in connection with the HVAC systems, including all thermostats, control valves, damper motors and dampers for the outdoor air intakes and fan discharges. All control wiring for automatic temperature controls, including interlocking wiring for fans, air terminals, etc. by this Contractor.
   r. Painting and pipe, duct and equipment identification for all work by this Contractor is previously specified under "Special Requirements for Mechanical and Electrical Work".

s. Test and balancing.
t. Sleeves, pipe inserts and anchor bolts, escutcheons, prefabricated roof curbs, etc., as hereinafter specified.
u. Identification, name plates, tags and charts.
v. Cutting and rough patching.
w. Furnishing and setting of electric motors.
x. Furnishing of starters, motor control centers and motor control devices as specified under "Special Requirements for Mechanical and Electrical Work".
y. Cap flashing for pipe and duct passing through roof.
z. Removal, relocation and/or demolition of existing HVAC work in conjunction with the existing buildings in order to erect the new buildings as indicated on the Contract Drawings.
aa. Energy Management Building Automation System.
bb. All demolition work associated with HVAC systems.

1.03 WORK INCLUDED UNDER OTHER SECTIONS OF THE SPECIFICATIONS

A. The following work is included under other Sections of the Specifications:
1. Motorized dampers furnished and installed under this Contract.
2. Base flashing of curbs and sleeves at roofs.
3. Power wiring for all motors except where otherwise noted.
4. Temporary heat.
5. Setting of access doors furnished by this Contractor.
6. All motor disconnect switches, except where in combination starters and where otherwise noted.
7. Finish painting.
8. Access doors in ceiling and walls.
9. Finish patching.
10. Ventilating hoods - labs, etc.
11. Wiring of switches, aquastats, pressure controls in power circuit of cabinet and unit heaters.
12. Fan shutdown system.
13. Mounting of all starters, motor control centers, starter panelboards, and motor control devices: Division 26.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with quality established in Section 01 31 46 "Special Requirements for Mechanical and Electrical Work", and hereinafter specified. All work performed shall comply with local codes.

1.05 SUBMITTALS

A. Submit shop drawings covering the following items:
1. Coordination drawings.
2. Internal cleaning and treating of piping.
3. Sleeve and ductwork penetration drawings.
4. Identification schedule and samples.
5. Coils.
6. Expansion joints, anchors and guides, including details of installation.
7. Air diffusers, registers and grilles.
8. Schedule of ductwork, joints, gauges, supports, access doors, etc.
9. Hi Plume exhaust fans.
10. Sheet metal fabrication drawings.
11. Schedule of piping and fitting materials.

12. Piping shop drawings.
13. Schedule of valves, strainers, vacuum breakers.
14. Schedule of pipe and ductwork supports, including inserts, escutcheons, etc.
15. Heating systems, including fin tube radiation convectors, etc., as specified.
16. All motor starters, motor control devices and motor control centers.
17. Schedule of insulation types and samples of each type.
18. Acoustic material.
19. VAV and constant air valve boxes.
20. Air vents, water strainers for water systems.
21. Automatic Temperature Control System.

B. All shop drawings being submitted that include electrical work shall be submitted with all internal and external wiring diagrams.

C. The previously listed items are major equipment and do not limit this Division's responsibility to submit shop drawings for all equipment and accessories which are to be provided under this Division of the Specifications.

PART 2 - PRODUCTS

2.01 SPARE PARTS

A. Miscellaneous Spare Parts:
1. Electrical equipment - two spare starter fuses identified for each type and size for all starters for exhaust fans.
2. One set of bearings properly identified for each type and size exhaust fan.

B. Furnish tools required for equipment as follows:
1. One set of high grade tools as recommended and approved by the respective manufacturer for fans, and other equipment. Tools shall be furnished in a suitable hardwood or other approved container with lock and two (2) keys. Pasted on the inside cover shall be a list of all tools provided in container.
2. One pressure grease gun of approved design and size, complete with necessary adaptors to fit all lubricating fittings on installed equipment.
3. One pitot tube, complete with required manometers, to read static pressure and velocity pressure simultaneously. Provide 6'-0" of rubber tubing.

2.02 LIST OF MANUFACTURERS

A. The manufacturer's name appearing first on this list is the manufacturer the project design was based upon. However, the additional manufacturers listed herein are also acceptable with the provision that they meet the requirements of these Specifications, ratings, and/or space allocations listed in the Specifications or shown on the Drawings.
1. Duct Terminal Units
    a. Anemostat
    b. Price
    c. Titus
    d. Nailor
    e. Envirotech
    f. or approved equal

2. Water Coils
   a. American Air Filter
   b. Trane
   c. York
   d. Carrier
   e. or approved equal
3. Hi Plume Exhaust Fans
   a. Loren Cook
   b. Greenheck
   c. Strobic Air
   d. or approved equal
4. Finned Tube Radiation and Convectors
   a. Vulcan
   b. Trane
   c. Sterling
   d. or approved equal
5. Water Specialties
   a. Bell & Gossett
   b. Taco
   c. Armstrong
   d. or approved equal
6. Expansion Joints
   a. Zallea
   b. Flexonics
   c. Flex Hose
   d. or approved equal
7. Flow Measuring Devices
   a. Barco Division; Aeroquip Corp.
   b. Pres O Ind.
   c. or approved equal
8. Motors
   a. General Electric
   b. Westinghouse
   c. Allis Chalmers
   d. or approved equal
9. Starters, Motor Control Centers, Switches
   a. Allen Bradley / Rockwell
   b. Square D
   c. General Electric
   d. Westinghouse
   e. Cutler-Hammer
   f. or approved equal
10. Diffusers, Registers & Grilles
    a. Titus
    b. Price
    c. Anemostat
    d. Acutherm
    e. Nailor
11. Valves
    a. Milwaukee Valve
    b. Crane

c. Hammond Valve
d. or as specified under paragraph on "Valves".

12. Insulation and Acoustic Lining
    a. Owens-Corning Fiberglass Corp.
    b. CSG Snap-on
    c. Johns Manville
    d. or approved equal
13. Automatic Temperature Controls
    a. Johnson Controls
    b. Honeywell
    c. Siemens
    d. Andover
    e. Alerton
    f. Automated Logic
14. Internal Cleaning & Treating of Piping
    a. Heating Economy Services Co., Inc.
    b. Tower Water Management
    c. The Metro Group, Inc.
    d. Drew Chemical Co.

END OF SECTION

SECTION 230523

VALVES FOR HVAC

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

C. Section 23 20 00 – Piping for HVAC.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all Valves as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. "Manufacturers" - Firms regularly engaged in manufacture of valves, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide valves produced by the manufacturers, which are listed in Section 23 05 12, "Approved Manufacturer's List".

C. Provide valves whose performance under specified conditions, is certified by the manufacturer.

D. To assure uniformity and compatibility, all grooved end valves and adjoining couplings shall be supplied by a single manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 VALVES

A. Valves- General: All valves shall be of a design which the manufacturer lists for the service and shall be of materials allowed by the latest edition of the ASME Code for pressure piping for the pressure and

temperature contemplated, unless a higher grade or quality is herein specified. All valves of the same type shall be of the same manufacturer, except for special applications.

B. The system shall be supplied with valves in all branch mains and risers, and control valves, heating and cooling surfaces and at all apparatus; so located, arranged and operated as to give complete shut-off. Except where flanged valves are used, each connection to equipment shall be made with screwed unions, flanged unions, or grooved couplings on the equipment or discharge side of the valve.

C. All valves shall be installed and arranged so that they are easily accessible.

D. Each valve shall have the maker's name or brand, the figure or list number and the guaranteed working pressure cast on the body or stamped on the bonnet, or shall be provided with other means of easy identification.

E. Provide valve steam handle extensions on all ball valves and/or butterfly valves, where insulated, when insulation thickness would otherwise cause the insulation to be damaged as a result of the 90 degree handle movement.

F. Check valves installed in the horizontal position shall be swing checks; valves installed in the vertical position shall be silent checks for 2½" and above, and lift check for 2" and smaller, except that all check valves in pump discharges shall be silent checks.

G. Provide isolation valves where tying new piping into the existing system. Refer to the valves specifications for the proper valve type for the service. Refer to the Drawings for the pipe/valve size. In addition to the isolation valves at the tie-in points, also provide a balancing valve on the supply side for chilled water, chilled glycol/brine, condenser water and heating/reheat hot water system tie-ins.

H. Provide capped blow-off valves at all strainers, and where shown on the Drawings.

I. Generally, all valves are to be of the gate type, except that globe valves shall be used for balancing service, throttling services and on traps, and pressure reducing and control valve bypasses. Globe valves used on bypasses shall have monel metal mountings. Pumps shall have globe type balancing flow measuring & shut off valves on discharge piping.

J. All valves 2 inches in diameter and smaller shall be all bronze with bronze bodies. Valves 2½ inches in diameter and larger shall have iron bodies with bronze mountings (except where otherwise noted).

K. All flanged-end valves shall have renewable metal seat rings and discs. On gate valves these parts shall be of bronze, on all globe valves they shall be of bronze and suitable for throttling service.

L. Grooved-end valves may be used in lieu of threaded, flanged, lug or wafer valves, if and where grooved end piping is used. All grooved-end valves shall be complete with grooved ends for use with mechanical couplings of the same manufacturer. Valve sealing elastomer shall be of the same composition as the adjoining coupling gaskets.
   1. Grooved End Butterfly Valves:
      a. 2"-12": ASTM A395 and A536 ductile iron body and disc, with integrally cast stem. Disc shall be nickel-plated. Body coated with Black enamel. Victaulic Vic-300 MasterSeal™.
      b. 14"-24": ASTM A395 and A536 ductile iron body and disc. Disc and body PPS coated. Mounted elastomer seal with stainless steel stem. Victaulic Series-Victaulic Vic-300 AGS (300 psi max).
      c. 2-1/2”–6”: Copper tube dimensioned bronze body, EPDM encapsulated ductile iron disc, integrally cast stem. Victaulic Series 608.

2. Grooved end check valves shall be ASTM A395 and A536 ductile iron body, with stainless steel spring and shaft. Victaulic Series 716H and 716.
   a. 2" - 3": Ductile iron body with stainless steel disc, mounted elastomer seal, and nickel-plated seat.
   b. 4"-12": Black enamel coated ductile iron body, elastomer encapsulated ductile iron disc, with welded-in nickel seat.
   c. 14”-24”: ASTM A395 ductile iron body, stainless steel disc, spring, and shaft, EPDM seat bonded to the valve body, AGS grooved ends. Victaulic Series W715.

M. All screwed-end globe valves shall be of the union bonnet type with renewable teflon discs.

N. All valves shall have their bonnets back-seated to provide for packing under pressure. All gate valves shall be of the solid tapered wedge type.

O. Drain valves shall be provided where they may be required or necessary, for draining the lines and equipment. Drain valves or plug cocks shall be provided at the low points for proper drainage. Cocks and valves shall be provided with threaded ends for those connections.

P. All valves up to 2 inches in diameter shall have screw ends, 2½ inches in diameter and over shall have flanged ends. Valves 2½" and larger which are non-rising stem, shall have position indicators.

Q. All bronze and iron valves shall be furnished with Teflon impregnated packing.

R. All handwheels shall be of malleable iron.

S. No Asbestos shall be used in construction of valves including the gaskets.

T. All valves shall be of type and number as specified below: For all services, except as otherwise noted.

TYPE	SIZE	NIBCO NO.	CRANE NO.	VICTAULIC NO.	HAMMOND NO	MILWAUKEE NO.	ABZ No.	REMARKS
Gate Valve	2” & Smaller	T-134	428UB		IB629	1151		150 lb. WSP, Bronze
	2 ½” & Larger	F-617-O	465 ½		IR1140HI	F2885M		Rising Stem 125 lb. WSP, Bronze Trimmed, Iron Body, OS&Y
Globe Valve	2” & Smaller	T-275Y (Teflon) T275-B (Steam) T276-AP (SS Full-Plug)	14 ½ P	786 787 78K	IB444	572 593A		300 lb WSP, Bronze
	2 ½” & Larger	F-718B	351	788 789	IR116	F2981M		125 lb, WSP, Bronze Trimmed, Iron Body OS&Y

TYPE	SIZE	NIBCO NO.	CRANE NO.	VICTAULIC NO.	HAMMOND NO	MILWAUKEE NO.	ABZ No.	REMARKS
Angle Valve	2" & Smaller	T375-Y (Teflon) T375-B (Steam) T376-AP (SS Full-Plug)	16 ½		IB454T	582		300 lb. WSP, Bronze
	2 ½" & Larger	F-818-B	353					125 lb. WSP, Bronze Trimmed, Iron Body, OS&Y
Butterfly Valve (High Performance)	2 ½" & Larger	LCS-6822 LCS-7822		Vic-300 MasterSeal Vic-300 AGS	HP1LCS4212 HP1LCS4213	HP1LCS4212 HP1LCS4213	400 Series	300 psi Grooved DI, EPDM 285 psi Lug, DI, SS Disc, EPDM
Swing Check	2" & Smaller	T-433-Y	137	789	IB946	515	900	150 lb WSP, Bronze
	2 ½" & Larger	F-918-B	373	712	IR1124HI	F2974M	900	125 lb WSP, Bronze Trimmed, Iron Body
Silent Check	All Sizes	F-910 / w-910 (CI) G-920-W (DI)	-----	716 716H W715	IR9253 IR9354	1400 1800	900	Williams-Hager Fig. 636, 125 WSP Semi-steel.
Drain Valves	2" & Smaller	T-113-HC	451					200 lb. OWG, Non- rising stem, Hose end, Bronze with Bronze Cap & Chain
Blow-Off Valves	2" & Smaller	T-585-70-HC (Ball) T-174-A (Gate)	----		8501H (Ball) IB652 (Gate)	BA100H (Ball) 1182 (Gate)		300 lb. WSP, Bronze Y-Type
Strainers	2" & Smaller	T-221/222-A						125 lb, WSP, Bronze
	2 ½" & Larger	T-751-A F-721-A		730 W730 732 W732				250 lb, WSP, Iron Body, 125 lb, WSP, Iron Body

U. Valves for radiation & gas service shall be as follows:

V. Hot Water Radiation Shut-off all sizes, 200 psi water, Sarco No. 740A with lock shield.
1. Fig. 1 Angle Pattern
2. Fig. 3 straight thru
3. Fig. 4 Lock shield type

W. Radiation Balancing - All sizes, 200 psi water, bronze, male union outlet, combination balancing, shut off and flow measuring, Sarco metered balance master valve, or approved equal. Provide model flow test kit.

X. Gas System
1. 2" & smaller, 125 WOG Crane No. 1228, square head cock
2. 2½" to 4"; 125 WOG Crane No. 324
3. Alternatively, for gas service the Contractor may provide a UL/FM/CSA/NSF rated ball valve such as “RuBs.92".

2.02 VALVES IN COPPER TUBING
*

A. Except where otherwise noted, all valves for use with copper tubing shall be as follows

*NOTE TO SPEC. WRITER: SEE NOTE 1

TYPE	SIZE	NIBCO NO	CRANE NO	VICTAULIC NO	HAMMOND NO	MILWAUKEE NO	REMARKS
Gate Valve	2” & Smaller	S-111	1320	----	IB635	149	125 lb. WSP, Bronze
	3” & Smaller	S-134	----	----	IB648	1169	300 lb. Non-Shock
	2 ½” & Larger	F-617-O	428	----	IR1140HI	F2885M	125 lb, WSP, Bronze trimmed, rion body, OS&Y
Globe Valve	2” & Smaller	S-211-Y	1310	----	IB418	1502	125 lb WSP, bronze
	3” & Smaller	S-235-Y	----	----	IB423	1590T	300 lb. Non-shock CW Bronze with solder joint adapter
	2 ½” & Larger	F-718-B	14 ½ P	----	IR116HI	F2981M	125 lb. WSP, bronze trimmed, iron body OS&Y
Angle Valve	2” & Smaller	S-311-Y	1311	----	IB463	504	125 lb WSP, Bronze with solder joint adapter
	3” & Smaller	S-335-Y	----	----	IB454T	595T	300 lb. Non-shock CW Bronze with solder joint adapter
	2 ½” & Larger	F-818-B	16 ½ P	----			125 lb WSP, bronze trimmed, iron body OS&Y
Swing Check	2” & Smaller	S-413-B	1303	----	IB912	1509	125 lb WSP, Bronze
	3” & Smaller	S-433-B	----	----	IB945	1515	300 lb Non-shock CW Bronze with solder joint adapter
	2 ½” & Larger	F-918-B	34	----	IR1124HI	F2974M	125 lb WSP, bronze trimmed, iron body
Balancing Valves	½” to 2”		Tour and Anderson	786 787 78K			125 lb, WSP, bronze body, globe style,

TYPE	SIZE	NIBCO NO	CRANE NO	VICTAULIC NO	HAMMOND NO	MILWAUKEE NO	REMARKS
							integral test, point, thrd or swt.
	2 ½" to 12"						125 lb. WSP, iron body, non-rising stem, flg or grv

2.03 LUBRICATED PLUG VALVES

A. Full port opening tapered plug suitable for lubrication under service pressure with plug in any position.

B. Lubricating Guns:
1. One for every 10 valves.
2. Extra heavy, lever type, hydraulic hand gun.
3. 15,000 psi gauge and 12" long connection hose.

C. Lubricant:
1. Manufacturer's recommendations.
2. One year supply, each valve.

D. Operators:
1. 4" with wrench, except as noted.
2. Wrench set for each size valve.
3. Wrench for every 10 valves, each size
4. 6" and larger: gear operated.
5. Permanently installed handwheel.

2.04 VALVE CONSTRUCTION

A. Piping less than 100 psi: 200# WOG Class, cast iron body.

B. Piping 100 psi to 250 psi: ANSI Class 150, carbon steel.
1. 4" and larger: flanged, ANSI Class 150 rated.

C. Piping over 250 psi: ANSI Class 300, carbon steel body.
1. Up to 2": screwed
2. 2½" and larger: flanged, ANSI Class 300 rated.

2.05 BALANCING VALVES

A. All balancing valves shall be combination balancing, flow measuring and shut off valves. Valves shall be globe style design and shall have a position indicator and memory stop or locking device so that the valve can be closed without disturbing the setting and returned to the balanced position without further adjustment.

B. Valves shall be as manufactured by Tour and Andersson, Inc. or approved equal.

C. Nominal working pressure for the valves shall be 250 psig or greater at 250°F.

D. Provide portable flow measuring instruments which shall be turned over to the Owner at the completion of work.

E. Butterfly valves can be used for only shutoff valves and shall not be used for balancing.

F. Coil Hook-Up Assembly: Install with Tour & Andersson balancing valves 2" and smaller, Victaulic Series 799 or 79V Koil-Kit™ to complete terminal hookup at coil outlet and to reduce space requirements. Assembly shall consist of Victaulic Series 78U union port fitting, Series 78Y strainer/ball valve or Series 78T union/ball valve combination and flexible hoses.

2.06 BALL VALVES

A. Ball Valves up to 2½" may be used for all water services as an alternate to gate valves.

B. Ball valves shall be bronze body, bronze ball and stem, Teflon seats and seals threaded ends, 400 psig cold W.O.G. Worchester No. 411T-SE or equal. "APOLLO" 70 - 100 Series.

C. Provide valve stem handle extensions per para. 2.01.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where valves are to be installed and determine space conditions and notify architect in writing of conditions determined to proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install valves where shown or specified, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that valves comply with requirements and serve intended purposes.

B. Install a manually operated bypass globe valve around all control valves (motorized or self-contained regulators).[1] Provide isolation valves immediately upstream and downstream of control valve, and install the globe valve bypass outside of the two isolation valves.

C. Contractor is responsible for final valve orientation. Valves shall be installed in such a manner to avoid leakage through their stem seals, while still orienting valve handles to provide suitable accessibility and operability. Valve orientation shall be in compliance with the valve manufacturer's installation instructions. Valve handle orientation shall be indicated on the piping shop drawings. Valves orientation and handles not shown on the piping shop drawings will be subject to possible removal and reorientation in the field based on the Engineer's observations following the completion of construction.

D. Coordinate with other work as necessary to prevent interference of valves with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of valves, test valves to demonstrate compliance with requirements. When possible, field correct malfunctioning valves, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION

SECTION 230580

HVAC SPECIALTIES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all HVAC Specialties as shown on the Drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Firms regularly engaged in manufacturer of this equipment with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than ten (10) years.

B. Provide products produced by the manufacturers, which are listed in Section 23 05 12, entitled "Approved Manufacturers List".

C. Provide equipment whose performance under specified conditions is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 EXPANSION JOINTS, BALL JOINTS, LOOPS, ANCHORS AND GUIDES

A. Provisions for expansion in piping mains, branches, and risers shall be made by the installation of offsets, expansion loops, or compensators as indicated on the Drawings and as required. Every 100'-0" horizontal steam and hot water piping shall have expansion loop and anchors. Minimum loop shall be 8'-0" by 6'-0" if not indicated on the Drawings.

B. All piping with loops or compensators shall be anchored so as to throw all expansion toward the loops or compensators.

C. Guides shall be installed on both sides of each expansion loop and compensator. Guides shall be Flexonics pipe alignment guides or approved equal. Anchors and guides shall be secured to beams, columns or concrete slabs.

D. Pipe hangers and rollers are not considered guides.

E. Provide 12" long guides for each expansion joint. Guides shall be located 3'-0" on each side of the expansion joints.

Furnish and install as shown on plans, or where necessary to absorb max. 1¾" expansion and max. ¼" contraction between two anchor points in copper lines, up to and including 2½", Flexonics Model HB Expansion Compensators having two-ply phosphor bronze bellows and brass shrouds and end fittings, as manufactured by Flexonics Division of Calumet and Heela, Inc., Bartlett, Illinois. All internal parts shall be of non-ferrous metals. Service pressure shall be external to the bellows. Compensators shall have internal guides extending the full length of the bellows travel. Compensators shall have internal positive anti-torque devices to prevent twist or torque on installation and shall have properly located positioning clip to insure installation of correct end-to-end dimension to allow full rated traverse. Compensator shall be for max. 125 PSIG. working pressure. Test pressure shall not exceed 175 PSIG.

Furnish and install as shown on plans, or where necessary to absorb max. 1¾" expansion and max. ¼" contraction between two anchor points in iron and steel pipe lines up to and including 2½", Flexonics Model II Expansion Compensators having two-ply stainless steel bellows and carbon steel shrouds and end fittings, as manufactured by Flexonics Division of Calumet & Heela, Inc., Bartlett, Illinois. Service pressure shall be external to the bellows. Compensators shall have properly located positioning clip to insure installation at correct end-to-end dimension to allow full rated traverse. Compensator shall be for Max. 150 PSIG. working pressure. Test pressure shall not exceed 200 PSIG.

H. Expansion joints in 3" and above piping shall be hydraulically formed bellows type with internal sleeves and external covers for insulation. Expansion joints, except where otherwise noted, shall be of the self-equalizing type having fully-contoured, cast iron equalizing rings.

Provide non-equalizing type expansion joints with internal sleeves on low pressure service (up to 15 PSIG including test pressure) such as diesel engine exhaust, or flexible cooling tower connections.

J. Manufacturer shall note on all submittal forms the resultant anchor loads due to pressure thrust and compressive forces at design conditions. Expansion joints shall be as manufactured by Flex-Hose, ADSCO, Zallea, Flexonic, or approved equal.

Ball Joints

1. Flexible ball joints shall be Barco Type "N" rated for continuous service at 525 deg. F and shall have provision for seal adjustment. Ball joints shall be carbon steel, providing 15-degree angular flexing movement and 360 rotation, with two pressure molded non-asbestos composition gaskets.
2. All ball joints shall be with welded ends.
3. All joints shall be designed for welding to piping specified for the various services.
4. All joints shall be installed as shown on the Drawings and in strict accordance with the manufacturer's recommendations.

AIR VENTS

A. In installing water piping systems and all equipment, carefully plan the actual installation in such a manner that high pints and air pockets are kept to a minimum and are properly vented where they are

unavoidable. All air elimination devices called for on the Drawings and in these Specifications shall be provided and properly installed. In addition, furnish and install all other air elimination devices which may be required due to job conditions. Assume responsibility for a proper, continuous and automatic air elimination to assure even and balanced distribution of water to all equipment.

B. Furnish and install an Armstrong No. 1 AV or Sarco 13W automatic air vent with test petcock at each high point in the water piping mains and where indicated on the Drawings. Furnish and install a 125 PSIG rated valve on the system side of each automatic air vent. Vents on hot water, dual temperature water and chilled water lines shall have Hoke Fig. No. PY-271 valves or approved equal. Vents on all other water lines shall have Hoke Fig. No. RB-271 valves or approved equal.

C. Furnish and install manual air vents Hoffman No. 500 or approved equal, for all upfed radiation. Furnish and install a 125 PSIG rated ball valve on the system side of each manual air vent. Provide access to all air vents.

STRAINERS FOR WATER SYSTEM

A. Furnish and install a full size Y-pattern strainer on the inlet of each control valve and each water pump, and where indicated on the Drawings. For pumps, the Contractor shall install either a Y-strainer or a suction diffuser with internal screened basket. Contractor shall not install both a Y-strainer and a suction diffuser.

B. The strainers shall be as manufactured by Spence, Sarco, Barnes and Jones, Elliott, Crane or Mueller.

C. All strainers, except where otherwise noted, shall have bronze body up to 2½", semi-steel above 2½", rated at 125 PSIG for all systems with 50 PSIG max. pressure and 250 PSIG for all others. Strainers 2-inch diameter and smaller shall have screwed ends. Strainers 2½ inch diameter and larger shall have flanged ends.

D. All strainers shall have removable cylindrical or conical screens of brass construction. They shall be designed to allow blowing out of accumulated sediment and to facilitate removal and replacement of the screen without disconnecting the main piping.

E. Screens for water 1/16" for 3" inclusive, ⅛" for 4" and above.

F. An approved blow-out connection with gate valve shall be made to each strainer. The valves shall be located not higher than 8 feet above the floor. All drain connections shall be piped to floor drains.

EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where these specialties are to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install HVAC Specialties where shown, in accordance with manufacturer's written instructions and with recognized industry practices, to ensure that HVAC Specialties comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of HVAC Specialties with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of HVAC Specialties, test HVAC Specialties to demonstrate compliance with requirements. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION

SECTION 230593

TESTING AND BALANCING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. All piping and equipment shall be tested. Labor including standby electrician, materials, instruments and power required for testing shall be furnished unless otherwise indicated under the particular Section of the Specification.

B. Tests shall be performed in the presence of and to the satisfaction of the Architect and such other parties as may have legal jurisdiction.

C. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their ratings.

D. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the Architects.

E. Any damage resulting from tests to any and all trades shall be repaired and damaged materials replaced, all to the satisfaction of the Architect.

F. The duration of tests shall be as determined by all authorities having jurisdiction, but in no case less than the time prescribed below.

G. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated and depends upon the operation of other equipment, systems and controls for proper operation, functioning and performance, the latter shall be operated simultaneously with the equipment or system being tested.

H. All fans and duct systems shall be completely balanced by the adjustment of sheaves, dampers, registers and other volume and diverting control devices, to obtain the air quantities indicated on the design drawings. Replace sheaves if required to meet design conditions.

I. All piping systems shall be completely balanced by the adjustment of plug cocks, globe valves or other control devices, to obtain flow quantities indicated on the design drawings.

J. Tests shall be performed in presence and to satisfaction of Architect, and such other parties as may have legal jurisdiction. Submit completed reports for approval. If air and water balancing cannot be verified in two, four-hour tests (total of eight hours) the Contractor shall pay the Architect or his representative for any additional time spent to balance the system.

K. (Required by NYC Code; use for NYC Projects). Upon completion of the work, a test shall be conducted in the presence and under the direction of a NYS Licensed Professional Engineer, retained by the Contractor, and qualified to conduct such tests. The tests shall show compliance with the code requirements for ventilation and the proper functioning of operating devices, before the system is approved. Tests shall also be conducted under the direction of the same Licensed Professional Engineer to demonstrate that all installed fire and fire smoke dampers operate properly. The Contractor shall submit a letter signed and sealed by the Licensed Professional Engineer indicating that such testing has been successfully conducted and shall make all associated controlled Special Inspections and other submissions to the Authority Having Jurisdiction (AHJ).

1.03 QUALITY ASSURANCE

A. Prior to installation of the mechanical systems, engage the services of an independent air and water balancing firm that shall be subject to the approval of the Architect. The firm shall have no affiliation with a mechanical contracting or sheetmetal company. Balancing and testing company shall be a member of the Associated Air Balance Council (AABC), National Environmental Balance Bureau (NEBB) or Testing, Adjusting and Balancing Bureau (TABB). The balancing firm shall have at least one member of its full time staff who is a licensed professional engineer who shall supervise the balancing work. Prior to balancing, a list of instruments to be used shall be submitted to the Architect. All instruments shall be calibrated within six months before tests.

B. Prior to installation of the mechanical systems, the licensed Professional Engineer for the Balancing and Testing Company shall review the contract documents to confirm that all balancing devices are provided to allow for complete balancing of the air and water systems for the project. The Balancing and Testing Company shall submit a letter confirming that they have performed this review and identifying any issues.

After the mechanical systems are installed and before the systems are enclosed behind walls and ceilings, the PE for the Balancing and Testing Company shall perform a review of the installation to verify that the required balancing devices have been installed and that the systems are ready for balancing. The Balancing and Testing Company shall submit a letter confirming that the inspection has been performed and that the system is ready for balancing.

Both letters shall be signed and sealed by the Balancing and Testing Company’s Professional Engineer.

C. When all specified testing and balancing procedures have been completed, a written report shall be submitted to the Architect for review. The report shall be tabulated in standard AABC/TABB format. As part of the Architect's review process, the accuracy of the balancing report shall be field spot checked on a random basis, with the assistance of the balancing firm's project supervisor. The HVAC Contractor shall reimburse the Architect for all time spent in excess of eight working hours, to demonstrate the accuracy of the balancing report.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 "Special Requirements for Mechanical and Electrical Work". Submit all test and balancing reports as described hereinafter.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 FIELD TEST OF PIPING

A. During construction properly cap or plug all lines to prevent the entrance of sand, dirt, etc. The system of piping shall be blown through wherever necessary after completion (for the purpose of removing grit, dirt, sand, etc., from all equipment and piping), for as long a time as is required to thoroughly clean the apparatus.

B. Use anti-freeze solution for piping to be tested in winter.

C. All piping shall be tested as hereinafter specified. Tests shall be made after erection and before covering is applied or piping painted or concealed, and as sections of mains and groups of risers are completed. The extent of the work completed before pressure tests are made shall be determined by the Architect.

D. All piping, unless otherwise specified, shall be tested to a hydrostatic pressure at least 1-1/2 times the maximum designed working pressure (but not less than 50 lbs. per square inch) for a sufficiently long time to detect all leaks and defects; and after testing shall be made tight in the most approved manner. Tests shall be repeated once after leaks and defects have been repaired. When automatic control valves, equipment and similar devices which are incapable of withstanding test pressures applied to piping, such devices shall be removed, or otherwise protected during tests. After approval of such tests, devices shall be installed and tested with operating medium to operating pressures. The following shall be tested for four consecutive hours and proved tight. Leaks shall be remedied by replacing defective work.

Hydrostatic

Item	Field Test
Hot water heating	100 psi
[1]Gas	50 psi

E. Leaks appearing during the various pressure tests shall be corrected by replacing all defective materials or welds and subsequent tests shall be made until the piping is found perfect. Caulking of screwed joints or pending of welds is prohibited. Wherever it is necessary to cut out a weld and the ends of the pipe

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[1] NYC Code requires the following:

(1) *Gas distribution piping:*

a. *Distribution pressures up to and including* one-half psig. the completed piping is to be tested [at three psig] *with a mercury gauge at a pressure equal to a column of mercury six inches in height* for a minimum of [one hour] *thirty minutes*.

b. Distribution pressures over one-half psig through three psig. The completed piping is to be tested at fifty psig for a minimum of [one hour] *thirty minutes*.

c. Distribution pressures over three psig through fifteen psig. The completed piping is to be tested at one hundred psig for a minimum of [four hours] *one hour*.

d. Distribution pressures above fifteen psig. The completed piping is to be tested to twice the maximum allowable operating pressure, but not less than one hundred psig, for a minimum of [four hours] *one hour*.

cannot be conveniently brought together, then a short piece of pipe shall be fitted in and welded as approved by the Architect.

F. Provide all other tests required by the Building Department, Fire Department and all other Authorities Having Jurisdiction (AHJ).

3.02 RUNNING TEST OF PIPING SYSTEMS

A. When directed, any section of the work, after it has been completed and otherwise satisfactorily tested, shall be put in actual operation and operated for a period of two (2) days of 24 hours each, during which time any defects which may appear shall be remedied and any adjustment which may be necessary shall be made.

B. During the time of the tests, repack all valves, make all adjustments and otherwise put the apparatus in perfect condition for operation, and instruct the Owner's representative in the use and management of the apparatus.

C. Boiler feed suction (H.P. boilers)100 psi

3.03 AIR LEAKAGE TEST FOR MEDIUM PRESSURE DUCTWORK SYSTEM

A. The testing of all joints for air leakage after erection and the repair of any leaks are positive requirements. Leakage must be kept to a specified minimum. The test for air leakage is divided into two phases; namely, testing of individual vertical risers and testing of all branches. Provide all required instruments.

B. Test shall be made at 6 inches water gauge static pressure. All risers, branches and runouts shall be tested after installation before insulation is applied and before the air mixing units are installed. The total allowable leakage for the entire system shall be no more than one (1) percent of the total system capacity.

C. Equipment necessary for performing this test shall include a rotary hand blower calibrated orifice section and a "U" tube gauge board complete with cocks and rubber tubing. The test hookup, as well as details for the fabrication of the orifice section shall be in accordance with the recommendation of the "High Velocity Duct Manual" of Sheetmetal and Air Conditioning Contractors National Association, Inc.

3.04 EQUIPMENT TEST

A. Demonstrate that all equipment and apparatus fulfill the requirements of the Specifications and that all equipment shall be operated and tested for rated capacities and specified characteristics. Voltage and amperage readings shall be taken on all electric motors.

B. Operate fans for 40 hours and demonstrate fans operating at maximum capacity, with all variable volume dampers to be at the full open position.

3.05 TEST PREPARATION AND PROCEDURE

A. On initial startup, prior to any tests, check the rotation and running amperage of all fan and pump motors to prevent damage to equipment by overload.

B. Final balancing must be done with all systems completely installed and operating, and after the automatic temperature controls have had their final adjustment.

C. New, clean filters must be installed in all supply systems prior to balancing.

D. All water systems shall be completely filled and vented, and all strainers cleaned prior to balancing. Inspect expansion tanks for proper water level and operating of makeup water valves.

E. All main supply air ducts shall be traversed, using a pitot tube and manometer. The manometer shall be calibrated to read two significant figures in all velocity pressure ranges. Duct traverses shall be conducted using the log-Tchebycheff method. The equal area method is not acceptable.

F. A main duct is defined as either of the following:
1. A duct serving five or more outlets.
2. A duct serving two or more branch ducts.
3. A duct serving a reheat coil.
4. A zone duct from a multi-zone unit.
5. A duct emanating from a fan discharge or plenum and terminating at one or more outlets.

G. The intent of this operation is to measure by traverse the total air quantity supplied by the fan and to verify the distribution of air to zones.

H. Submit data in support of all supply fan deliveries by the following four methods:
1. By summation of the air quantity readings at all outlets.
2. By duct traverse of main supply ducts and directly at the air handler or fan discharge.
3. By a rotating vane traverse across a filter or coil bank.
4. By plotting RPM and static pressure readings on the fan curve. Air density corrections must be indicated.

I. For exhaust fans, the rotating vane traverse is not required.

J. Inspect all fan scrolls and remove objects or debris. Inspect all coils and remove debris or obstructions. Verify that all fire dampers are open.

K. The supply air systems shall be completely balanced prior to the final balancing of the water systems.

L. Upon completion of all air and water balancing, all duct dampers, plug valves and other throttling devices shall be permanently marked in the final adjusted position.

3.06 AIR BALANCE

A. Record the following design requirements for all fans and fan motors from the approved shop drawings and existing AC-4A and RE-4a fans.
1. Air quantities - CFM
2. Approximate fan speed - RPM
3. Fan static pressure (total or external) - inches of water.
4. Maximum tip speed - FPM
5. Outlet velocity - FPM
6. Fan brake horsepower
7. Motor horsepower
8. Volts, phases, cycles and amps at design conditions.

B. Record the following data from all fans and fan motors installed at the project and existing AC-4A and RE-4A:
1. Manufacturer, model and size
2. Motor horsepower, service factor and RPM
3. Volts, phases, cycles and full load amps

4. Motor starter and heaters size
5. Equipment location

C. All fans EF-1, AC-4A and RE-4A and duct systems shall be completely balanced by the adjustment of sheaves, dampers, registers and other volume and diverting control devices, to obtain the air quantities indicated on the Drawings. Outside air and return air modulating dampers shall be adjusted to admit the specified quantities of air under all cycles of operation. All final adjusted supply, return and exhaust air quantities shall be within 10% of the design requirements (while adhering to positive or negative pressure room design conditions, if and where applicable). Final adjusted minimum outside air quantity shall be -0% / +5% of the design requirement. Replace sheaves if required to meet design conditions.

D. Record the following test data for all fans EF-1, AC-4A and RE-4A and motors installed at the Project at final balanced conditions:
1. Fan speed RPM.
2. Fan static pressure (external and total) inches of water.
3. Static pressure drop across all filters, dampers, coils and other items in the supply fan casings.
4. Motor operating amps. (Measure, record and report all motor amps at minimum outside air volume and at maximum outside air volume.) This requirement applies to both constant volume and variable air volume systems where economizers are present.
5. Actual voltage
6. Fan CFM
7. Calculated brake horsepower.

E. Submit single line diagrams of all duct systems indicating all terminal outlets identified by number. Data sheets shall list all such outlets denoted by the same numbers, including the outlet's size, "K" factor, location, CFM and jet velocity.

F. Submit this data for all supply, return and exhaust air systems.

3.07 VARIABLE AIR VOLUME SYSTEM

A. Check and record the following items on the supply and return fans:
1. Correct fan rotation.
2. Filter condition (clean or dirty).
3. Cooling coil condition (dry or wet).

B. Set the controls for the supply and return fans to operate at maximum capacity and for all variable volume dampers to be at the full open position.

C. Set the system up to operate with maximum return air and minimum outside air.

D. The following preliminary data should be obtained and recorded at the supply and return fans:
1. Fan and motor RPM.
2. Motor and current voltage.
3. Fan, coils and filter statics.
4. Nameplate data on the fans and motors.
5. Motor sheave, fan pulley and belt sizes.

E. Traverse the main supply ducts and return ducts to determine CFM deliveries of the fans.

F. Set the system to operate at 100% outside air and check the motor amperage. The motor amperage should remain relatively constant indicating no change in total air flow. If a change in flow does occur,

adjust outside air, return air, and relief air dampers accordingly. Set enough variable volume controllers throughout the building to maximum in order to simulate a maximum load on the fan.

G. Measure the system duct static pressure at selected points throughout the system. Monitoring points shall be in those duct runs which are of the longest equivalent length (greatest friction loss). Monitor these points during the adjusting and balancing procedures to assure proper inlet static pressure is being maintained to the variable volume units.

H. Adjust the return fan to approximately 5% above design CFM and the supply fan to either 5% above design or to the point where the static pressure at the end of each branch is at required static pressure, whichever condition is reached first.
   1. If the fan is adjusted to obtain the minimum static pressure, then it may be necessary to readjust the fan during the balancing as the static pressure will decrease as the constant volume controller deliveries are increased.

I. Make preliminary outlet readings and balance the outlets to design CFM and record all readings.

J. Individually set the controls for each variable volume damper to comply with correct sequence of operation.

K. Check the variable volume controller for design delivery.
   1. Check all the units, but make no adjustments. Report the results.
   2. If check passes, then proceed with balancing.
   3. Do all setting and adjusting required.
   4. When necessary corrections have been made, a verification test will be required.

L. Adjust the outlets for design delivery.

M. The following final data should be obtained and recorded at the supply and return fans:
   1. Fan and motor RPM.
   2. Motor current and voltage.
   3. Fans, coils and filter statics
   4. Approximate motor sheave setting

N. Check the following controls:
   1. Economizer system function, calibration and damper synchronization.
   2. Face and bypass dampers function and calibration, if any.
   3. High temperature limit shutoff function and calibration, if any.
   4. Low temperature limit shutoff function and calibration, if any.

O. Set all controls to their normal set points and allow all controllers to reach a satisfied state.

P. Measure the mixed air plenum static pressure to verify that the return fan capacity controller is functioning properly. The static pressure in the plenum should be within .05" W.C. of the final balance condition.

Q. Walk through the building and listen for noise generated by the air distribution system. Excessive noise should be reported.

R. All above recorded items and readings shall be submitted to the Architect.

S. Balance all induction units by primary air nozzle pressure. Record the following data in addition to the design requirements for each unit.
   1. Unit size and location.
   2. Final nozzle pressure - inches of water.
   3. Water entering and leaving temperature and pressure drop through coil at full flow.
   4. Primary air temperature, room temperature and supply air temperature.

T. Adjust and test all terminal boxes, mixing boxes and their controls to deliver the required air quantities. Record the following data in addition to the design requirements for each unit:
   1. Box size and location.
   2. Air temperatures in the hot duct and cold duct inlets for cooling and full heating.
   3. Static, velocity and total pressures in hot duct and cold duct inlets for full cooling and full heating.

3.14 ADDITIONAL PROCEDURES FOR VARIABLE AIR VOLUME SYSTEM

A. Set the controls for the supply and return fans to operate at maximum capacity and for all variable volume dampers to be at the full open position. Open VAV diffuser dampers by heating up the building so that diffusers call for full cooling.

B. Set the system up to operate with maximum return air and minimum outside air.

C. Set the required number of VAV boxes for systems which have VAV boxes to fully closed or minimum position to account for system diversity. All other boxes shall be fully open. Closed and minimum position boxes should be closest to the supply fan.

D. Set the supply and return fan speed to obtain design air flow or greater.

E. Traverse the main supply ducts and return ducts to determine CFM deliveries of the fans.

F. Set the system to operate at 100% outside air for systems capable of 100% OA and check the motor amperage. The motor amperage should remain relatively constant indicating no change in total air flow. If a change in flow does occur, adjust outside air, return air, and relief air dampers accordingly.

G. Measure the system duct static pressure at selected points throughout the system. Monitoring points shall be in those duct runs which are of the longest equivalent length (greatest friction loss). Monitor these points during the adjusting and balancing procedures to assure proper inlet static pressure is being maintained to the variable volume units. Measure and record static pressure downstream of all duct mounted pressure independence modules (PIM) used for VAV diffusers.

H. Adjust the return fan to approximately 5% above design CFM and the supply fan to either 5% above design or to the point where the static pressure at the end of each branch (upstream of PIM) is at required static pressure, whichever condition is reached first.

I. Make preliminary outlet readings and balance the outlets to design CFM and record all readings.

J. Where applicable, individually set the controls for each variable volume box to minimum damper position and measure airflow at each of the outlets. Adjust the damper minimum position so the outlet total CFM is at the design minimum delivery. At the minimum delivery rate, the balance between the outlets may not hold, but no outlet adjustments should be made.

K. For VAV boxes check the variable volume controller for design delivery.
   1. Check all the units, but make no adjustments. Report the results.

2. If check passes, then proceed with balancing.
3. When necessary corrections have been made, a verification test will be required.
4. For VAV boxes with an upstream volume damper check that box damper is more than 50% open at design delivery and that no objectionable noise exists in the rooms served. If necessary, adjust upstream volume damper to achieve these conditions.
5. Measure and record CFM and inlet static pressure for each VAV box.

L. Adjust the outlets for design delivery. For VAV diffusers comply with manufacturer's balancing procedures. The VAV diffuser manufacturer's representative shall provide training in the balancing process.

3.15 WATER BALANCE

A. Record the following design requirements for all pumps and pump motors from the approved shop drawings:
1. Water quantity - GPM
2. Total head - feet of water
3. Pump speed - RPM
4. Impeller size
5. NPSH (if required)
6. Motor horsepower
7. Volts, phases, cycles and amps at design conditions

B. Record the following data from all pumps motors installed at the project:
1. Manufacturer, model and size.
2. Impeller size
3. Motor horsepower, service factor and RPM
4. Volts, phases, cycles and full load amps
5. Motor starter and heaters size
6. Equipment location

C. All pumps and piping systems shall be completely balanced by the adjustment of plug cocks, globe valves or other control devices, to obtain the flow quantities indicated on the Drawings. Balancing shall be done with all controls set for full flow through coils. All automatic throttling valves shall be in the full-open position. All automatic three-way valves shall have the bypass port closed.

D. Record the following test data for all pumps and pump motors installed at the Project:
1. Pump speed - RPM
2. Total head at shut-off and dead-end discharge - feet of water. (Plot this value on pump curve as a verification of impeller size.)
3. Suction, discharge and total head at final adjusted flow - feet of water.

E. Balance the water flow through all chillers, condensers, coils, convertors, cabinet heaters, heat exchangers, unit heaters, induction units, fan coil units, etc., in accordance with design requirements.

F. For all orifice plates, record the pipe size, orifice size, flow factor, required differential pressure, final differential pressure and calculated final flow quantity.

G. For all venturi type, pitot tube, or other flow measuring devices record the pipe size, manufacturer and size of device, and the direct reading or the differential pressure, and calculated final flow.

H. Flow shall be balanced through all equipment and coils by means of balancing and flow measuring valves provided. In addition pressure drop shall be measured and curves obtained from the various manufacturers indicating the relationship between flow and pressure drop through the coils and equipment. Readings shall be taken on calibrated test gauges. Submit curves with the final report. Final report shall document all flow and pressure drop measurements.

I. Balance pumps to their design flow rate, within 100% and 110% of design, so long as pump and motor rating permits. Balance flow through all coils and terminal units to ±10% of design flow rate.

J. Upon completion of the water balance, reconcile the total heat transfer through all coils by recording the entering and leaving water temperatures and the entering and leaving air dry bulb and wet bulb temperatures.

K. Upon completion of balancing, adjust all differential bypasses and three-way valve bypasses for the same pressure drop or full bypass as on full flow.

END OF SECTION

SECTION 230700
INSULATION FOR HVAC WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes furnishing and installing all labor, materials, equipment, accessories and services necessary to provide Piping, Ductwork and Equipment Insulation installation, which is complete in every respect and of the composition and quality as shown on the Drawings and hereinafter specified.

1.03 PIPE INSULATION

A. The following pipes shall not be insulated. Insulate all other piping:
1. Unions.
2. Automatic air vent drain pipes.
3. Gas and gas vent piping.
4. Drain pipes embedded in concrete.
5. Piping under radiation cover.

1.04 DUCTWORK INSULATION

Insulate all ductwork except the following portions of ductwork:
1. All exhaust ductwork, except where otherwise noted.
2. Exposed supply ducts in air-conditioned spaces if same supply air duct serves that area only. Dry and Wet Labs.

1.05 QUALITY ASSURANCE

A. "Installer": A firm with at least ten 10 years successful installation experience on projects with piping and ductwork insulation similar to that required for this project.

B. All insulation shall have composite (including insulation jacket or facing and adhesive) fire and smoke hazard ratings as tested by procedure ASTM E-84, NFPA 255 and UL 723 not exceeding:
1. Flame Spread 25
2. Smoke Developed 50
3. Fuel Contributed 50

C. Accessories such as adhesives, mastics, cements, tapes and cloths for fittings shall have component ratings as listed above. All products shall bear UL labels indicating the above are not exceeded.

D. Provide certifications or other data as necessary to show compliance with these Specifications and governing regulations. Include proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.

E. Provide products produced by the manufacturers which are listed in Section 23 05 12, "Approved Manufacturers List"

F. Insulation Materials: Insulating materials manufacturing facilities must be certified and registered with an approved registrar for conformance with ISO9000 quality standard.

1.06 SUBMITTALS

A. Refer to Section 01 31 46 - "Special Requirements for Mechanical and Electrical Work", and submit shop drawings and samples.

1.07 GUARANTEE

A. Refer to Section 01 31 46 - "Special Requirements for Mechanical and Electrical Work".

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation; remove from project site.

B. Deliver insulation, coverings, cements, adhesives and coatings to the site in factory-fabricated containers with the manufacturer's stamp, or label, affixed showing fire hazard ratings of the products.

C. Store insulation in original wrappings and protect from weather and construction traffic.

PART 2 - PRODUCTS

2.01 HOT PIPE INSULATION

A. The following piping shall be covered with fiberglass insulation:

Service	Thickness
Hot Water Supply and Return (200 Degrees F and below)	
Up to 1¼”	1½"
1½” and above	2"

B. Insulation shall be glass fiber complying with ASTM C547, Type I with a maximum K factor of 0.23 at 75 degrees F. mean temperature. Insulation shall be suitable for 650 degree F. (2" minimum thickness above 450 degrees F.).

C. Insulation shall be sectional pipe insulation as made by Owens- Corning Fiberglass Corp., or Johns Manville Micro-Lok fiberglass pipe insulation, with all purpose white kraft reinforced jacket with self-seal lap to comply with ASTM C1136 Type I.

D. Longitudinal jacket laps and butt strips shall be smoothly secured per manufacturers recommendations.

E. All fittings, valves and flanges for pipe sizes smaller than 4" shall be insulated with molded fiberglass fittings of same thickness as the adjoining pipe insulation, secured with No. 20 gauge galvanized annealed steel wire and covered with Zeston 2000 25/50 PVC fittings as made by Johns Manville, except as specified in 2.02 H.

F. Finish for Exposed Pipe Insulation:
1. All exposed pipe, valve and fittings insulation shall have 0.016 inch thick corrugated aluminum jacket banded with ½" s.s. bands spaced 12 inches o.c. Piping, fittings and valves exposed in building, within seven feet of the floor or access platform, shall have 0.016" thick aluminum jacket banded with ½" aluminum bands spaced 12" o.c. or two bands per section. Joints and jacket shall provide complete weatherproof protection either by mechanical contact or by use of Foster 95-44 or Childers CP-76 metal jacketing sealant (gallon cans only; no tubes).
2. The term "exposed" is hereby defined as any place indoors in rooms with no ceiling or partial ceiling.

G. Insulation shall be protected by saddles from hangers, guides and rollers.

H. Strainers on hot pipes shall not be insulated.

I. Direct contact between pipe and hanger shall be avoided. Hanger shall pass outside of a metal saddle which shall cover a section of high density insulation (such as calcium silicate) of sufficient length to support pipe without crushing insulation. (See table below.) Hangers shall not pierce insulation and all vapor barriers shall be unbroken and continuous.

Pipe Size	Saddle & Insert Length
1½"- 2"	10" Long
3"-6"	12" Long
8"-10"	16" Long
12" & Over	22" Long

J. At pipe supports, insulation shield protection saddles and matching hanger shall be used.

2.02 PVC INSULATED FITTING COVERS

A. The Contractor shall use Zeston 2000 25/50 rated PVC covers as made by Johns Manville or approved equal, for concealed piping.

B. Hot Systems: Fittings shall be insulated by applying the proper factory precut Hi-Lo Temp insulation insert to the pipe fitting. The ends of the Ho-Lo Temp insulation insert shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe covering tufted and tucked in, fully insulating the pipe fitting. PVC fitting cover is then applied and shall be secured by tack fastening, banding or taping the ends to the adjacent pipe covering.

C. 2 or more layers of the Hi-Lo Temp insulation inserts shall be applied with the first layer being secured with a few wrappings of fiberglass yarn.

D. Fitting cover: The temperature of the PVC fitting cover must be kept below 150°F by the use of proper thickness of insulation and by keeping the PVC cover away from contact with, or exposure to, sources of direct or radiant heat.

E. Where insulated piping is exposed, the PVC covers shall be omitted since the use of 0.016" thick aluminum cladding is required on all piping, fittings and valves.

2.03 FIRE STOPPING

A. Packing of openings, where ducts and pipes penetrate fire barriers, shall be done with Rockwool insulation as made by United States Gypsum, Co.

B. Insulation shall comply with Fed. Spec. HH-1-558, Form A, Class 4, K=0.24, melting point 2000 degrees F.

C. An acceptable alternative to rockwool insulation shall be 3M Product Caulk CP25 or approved equal.

2.03 DUCTWORK INSULATION

A. Insulation for Concealed Duct
1. Except where otherwise noted, all concealed rectangular and round ductwork shall be covered with flexible duct insulation with or without vapor barrier complying with ASTM C553, Types I and II and of the thickness and densities indicated below.

Service	R Value	With
B. Cold and Hot Air Supply Ducts	6	Vapor Barrier

1. Flexible duct insulation with vapor barrier shall be 1 lb. per cu. ft. density glass fiber with a maximum K factor of 0.29 at 75 deg. F. mean temperature, with reinforced foil-faced, flame resistant kraft vapor barrier (facing to comply with ASTM C1136, Type II).
2. Insulation with vapor barrier shall be duct wrap insulation FRK-25, type 100 as made by Owens-Corning or Johns Manville Microlite Type 100 with FSK vapor barrier facing or standard 1 lb./cf duct insulation as made by CGG with FSK facing.
3. Flexible duct insulation without vapor barrier shall be 1 lb. per cu. ft. density glass fiber with a maximum K factor of 0.29 at 75 deg. F. mean temperature and shall be Owens Corning Fiberglass Type 75P, Johns Manville Microlite Type 100 or approved equal.
4. Adhere insulation to duct with Foster fire resistant adhesive 85-60 or Childers CP-127 or approved equal, applied in 4 inch wide transverse strips at 8 inch intervals. Insulation shall be butted with facing overlapping all joints at least 2 inches and sealed with Foster fire resistant adhesive 85-60 or Childers CP-127 or equal. For insulation with vapor barrier use Foster fire resistant vapor barrier adhesive or approved equal and joints without tabs shall be firmly sealed with aluminum foil tape adhered with same adhesive. Secure insulation with 18 gauge corrosion resistant wire spaced not more than 18 inches on center. Coat all duct taped seams, punctures and breaks with Foster 30-65 or Childers CP-34 vapor barrier coating.
5. Additionally, secure insulation to bottom of rectangular ducts over 24" wide with welded pins or stick clips on 18" centers. Cut off excess pins and seal as above.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this insulation is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install insulation in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that insulation complies with requirements and serves intended purposes.

B. Coordinate with other work as necessary to interface installation of insulation with other components of systems.

C. All insulating materials shall be applied only by experienced workmen, in accordance with the best covering practice. All piping, duct or equipment shall be blown out, cleaned, tested and painted prior to the application of any covering. Adhesives, sealers and mastics shall not be applied, when the ambient temperature is below 40°F, or surfaces that are wet.

D. At all openings in insulation and acoustical duct lining, insulate edges neatly and protect with sheet metal nosing. Use sealant as well.

E. All items described in general indicate the type of covering required, however, all piping, ductwork or equipment that transmits heat or will form condensation shall be insulated.

F. Finish for Concealed Pipe Insulation:
1. Factory ASJ (All service jacket) secured in place with Bostich staples 4" o.c. or ASJ with self sealing lap as made by Johns Manville, Owens-Corning or approved equal. All fittings shall be covered with Zeston PVC covers.

G. All piping and ductwork insulation shall be continuous through non-fire rated ceiling openings and sleeves passing through non-fire rated walls or floors. Sleeves shall be packed with mineral wool or thermofiber. Discontinue insulation as it passes through fire-rated wall or floor and use mineral wool or thermofiber packing instead. Specific mastics, adhesives and coating shall be applied in strict accordance with Manufacturer's instruction, including recommended coverages.

H. All valved and capped outlets left for future work shall be insulated as herein specified for the specific systems with a removable section of insulation over caps.

I. Where insulation on existing piping, equipment, etc., has been cut, removed or damaged, this Contractor shall reinsulate as herein specified.

J. All insulation of access doors shall be set in sheet metal double-pan construction.

K. All ductwork shall be insulated in the field, following complete installation of the ductwork. Installation of insulation on the ductwork in the shop (prior to delivery and installation of the ductwork) is prohibited.

L. For installation of elastomeric closed-cell insulation:
1. Piping:
    a. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armaflex 520, 520 BLV or 520 Black Adhesive. When using AP Armaflex SS, only the butt joints shall be adhered using Armaflex 520, 520 BLV or 520 Black Adhesive. Armaflex HT 625 Adhesive shall be used with UT Solaflex.
    b. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.

c. Tape the ends of the copper tubing before slipping the Armaflex insulation over the new pipes to prevent dust from entering the pipe.
d. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp non-serrated knives must be used.
e. Sheet insulation shall be used on all pipes larger than 8" IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12" IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24" IPS, complete adhesion is recommended.
f. Seams shall be staggered when applying multiple layers of insulation.

2. Hangers:
   a. Support piping system using high density inserts with sufficient compressive strength. The pipe support insulation shall be elastomeric foam with the same or greater thickness than the pipe insulation. All joints shall be sealed with Armaflex 520, 520 BLV or 520 Black adhesive.
   b. Standard and split hangers -- Piping supported by ring hangers shall have hangers insulated with the same insulation thickness as the adjacent pipe. All seams and butt joints shall be sealed with Armaflex 520, 520 BLV or 520 Black Adhesive. Armaflex HT 625 Adhesive shall be used with UT Solaflex. Ring hangers may be sleeved using oversized tubular insulation. On cold piping, insulation shall extend up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
   c. Clevis hangers or other pipe support systems -- Saddles shall be installed under all insulated lines at unistrut clamps, clevis hangers, or locations where the insulation may be compressed due to the weight of the pipe. All piping shall have wooden dowels or blocks of a thickness equal to the insulation inserted and adhered to the insulation between the pipe and the saddle.
      It is highly recommended for continuous insulation protection to use hanger sizes equal to the outer diameter of the pipe plus insulation thickness.
   d. Armafix IPH or Armafix NPH can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. To minimize the movement of Armafix, it is recommended that a pair of non-skid pads be adhered to the clamps. In addition, to prevent loosening of the clamps, use of an anti-vibratory fastener, such as a nylon-locking nut, is also recommended.

3. Square and Rectangular Ductwork:
   a. The top of the ductwork must be sloped to prevent "ponding" of water. The recommendation is at least a 2° angle to the outer side.
   b. Armaflex Sheet Insulation shall be adhered directly to clean, oil-free surfaces with a full coverage of Armaflex 520, 520 Black or Low VOC Spray Adhesive. Armaflex HT 625 Adhesive shall be used with UT Solaflex. AP Armaflex SA shall be adhered directly to clean, oil-free surfaces.
   c. The duct insulation shall be constructed from the bottom up, with the top insulation sized to extend over the side insulation. This will form a watershed.
   d. Butt-edge seams shall be adhered using Armaflex 520, 520 Black, or HT 625 Adhesive by the compression fit method to allow for expansion/contraction. Leave a 1/2"-wide uncoated border at the butt-edge seams on the duct surface and the insulation surface. Overlap the insulation 1/4" at the butt-edges and compress the edges into place. Apply Armaflex 520, 520 Black or HT 625 Adhesive to the butt-edges of the insulation.
   e. Standing metal duct seams shall be insulated with the same insulation thickness as installed on the duct surface. Seams may be covered using strips of Armaflex Sheet Insulation or half sections of tubular pipe insulation with miter-cut ends. Standing seams shall be adhered using Armaflex 520, 520 Black or HT 625 Adhesive.

f. Insulation seams shall be staggered when applying multiple layers of insulation.

4. Round Ductwork:
   a. AP Armaflex Sheet and Roll Insulation, UT Solaflex Roll Insulation, or NH Armaflex Sheet and Roll Insulation shall be used on all round ductwork. Insulation shall be wrapped not stretched around the duct. On ductwork larger than 12” in diameter, the insulation shall be adhered to the duct surface on the lower one third. On ductwork greater than 24” in diameter, the insulation shall be completely adhered to the duct surface. Longitudinal seams shall be located on the lower half of any round ductwork.
   b. Butt-edge seams shall be adhered using Armaflex 520, 520 Black or HT 625 Adhesive by the compression fit method to allow for expansion/contraction. Leave a 1/2” wide uncoated border at the butt-edge seams on the duct surface and the insulation surface. Overlap the insulation 1/4” at the butt-edges and compress the edges into place. Apply Armaflex 520, 520 Black, or HT 625 Adhesive to the butt-edges of the insulation.
   c. Insulation seams shall be staggered when applying multiple layers of insulation.

3.03 PROTECTION

A. The installer of the insulation shall advise the Contractor of required protection for the insulation work during the remainder of the construction period, to avoid damage and deterioration.

END OF SECTION

SECTION 230900

AUTOMATIC TEMPERATURE CONTROLS - ELECTRIC

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical work shall apply.

C. The work of this section shall be integrated with the existing BMS provided by Advantex Solutions. Please contact Giovanni Natale from Advantex Solutions Inc. Contact Information: P-718-278-2290; C-917-682-2521; Email - GNatale@Advantexsolutions.com).

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and place into satisfactory operation a complete system of automatic temperature controls as shown on the drawings and hereinafter specified.

B. The control system shall be of the electric unless otherwise indicated, all as hereinafter specified. Control equipment shall be as manufactured by Distech Controls. All controls and the Building Management System (BMS) shall be the product of one manufacturer. The temperature control manufacturer shall be responsible for the quality and satisfactory operation of material provided but not actually manufactured by him. The system shall be a BACNET system.

C. The system shall have a graphic system which is compatible with the system currently installed in accordance with the specification, which is a Distech Controls system, installed and maintained by Advantex Solutions Inc. Please contact Giovanni Natale from Advantex (P-718-278-2290; C-917-682-2521; Email - GNatale@Advantexsolutions.com).

D. The control system shall include all necessary thermostats, damper motors, relays, etc., and all necessary equipment for a complete control system, regardless of whether or nor specifically mentioned, including electric relays and contactors required for control interlocking.

E. The control system shall include all control and interlock wiring from relays, to motor controllers, contactors, etc. All control circuits shall be 120 volts.

F. Provide nameplates on all devices, whether or not mounted on the face of local control panels. In occupied areas, nameplates shall be concealed beneath covers of room type instruments, to describe functions.

G. All hot water coil valves are 2-way valves.

H. Terms ATC subcontractor, BMS subcontractor and temperature control Contractor refer to the Contractor providing work under this section of the specification. The BMS subcontractor or automation system

Contractor referred to in this and other sections shall be one and the same Contractor as the ATC subcontractor.

I. All sensors, transmitters, thermostats, to be mounted in pipes or ducts shall be mounted in such pipe or ducts by the ATC Contractor. The final installation of these devices, i.e. connection, shall be the responsibility of this section.

J. Wiring between the existing fire alarm system (FAS) and the automatic temperature control system shall be under this section. The BMS contractor shall be responsible to terminate the FAS wiring in the BMS panel and to VFDs.

K. All temperature sensors, humidity sensors, pneumatic to electric transducers, actuators and DDC controllers and all associated wiring including power wiring, damper (excluding fire and smoke) wiring and wiring to control duct terminal units, i.e. automatic dampers, shall be provided under this section. This shall include extending power wiring from junction boxes left under the electrical work and making power wiring connections. See electrical drawings for location of junction boxes. Where junction boxes are not shown on the electrical drawings, provide 120 volt power wiring from the nearest power panel under this section.

L. The BMS shall include the as-built narrative sequence of operation for all systems so that the operator can access the sequence of operation for any system while viewing the graphic for that system.

M. As-built sequence of operation shall be provided in BMS software. When viewing a control schematic on the BMS, the operator shall have the option of having the system display the sequence of operation.

1.03 QUALITY ASSURANCE

A. Only firms regularly engaged in manufacture and installation of this equipment with characteristics and capacities required and whose products have been installed by them and are in satisfactory use in similar service for not less than 10 years will be acceptable.

B. All control equipment used in this project shall have been successfully proven in actual field installations for a period of two (2) years prior to the date of submittal of said equipment to the Architect for approval.

C. The control system shall be installed completely in all respects by competent mechanics, regularly employed by the manufacturer of the control system.

D. The air monitoring (airflow measuring) device manufacturer shall review the final installation of all these devices and provide a check list and written approval of the installation.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

B. Complete shop drawings shall be submitted to the Architect for approval before any field installation is started. Such drawings shall give a complete description of all control elements and shall show completed schematic piping and wiring diagrams, including functional description. Valve and damper schedules shall be included.

C. Floor plans indicating all room thermostat locations not shown on the Drawings, and samples of each type, shall be prepared and submitted to the Architect for approval before installation. Samples of

unitary controls shall also be submitted for approval, and a typical assembly shall be field erected, before installation. All room controls shall be mounted five feet above finished floor.

1.05 RELATED WORK UNDER ELECTRICAL WORK

A. All wiring to the fire alarm control panel. See Supplementary General Requirements for Mechanical and Electrical Work. Any power wiring not shown on the electrical plans and required for the automatic control systems shall be provided by the ATC subcontractor under this section.

1.06 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.07 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

B. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If, within one year from date of acceptance by the Architect, any equipment herein described is proved to be defective in workmanship or material, it shall be adjusted, repaired or replaced, free of charge, during the guarantee period.

PART 2 - PRODUCTS

2.01 GENERAL

A. The system shall be a 100% BACNET system.
1. Standalone Digital Controls Units shall provide control of HVAC. Each controller shall have its own control programs and will continue to operate in the event of a failure or communication loss to its associated Network Control Unit (NCU).
2. Memory:
Control programs shall be stored in battery backed-up RAM and EEPROM. Each controller shall have a minimum of 32K of user RAM memory and 128K bytes of EEPROM.
3. Communication Ports:
RCUs shall provide a communication port to the field bus. In addition, a part shall be provided for connection of a portable service tool to support local commissioning and parameter changes with or without the NCU online. It shall be possible from a service port on any RCU to view, enable/disable, and modify values of any point or program on any controller on the local field bus, any NCU or any RCU on a different field bus.
4. Input/Output:
Each RCU shall support the addition of the following types of inputs and outputs:
$ Digital Inputs for status/alarm contacts
$ Counter Inputs for summing pulses from meters
$ Thermistor Inputs for measuring temperatures in space, ducts and thermowells
$ Analog inputs for pressure, humidity, flow and position measurements
$ Digital Outputs for on/off equipment control

$ Analog Outputs for valve and damper position control, and capacity control of primary equipment

5. Expandability:
Input and output capacity shall be expandable through the use of plug-in modules. A minimum of two modules shall be added to the base RCU before additional power is required.

6. Networking:
Each RCU will be able to exchange information on a peer to peer basis with other Control Units during each field bus scan. Each RCU shall be capable of storing and referencing global variable (on the LAN) with or without any workstations online. Each RCU shall be able to have its program viewed and/or enabled/disabled either locally through a portable service tool or through a workstation connected to an NCU.

7. Indicator Lamps:
RCUs will have as a minimum, LED indication of CPU status, and field bus status.

8. Real Time Clock (RTC):
An RCU shall have a real time clock in either hardware or software. The accuracy shall be within 10 seconds per day. The RTC shall provide the following information: time of day, month, year, and day of week. Each RCU shall receive a signal, every hour, over the network from the NCU which synchronizes all RCU real time clocks.

9. Automatic Restart After Power Failure:
Upon restoration of power, the RCU shall automatically and without human intervention, update all monitored functions, résumé operation based on current, synchronized time and status, and implement special start-up strategies as required.

10. Alarm Management:
For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested by each scan of the RCU and can result in the display of one or more alarm messages or reports.

Up to 8 alarms can be configured for each point in the controller enabling the escalation often alarm priority (urgency) based upon which alarm(s) is/are triggered.

Alarm messages can be sent to a local terminal or modem connected to an NCU or to the Operator's Workstation(s).

Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided.

If communication with the NCU is temporarily interrupted, the alarm will be buffered in the RCU. When communications return, the alarm will be transmitted to the NCU if the point is still in the alarm condition.

11. Unitary Controllers

The I/O of each Unitary Controller shall contain the sufficient quantity and types as required to meet the sequence of operation found in the Execution portion of specification. In addition, each controller shall have the capability for time of day scheduling, occupancy mode control, after hour operation, lighting control, alarming, and trending.

2.02 ELECTRIC WIRING

A. All electric wiring, materials and installation shall be in accordance with the latest revision of the National Electric Code, the New York City Electrical Code and other applicable Local Code, and shall carry the UL label where applicable. All exposed wiring shall be installed in EMT galvanized steel conduit, :"

minimum, and shall be a minimum of #14 AWG. Concealed wiring shall be installed in EMT, :" minimum. All specials, such as junction boxes and connectors, shall be of type designed for use with conduit. Concealed wiring for low voltage systems can be run without conduit in enclosed fully accessible ceilings and in the raised floor plenum, provided that wire is plenum rated and that it is neatly run, supported and permanently tagged. Contractor shall submit support and tagging procedures for approval. Wiring shall be plenum rated. Low voltage wire in gypsum board and other inaccessible ceilings shall be run in conduit.

2.03 VARIABLE AIR VOLUME SYSTEM CONTROL

A. Variable air volume system control shall be DDC. Components listed herein shall be as manufactured by Tek-Air System Inc., or Air Monitor Corp. or approved equal.

B. Control Components

1. Static pressure transmitter
   Velocity pressure transmitter
   Return, supply and outside air volume transmitter

2. The major components:

   a. Static Pressure Transmitter:
      The static pressure transmitter shall be capable of transmitting a linear 4 to 20 MA output signal proportional to differential (static) pressure input signals within the following performance and application criteria:

      1) Calibrated Span: Not greater than twice the static pressure at maximum flow rate, nor more than 15 times the static pressure at minimum flow rate.
      2) Calibrated Accuracy ∀ 2.0% of span.
      3) Repeatability: Within 0.5% of output.
      4) Dead Band of Hysteresis: Not detectable or measurable.
      5) Linearity: 1.5% of span.
      6) Response Time: At or near the speed of sound.
      7) The transmitter output shall not be affected by direction of mounting or external vibration and shall be furnished with a factory calibrated span. Static pressure transmitter shall be Exactor Series 200 by Air Monitor Corporation or approved equal.

   b. Velocity Pressure Transmitter:
      The velocity pressure transmitter shall be capable of transmitting a 4 to 20 mA output signal proportional to differential (velocity) pressure input signals within the following performance and application criteria:

      1) Calibrated Span: Not greater than twice the velocity pressure at maximum flow rate, nor more than 16 times the velocity pressure at minimum flow rate.
      2) Calibrated Accuracy: ∀ 1.5% of span, or 2.5% of output, whichever is less.
      3) Repeatability: Within 0.1% of output.
      4) Dead Bank of Hysteresis: Not detectable or measurable.
      5) Linearity: 1.0% of span.
      6) Response Time: At or near the speed of sound.
      7) The transmitter output shall not be affected by direction of mounting, or external vibration, and shall be furnished with a factory calibrated span.

C. Duct Air Monitor Device (DAMD or AFM)
   Provide airflow measuring stations in the exhaust fan inlets as indicated on the drawings and as outlined herein and as required to meet the sequence of operations. Installation in the fan inlets

shall be installed under this section under the supervision of the device manufacturer. The manufacturer shall submit written certification that all devices are installed properly.

2.04 INSERTION AND IMMERSION THERMOSTATS

A. All thermostats shall have adjustable throttling ranges and shall be capable of positioning valve or damper operators in intermediate positions. The control elements of the thermostats shall be centrally mounted inside the supply duct or casing to measure the air temperature. The sensing shall be transmitted to the central mechanism located on the local control panel by means of capillary tubing or electronic transmission. Thermostats shall be capable of controlling without hunting and shall be respond to a change of plus or minus 3 deg F. Control point shall be adjustable 15deg F above and below intended setting, with a minimum scale of at least 50 deg F. Sensing elements shall be of proper design and material for its specific application and shall have sufficient length to cover a minimum of two-thirds of the coil or duct.

2.05 AUTOMATIC CONTROL VALVES

A. All automatic control valves shall be furnished by the temperature control manufacturer and shall be installed by the HVAC Contractor under the control manufacturer's supervision.

B. All throttling 2-way water valves shall be sized for pressure drop equal to respective coil pressure drop at flow rates indicated on the drawings with a minimum pressure drop of 10 feet. All 3-way water valves shall be sized for a minimum pressure drop of 5 feet. All water valves shall be single seated, except where water pressure and flow require double seated valves.

C. The electric valves mounted outdoor shall be covered with a NEMA 4 actuator enclosure rated for outdoor use.

D. All steam control valves shall be single seated and have linear flow characteristics. No single valve shall be larger than 2½". Wherever the flow rate is such as to require a valve larger than 2½", then two valves in parallel shall be used, with one no larger than 2½". The valves shall operate sequentially. Trim shall be stainless steel for all steam valves.

2.06 AUTOMATIC CONTROL DAMPERS

A. The automatic dampers shall be furnished by the BMS contractor and installed by the Sheet Metal Contractor. The Control Contractor shall furnish and install the automatic damper operators for all automatic dampers for all the air handling units.

B. Automatic Dampers
1. Dampers shall have blades not more than 8" wide. Linkage and hardware shall be zinc plated steel. Damper blades and rods shall be installed in horizontal position. Any dampers over 72" wide shall have jack shafts.
2. In aluminum and stainless steel ductwork, damper material shall match the ductwork, with blades of 16 gauge aluminum, or 16 gauge stainless steel.
3. All dampers shall be of the proportioning or opposed blade type and shall be motor operated. Dampers shall have continuous elastomer or stainless steel stops to avoid leakage. Bearings shall be oilite nonferrous sleeve type. All dampers shall be provided with continuous 3/16" x 2" closed cell neoprene gasketing around perimeter of the frame and at interlocking blade edges, to form an airtight seal.
4. All dampers shall be constructed to provide a maximum leakage of 1%, with an approach velocity of 1500 fpm flow, when closed against a pressure difference of 4 inches of water. Submit leakage

and flow characteristic data for all dampers Greenheck Model FSD 311M low leakage 8 cfm/ft² @ 4" w.g. Leakage Class I as standard with end switch actuators and all the options listed on the drawings.

5. All outside air dampers shall automatically return to closed position in the event of loss of electricity or air.
6. Furnish and install, at locations shown on plans, or in accordance with schedules, control dampers that meet the following minimum construction standards: Frame shall be 16 gauge (1.6) galvanized steel structural hat channel with tabbed corners for reinforcement to meet 13 gage (2.4) criteria. Blades shall be 14 gage (2.0) equivalent thickness galvanized steel, roll formed airfoil type for low pressure drop and low noise generation. Blade edge seals shall be suitable for -76°F to + 350°F mechanically locked into the blade edge. Adhesive or clip-on type seals are unacceptable. Jamb seals shall be flexible metal compression type to prevent leakage between blade end and damper frame. Blade end overlapping frame is unacceptable.
   Bearings shall be corrosion resistant, permanently lubricated stainless steel sleeve type turning in an extruded hole in the damper frame. Axles shall be square or hexagonal positively locked into the damper blade. Linkage shall be concealed out of air stream, within the damper frame to reduce pressure drop and noise. Submittal must include leakage, maximum air flow and maximum pressure ratings based on AMCA Publication 500. Dampers shall be in all respects equivalent to Greenheck Model FSD 311M.

2.07 ELECTRIC VALVE & DAMPER OPERATORS/ACTUATORS

A. All electric operators shall be of totally enclosed type in rustproof housings of pressed steel or approved cast metal. An open type gear train will not be acceptable. All operators shall be of the spring return type, to provide failsafe operation and overtravel protection. Each automatic damper shall be provided with a separate damper operator. Operators to be located outdoors shall be provided with a NEMA 4X weatherproof enclosure. All electric operators shall be as manufactured by Belimo or approved equal.

1. Electronic/electric actuation shall be provided using Belimo or approved equal.
2. The actuator shall be Belimo type direct coupled (over the shaft), enabling it to be mounted directly to the damper or valve shaft without the need for connecting linkage. The fastening clamp shall use a ?V" bolt and ?V" shaped, toothed cradle to attach to the damper shaft for maximum holding strength. Single bolt or set screw type fasteners are not acceptable.
3. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator at the end of rotation or magnetic clutch are not acceptable.
4. For power failure/safety applications, a mechanical, spring return mechanism shall be used. Non-mechanical forms of fail-safe are not acceptable except for a central, emergency, backup power source.
5. All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by changing the mounting orientation. Spring return actuators should be capable of mounting directly onto a jackshaft up to 1.05" in diameter.
6. Proportional actuators shall accept a 2 to 10 VDC or 4 to 20 mA and provide a 2 to 10 VDC position feedback signal.
7. 24 VAC/DC actuators shall not require more than 10 VA for AC or 8 watts for DC applications.
8. All actuators shall have an external manual gear release or manual crank to aid in installation and allow manual positioning when the actuator is not powered.
9. All actuators shall have an external direction of rotation switch to aid in installation and provide proper control response.
10. Actuators shall be provided with a factory mounted 3-foot electrical cable and conduit fitting to provide easy hook up to an electrical junction box.
11. The actuators shall be listed under Underwriters Laboratories Standard 873 and Canadian Standards Association Class 813.02. They must be manufactured under ISO 9001 quality certification.

B. Actuators shall have a 2-year manufacturer's warranty, starting from the date of installation.

2.08 DAMPER POSITION SWITCHES

A. Shall be crank mounted and provide two snap-action SPDT contacts. Each switch shall be adjustable with a minimum differential of 9 deg. Or actuator with end switches are acceptable.

B. Approved manufacturer: Barber-Colman AM-321 or equivalent.

2.09 TEMPERATURE AND HUMIDITY TRANSMITTERS

A. All temperature or humidity transmitters shall be capable of measuring space or duct temperature or humidity and transmitting an electric signal (4 to 20 MA) directly proportional to the temperature. Temperature transmitter shall be of the thermistor type. The range of the temperature transmitters shall be 50 deg F. for room air sensing, and 100 deg F. or 200 deg F. for all other sensing, as approved. All humidity transmitters shall have a range of 80% RH. Each transmission system shall have an accuracy of 1% of scale range. All transmitters shall be located at point of measurement, with instrument case located outside of unit or ductwork with capillaries and sensing bulbs. Finish and final location of room transmitters shall be approved by the Architect. Room transmitters shall be stainless steel plate type with no display and no adjustment.

B. Transmitter shall provide one point field calibration for both RH and temperature.

C. Humidity sensors shall use thin film capacitance technology or an approved equal high accuracy technology. Sensors shall remain calibrated within ∀ 0.5% RH/year in normal air conditioning environments.

D. Humidity sensing accuracy shall be ∀ 2% RH in the 0 to 90% and the 10 deg F to 104 de F temperature ranges.

E. Temperature accuracy shall be 1 deg F in the 20 deg F to 122 deg F temperature range.

F. Wall mount housing shall be ABS plastic (color to be selected by the Architect.) Duct mounted housing shall be cast aluminum. Duct mounted sensor protection shall be stainless steel.

G. Provide two humidity calibrators and two equivalent temperature calibrators to allow facility staff to check & calibrate transmitters.

H. The final location of temperature sensors shall be coordinated with the Architect.

2.10 TEMPERATURE TRANSMITTERS

A. Transmitters shall be of 2-wire, 4-20 mA output type with a solid state or thermistor type element having an accuracy of ∀1% of span. Transmitter shall include protection against reverse polarity and supply voltage transients. A span and zero adjustment shall be provided with each transmitter to allow for recalibration as necessary.
   1. Room sensors
      a. Sensor covers shall be provided with tamper resistant screws.
   2. Duct sensors
      a. Single point duct mounted sensors shall have a minimum 9" rigid probe and be used when the duct size is less than 24". Duct mounted housing shall be cast aluminum.

b. Averaging duct mounted sensors shall have a minimum 12.5' long averaging element and be used when the duct size is greater than 24".

3. Liquid immersion sensors
   a. Liquid immersion sensors shall have a stainless steel probe and a stainless steel well. Length of the sensor well shall be selected based on the diameter of the pipe to provide accurate, reliable sensing of the liquid temperature. Provide well with lag extension equal to depth of pipe insulation.
4. Outside sensors
   a. Sensing elements shall be mounted in aspirator box as per master outside air transmitter section above.

2.11 HUMIDITY TRANSMITTERS

A. Transmitters shall be of 2-wire, 4-20 mA output type with a resistance or capacitance element having an accuracy of ∀2% between 20-95% Rh. Transmitter shall include protection against reverse polarity and supply voltage transients. An accuracy adjustment shall be provided with each transmitter to allow for recalibration as necessary.
   1. Duct mounted
      a. Sensor shall have a minimum 6" rigid probe with a pressure cast aluminum weatherproof box with gasketed cover.
   2. Wall mounted room sensor
      a. The room sensor shall be provided with tamper resistant screws.
   3. Outside mounted
      a. The sensing element shall be mounted inside aspirator box as per master outside air transmitter section above.

2.12 FLOW TRANSMITTERS

A. Airflow
   1. The sensor shall be a 4-20 mA output type with the accuracy of ∀1% with flow straighteners in circular duct applications. In rectangular duct applications, the accuracy shall be ∀2% with flow straighteners.
   2. Flow station shall be constructed of steel with flanged face for easy mounting. The flow straighteners shall be constructed of aluminum or steel.
   3. Approved manufacturer: Tek-Air, or Air Monitor or an approved equal.

2.13 THERMOMETERS

A. Furnish and install dial thermometers with 1% of range accuracy, on each local panel with appropriate temperature ranges, adjacent to each air insertion and water immersion controller. Thermometers shall have a 32" dial, remote bulb, of liquid filled or electronic transmission type, uniform scale and same type sensing bulbs as thermostats. In addition, provide thermometers on local panels for the following:
   1. O.A. temperature.
   2. Return air temperature
   3. H.W. supply and return temperature
   4. Ch. W. supply and return temperature
   5. Air handling unit discharge
   6. Each zone discharge air temperature

2.14 VALVES

A. All valves shall be equipped with throttling plugs and removable composition discs. All valves shall be sized by the control manufacturer and guaranteed to be of sufficient size to meet the heating and cooling requirements. All water valves shall be sized for pressure drop and flow rates indicated on the drawings. All valves shall be single seated.

2.15 ROOM THERMOSTATS

A. All proportioning thermostats shall have adjustable throttling range. All thermostats shall be provided with an adjustable range of 55 deg F – 85 deg F., key operated, non-indicating, locked cover type. Finish and final locations shall be approved by the Architect.

2.16 CURRENT SWITCHES

A. Current switches shall be provided for all HVAC equipment to indicate run status to the BMS. HVAC equipment shall include, but not be limited to, all supply, return, exhaust, relief and exhaust fans, pumps, etc. Current switches shall be split case type, single pole double throw, sized for motor amps. Current switches shall be Veris Hawkeye Model H608, Neilsen Kuljian Model D150 or RE Technologies Model SCSI.5A.

B. Provide 2-pole model or relay for status to BMS and fire alarm panel.

2.17 CONTROL TRANSFORMERS

A. A 120/24 VAC control transformer shall be provided in each DDC control panel, application specific controller panel, zone controller panel (VAV) terminal equipment control panel to power the DDC equipment and controllers located therein. Common transformers serving more than one dedicated panel shall not be allowed. Transformers shall be UL listed, properly fused to protect DDC equipment and sized by the controls Contractor. For equipment requiring 24 VDC power, provide similar transformer converter as required to power the DDC equipment.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine location where controls and equipment are to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of the automatic temperature control system and after motors have been energized with normal power source, test system to demonstrate compliance with requirement. When possible, field correct malfunctioning controls then retest to demonstrate compliance. Replace controls which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

3.04 SERVICE

A. After completion of the control system installation, the control manufacturer shall regulate and adjust all thermostats, control valves, damper motors, etc., and place in complete operating condition, subject to the approval of the Architect. Complete instructions shall be given to the operating personnel. There shall be two day's instruction given for Winter cycle and two day's instruction for Summer cycle operation.

3.05 SEQUENCE

A. Control sequence shall be as specified herein and/or as indicated on the Drawings. Schematic diagrams shown as the contract Drawings are intended to illustrate desired sequence of operation and are not intended to illustrate the means by which this is to be achieved. All required components whether illustrated or not shall be provided. Pressures and temperatures indicated are approximate and shall be adjusted on the job for maximum performance. After final adjustment, and before acceptance, the control diagrams required shall be revised, or supplemented, to show coordinated settings for all controls, including sensitivity, throttling range, tabulated settings for instruments in sequence, amps at which instruments are set, controlled variable coincide, and automatic reset becomes inactive.

B. A separate tabulation shall be provided of control settings of all automatic controls including components supplied with the machines. Tabulation shall also include upper and lower limits for all safety and operating controls on the machines. All of the above adjustments will be required at the completion of the job.

C. All setpoints indicated in the sequences of operation shall be fully adjustable through the BMS by the Operator.

3.06 VARIABLE FREQUENCY DRIVES (VFD)

A. Provide minimum of six (6) hard wired@ input-output points to each of the variable frequency drives that are under automatic control by the BMS as follows:
1. Start/stop = Digital Output
2. Speed adjustment signal = Analog Output
3. Speed feedback signal = Analog Input
4. Common fault alarm = Digital Input
5. Run status = Digital Input
6. VFD in bypass mode status indication = Digital Input

B. In addition to the hard wired points, provide an open protocol communication Athird party@ interface over local area network trunk cable from local BMS controller panel to the VFD, to permit BMS to monitor control all the VFD points. Coordinate the communications protocol, e.g., BACNET, Modbus, N2, etc. and communications interface ports RS-232 or RS-485, etc. with the VFD manufacturer. Refer to VFD specification section for additional details

3.07 FIRE ALARM SHUTDOWN WIRING

A. Disconnect existing fire alarm shutdown wiring from existing supply and return fan starters and reconnect to new supply and return fans' variable frequency drives (VFD). Provide all required conduit and wiring for disconnect and reconnect to new VFDs.

B. Verify, test and record that new fan VFDs are shut down from existing fire alarm system.

C. Coordinate with Owner and existing fire alarm vendor and/or service contract vendor.

3.08 VARIABLE AIR VOLUME BOX WITH REHEAT

A. The space sensor shall, on a rise in temperature above the cooling setpoint of 75°F (adjustable), gradually modulate open the VAV box damper from minimum cfm air flow to maximum cfm air flow, to maintain setpoint. The reheat coil control valves shall be closed.

B. On a drop in temperature, the VAV box damper shall go from maximum to minimum air flow.

C. Between cooling and heating setpoint, (dead band) the VAV box will remain at minimum air flow.

D. On a drop in temperature below the heating setpoint of 70°F (adjustable), the reheat coil control valves shall be modulated open.

E. On a continued drop in temperature after the reheat coil valve is fully open, the VAV box damper shall be modulated gradually from minimum to maximum air flow.

F. Provide a space carbon dioxide (CO_2) sensor adjacent to each space temperature sensor and an outside air CO_2 sensor located outside the building, as to provide a differential CO_2 level between the two. On a rise in differential CO_2 above 700 ppm, the VAV box damper shall override the space temperature control and gradually modulate open the VAV box damper as to provide more ventilation air to the space. If the space temperature drops due to the VAV box being opened by the CO_2 sensor, the thermostat shall compensate by opening the reheat coil to maintain space temperature setpoint.

G. Room setpoint conditions for each room shall be adjustable and shall be distinct setpoints for occupied heating, unoccupied heating and cooling. The unoccupied heating setpoint shall be 60°F (adjustable) and the unoccupied cooling setpoint shall be 85°F (adjustable).

3.09 ADJUSTING AND INSTRUCTIONS

A. The BMS/ATC sub-contractor shall train the Owners operating personnel for a minimum of the number of days indicated in Section 01 31 46 with personal on-the-job instruction provided by a competent Engineer or technician representing the contractor. This instruction shall be at a time to be selected by the Owner and is the minimum requirement. Where additional training time is specified elsewhere in this specification, that time shall be in addition to the above requirements.

B. The operators shall be trained in the operation and preventative maintenance of the entire system. The operators shall be trained to recognize malfunctions of the control system by head-end observations printed copy, visual and audible signals and by noting building conditions (head-end or field panel reading, actual equipment performance). The operators shall be thoroughly familiarized with all software and specific programs regarding this project.

C. Four sets of each of the following are to be provided.

D. Written operating and preventive and system maintenance instructions.

E. Specific data sheets and maintenance schedules.

F. Software listing for each point of connection, showing location, function, identification, etc. (two sets only).

G. As-built drawings for all controls and control wiring that include all items required under “Submittals”, with one set to laminated and mounted at a location(s) to be chosen by the Owner. Back-up system loading disk for use in programming the head-end and the standalone field panels (one set each).

H. Install Graphics of each control sub-system with all points shown on at least one graphic.

I. Provide testing and system performance trends in accordance with descriptions in submittals.

J. The BMS contractor shall warrant the continuous future availability of service for the system, with servicing to be provided by a factory trained service representative. As part of the warranty agreement (and any subsequent service contract agreements) the Contractor shall, at the discretion of the Owner, provide technical instructions on trouble shooting, maintenance, and servicing this system to the Owner s employees. This instruction shall take place on-site, during routine corrective maintenance visits by the Contractor.

K. REPRODUCIBLE DRAWINGS: The BMS contractor, upon completion of the installation, shall furnish to the Owner (at no additional charge) a complete set of reproducible “as-built” drawings. Reproducible drawings will consist of one set of black line (full-size) and one set installed on disk, AUTOCAD.DWG. Provide a separate set of drawings for each AHU and system.

3.10 CONTROL SYSTEM TESTING, ADJUSTING, CALIBRATION

A. Work and/or systems installed under this Division shall be fully functioning prior to Demonstration, Acceptance Periods and Contract Close Out. Contractor shall start, test, adjust, and calibrate all work and/or systems under this contract, as described below.

B. Verify proper electrical voltages and amperages, and verify that all circuits are free from grounds or faults.

C. Verify integrity/safety of all electrical connections.

D. Verify proper interface with fire alarm system.

E. Test, calibrate, and set all digital and analog sensing, and actuating devices. Calibrate each instrumentation device by making a comparison between the Operator Interface display and the reading at the device, using an instrument traceable to the National Bureau of Standards, which shall be at least twice as accurate as the device to be calibrated (e.g., if field device is +1- 0.5% accurate, test equipment shall be +1- 0.25% accurate over same range). Record the measured value and displayed value for each device in the Control System Commissioning Report.

F. Check and set zero and span adjustments for all actuating devices. Manually activate damper and valve operators to verify free travel and fail condition. Check split range positioners to verify proper operation. Record the results for each device in the Control System Commissioning Report.

G. Check each digital control point by making a comparison between the control command at the DPU and the status of the controlled device. Check each digital input point by making a comparison of the state of the sensing device and the Operator Interface display. Record the results for each device in the Control System Commissioning Report.

H. Verify proper sequences by using the approved checklists to record results and submit with Control System Commissioning report. Verify proper sequence and operation of all specified functions.

I. Tune all control loops to obtain the fastest stable response without hunting, offset or overshoot. Record tuning parameters and response test results for each control loop in the control System commissioning report. Except from a startup, maximum allowable variance from set point for controlled variables shall be as follows:
1. Air temperature: plus or minus 0.5°F
2. Water temperature: plus or minus 2°F
3. Relative humidity plus or minus 2%

3.11 CONTROL SYSTEM DEMONSTRATION

A. Demonstrate the operation of the Control Systems hardware, software, and all related components and systems to the satisfaction of the operating staff. Schedule the demonstration with Owner s representative 2 weeks in advance. Demonstration shall not be scheduled until all hardware and software submittals is approved.

B. The Contractor shall supply all personnel and equipment for the demonstration, including but not limited to, instruments, ladders, etc. Contractor supplied personnel must be competent with and knowledgeable of all project-specific hardware, software, and the HVAC systems. All training documentation and submittals shall be at the job site.

C. The system shall be demonstrated. Demonstration shall include, but not necessarily be limited to the following:

D. Demonstrate that all required software is installed on workstations. Demonstrate that all graphic screens, alarms, trends and reports are installed as submitted and approved.

E. Demonstrate that all points specified and shown can be interrogated and/or commanded (as applicable) from all work stations, as specified.

F. Demonstrate that remote communication abilities are in accordance with these Specifications.

G. Demonstrate correct calibration of input/output devices.

H. Demonstrate that all DDC and other software programs exist at respective field panels. The Direct Digital Control (DDC) programming and point database shall be as submitted and approved.

I. Demonstrate that all DDC and other software programs accomplish the specified sequences of operation.

J. Demonstrate that the panels automatically recover from power failures, as specified.

K. Demonstrate that all alarms are received at the appropriate workstations and printers.

L. Demonstrate that the stand-alone operation of panels meets the requirements of these Specifications.

M. Identify access to equipment. Demonstrate that access is sufficient to perform required maintenance.

N. Control System Demonstration shall be completed and approved prior to Substantial Completion.

3.12 ON SITE CONTROL SYSTEM OPERATOR TRAINING

A. Provide services of controls contractor s qualified technical personnel for the amount of days and hours indicated in Section 01 31 46 to instruct Owner's personnel in general operation and maintenance of the control systems.

B. Provide four sets of approved Operations and Maintenance Manuals to be used for training.

C. The contractor s designated training personnel shall meet and/or correspond with the Owner s representative for the purpose of discussing and fine-tuning the training agenda prior to the first training session. Training agenda shall generally be as follows:
1. Brief walk-through of the building, including identification of all controlled equipment and systems and condensed demonstration of Digital System Controller (DSC) capabilities.
2. Brief overview of the various parts of the O & M manual, including hardware and software programming and operating publications, catalog data, controls installation drawings, and DDC programming documentation.
3. DSC programming
4. Review 9 sequences of operation and how it is accomplished by DSC programming.
5. Fail modes and procedures to take in the event of a power failure.
6. Standalone modes and procedures to take in the event of various communication failures.
7. Demonstration of set-point optimization and fine-tuning concepts.
8. Demonstration of DSC features, diagnostics, program upload / download.
9. Demonstration of I/O hardware testing, calibration, and replacement.
10. Demonstration of all remaining miscellaneous workstation features.
11. Graphic workstation screens.
12. Review of Owner selected topics.
13. Question and answer period.

3.13 ATC/BMS ACCEPTANCE PERIOD

A. After approval of the ATC/BMS Demonstration and prior to Contract Close Out, the BMS system shall enter an Acceptance Period of four weeks. The Acceptance Period shall not be scheduled until all HVAC systems are in operation and have been accepted, all required cleaning and lubrication has been completed (i.e., filters changed, piping flushed, strainers cleaned, etc.), and the TAB report has been submitted and approved. Schedule the beginning of the Acceptance Period with the Owner's Representative 2 weeks in advance. During the Acceptance Period, the system shall operate properly without malfunction, without alarm caused by control action or device failure, and with smooth and stable control of systems and equipment in conformance with these specifications. At the end of the four-week period, the Commissioning Authority shall provide written notification of the pass/fail status of the Acceptance Period including documentation of problems requiring contractor attention. Should problems occur during the initial Acceptance Period, the contractor shall correct problems and provide notification to the Owner's representative that all problems have been corrected. The Acceptance Period shall be restarted at a mutually scheduled time for an additional one-week period. This process shall be repeated until Commissioning Authority issues notice that the ATC/BMS has passed the Acceptance Period without exception.

B. During the Acceptance Period, the Owner's Operations staff shall maintain a hard copy log of all alarms generated by the BMS. For each alarm received, contractor shall diagnose the cause of the alarm, and shall list on the log for each alarm, the diagnosed cause of the alarm, and the corrective action taken. If in the contractor's opinion, the cause of the alarm is not the responsibility of the contractor, contractor shall immediately notify the Owner's representative.

C. During the Acceptance Period, the contractor shall maintain all controller network and workstation hardware and software in a state that will allow remote access by Commissioning Authority to Trend Logs as specified below.

3.14 TREND LOGS

A. Prepare controller and workstation software to display graphical format trend logs during the Acceptance Period. Trend logs shall demonstrate compliance with contract documents. Trend logs shall be set up to meet the following requirements.

B. Trend logs shall include all analog and digital input values, analog and digital output values, and set points that are on a reset schedule.

C. Lines shall be labeled and shall be distinguishable from each other by using either different line types, or different line colors.

D. Indicate engineering units of the y-axis values; e.g., degrees F., inches w.g., Btu/lb, percent wide open, etc.

E. The y-axis scale shall be chosen so that all trended values are in a readable range. Do not mix trended values on one graph if their unit ranges are incompatible.

F. Trend outside air temperature, humidity, and enthalpy during each period in which any other points are trended.

G. All points trended for one HVAC subsystem (e.g. air handling unit, chilled water system, etc.) shall be trended during the same trend period.

H. Each graph shall be clearly labeled with HVAC subsystem title, date, and times.

I. A complete set of trend logs shall consist of all required points, trended for the time period listed for each point category. Point values shall be recorded based on the change-of-value (COV) differentials listed. If the ATC/BMS does not have the capability to trend based on COV, then point values shall be trended based on the time intervals listed:

Point Category	COV	Time Interval	Time Period
Duct Pressure	0.02 in. w.g.	1 minute	4 hours
Temperature	0.2 degrees F	10 minutes	24 hours
Humidity	1 percent RH	10 minutes	24 hours
Fan Volume Control Output	1 percent	1 minute	4 hours
Valve and Damper Outputs	1 percent	10 minutes	24 hours
CO_2	50 ppm	10 minutes	24 hours

3.15 ATC/BMS OPPOSITE SEASON ACCEPTANCE PERIOD

A. During the warranty period, but not later than 6 months from completion of the Acceptance Period, BMS shall enter an Opposite Season Acceptance Period of two weeks. Opposite Season Acceptance Period shall not be scheduled until seasonal conditions have changed to the opposite of those that occurred during the Acceptance Period. Schedule the beginning of the Acceptance Period with the Owner's representative 2 weeks in advance. All requirements specified for the Acceptance Period shall also apply to the Opposite Season Acceptance Period.

B. Warranty period shall start when all work is complete and accepted by the Owner.

END OF SECTION

SECTION 230901

BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinated with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

C. The work of this section shall be integrated with the existing BMS provided by Advantex Solutions. Please contact Giovanni Natale from Advantex Solutions Inc. Contact Information: P-718-278-2290; C-917-682-2521; Email - GNatale@Advantexsolutions.com).

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, a building automatic system as shown on the drawings and hereinafter specified.

B. The Building Automatic System shall be provided by the same manufacturer as the automatic temperature controls. The graphics for the new AC units installed under this projects shall be completed by ADVANTEX Solutions under this contract and integrated into the existing BMS system.

C. The Automatic System Subcontractor shall furnish and install all equipment, accessories, wiring and instrument piping required for a complete and functioning system.

D. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed especially for this project. All systems and components shall have been thoroughly tested and proven in actual use.

E. The automation system shall be of a fully modular architecture permitting expansion by adding computer memory, application software, operator peripherals and field hardware.

F. If expansion of the automation system necessitates greater computer processing power, it shall be possible to transfer all existing software and data base, both vendor supplied and user-defined, to a new more powerful computer.

G. Systems which require the existing user-defined data base to be re-entered through the operator's terminal shall not be acceptable.

H. Although fire alarm and security points will not be installed or monitored, initially the system shall be installed completely ready to receive or accept these points at a later date without additional central hardware or software.

I. The system as specified shall monitor, control, and calculate all of the points and functions as listed in the Building Automation Schedule.

J. The system as installed shall have sufficient computer memory and application software for 100% point expansion above those points as listed in the Building Automation Schedule.

K. The entire system of Automatic Temperature Controls and the Building Automation System shall be powered from the building's power system. Components and devices to be powered include, but are not limited to, all ATC panels, BAS computers and remote stations, valve actuators, damper actuators, central and unitary equipment controls. The source of emergency power for all such devices shall be derived from either junction boxes left by the Electrical Contractor as indicated on the electrical drawings, or, if not indicated on the electrical drawings, the HVAC Contractor under his contract shall provide power wiring taken directly from the building's Emergency Power Distribution Panel(s).

1.03 QUALITY ASSURANCE

A. Only firms regularly engaged in manufacture and installation of this equipment with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years shall be acceptable.

B. The entire building automation system shall be installed by skilled electricians and mechanics, all of whom are properly trained and qualified for this work. All wiring shall be installed in accordance with the Project Electrical Specifications.

C. Supervision and checkout of the system shall be by factory-trained engineers and technicians directly employed by the automation Contractor.

D. Provide system produced and installed by the manufacturers, which are listed in Section 23 05 12 "General Provisions for HVAC Work".

E. Provide equipment which performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work and submit shop drawings.

1.05 COORDINATE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

B. The system including all hardware and software components shall be guaranteed for a period of one year following the date of final acceptance. Any manufacturing defects arising during this warranty period shall be corrected without cost to the Owner.

C. All applicable software as detailed in this Specification shall be updated by the Automation Subcontractor free of charge during the warranty period. This will ensure that all system software will be the most up-to-date software available from the Automation Subcontractor.

PART 2 - PRODUCTS

2.01 OPERATOR INTERFACE WITH THE BAS

A. Computer Interface
1. Provide two (2) DELL Precision 7780 Workstation for engineers for BAS access from the room AC-12 with the following performances:
2. Intel® Core™ i9-13950HX vPro® (36 MB cache, 24 cores, 32 threads, up to 5.5 GHz, 55 W), Windows 11 Pro, NVIDIA RTX™ 3500 Ada 12GB GDDR6, 64GB, 1x64GB 5200MT/s CAMM, non-ECC, 1 TB, M.2 2280, Gen 4 PCIe NVMe, SSD
3. Display 17.3" FHD 1920x1080 WVA, 60Hz, anti-glare, non-touch, 99% DCI-P3, 500 nits, IR Camera, with Microphone.
4. Camera FHD/IR Camera, ExpressSign-In, Intelligent privacy, Camera Shutter, Microphone.
5. Memory 64GB, 1x64GB 5200MT/s CAMM, non-ECC.
6. Storage 1 TB, M.2 2280, Gen 4 PCIe NVMe, SSD.
7. Wireless Intel® Wi-Fi 6E AX211, 2x2, 802.11ax, Bluetooth® wireless card.
8. Primary Battery 6 Cell, 93 Wh, Lithium Ion Polymer and 240 W Power adapter.
9. Provide two (2) mobile tablets for field monitoring of the BMS as 12.9 inches iPad Pro Wi-Fi only with 512 GB and with apple pencil for marking capabilities in the field.

2.02 TRANSMISSION NETWORK

A. Distributed Communication Processor
1. The system shall use an intelligent Distributed Communication Processor (DCP). This processor shall be microprocessor based and shall interface with Central Processing Unit and Remote Processing Units.

B. Multi-Drop Trunk(s)
1. The automation system shall include a multi-drop digital transmission network that provides the communication link between the Distributed Communication Processor and all Remote Processing Units.
2. The transmission shall be asynchronous and utilize a polled-response method. The system shall utilize a cyclic redundancy check or dual transmission with parity check to ensure signal reliability.
3. The transmission network shall utilize a twisted shielded pair. The transmission speed shall be a minimum of 1200 baud and operate in a half-duplex mode.
4. The system shall support multiple multidrop trunks. Each multi-drop trunk shall support a minimum of 20 Remote Processing Units.
5. Each multi-drop trunk shall have an allowable line length of at least 20,000 feet without signal degradation. All multidrop trunks shall be interfaced to the system via standard EIA interfaces. With the addition of modems, the multidrop trunk shall interface to unconditioned voiceband 3002 telephone lines for remote building tie-into the automation system.
6. Transmission technique shall allow trunk cable to be installed in conduit with other system signals as well as switched 120 VAC or 240 VAC.

2.03 FIELD HARDWARE

A. Remote Processing Units

1. The system shall utilize intelligent distributed Remote Processing Units (RPU's to interface sensors being monitored and equipment being controlled by the automation system. Each RPU shall be microprocessor based and perform the following functions:
   a. Acquire, process and transfer information to the CPU.
   b. Accept, process and execute commands from the CPU or other input devices.
   c. Record evaluate and report changes of state and/or value that occur among points associated with the RPU.
2. Each RPU shall use multi-point function cards to carry out the control and monitoring functions as specified in the point list. For each RPU location, electronics shall be provided for at least 12 spare points.
3. Each RPU shall perform continuous diagnostics, and any malfunction shall be annunciated at the operator's console as well as visually indicated at the RPU.
4. Failure of any RPU on the system shall not affect the proper operation of the CPU and other RPU's.
5. The system shall be capable of phased startup. That is any RPU shall be capable of properly communicating with the CPU while remaining RPU's are being installed.
6. Surge transient protection shall be provided in each RPU for the purpose of suppressing induced voltage transients.
7. Each RPU shall contain a function card cage and backplane which can accommodate up to 128 points. Each RPU shall contain a power supply sized to drive the function cards, interface relays and sensors for the maximum allowable points.
8. Any RPU which used volatile memory shall have a minimum of four-hour uninterruptible battery backup unless the automation system has an automatic down loading capability.
9. If the CPU or transmission network fails but power to the RPU does not, the RPU shall continue to monitor all changes of state and/or value and shall retain the most recent values. The RPU shall also maintain all analog set points and command positions.
10. RPU's shall have all metal cabinets. Each RPU including cabinet, power supply, function cards and termination modules shall be approved by U.L. Each RPU shall have a pin-hinged door and master keyed lock. RPU's shall be capable of proper operation in an ambient environment of 32 deg F to 120 deg F and 10% to 90% RH.

B. Function Cards/Termination Modules
   1. Each RPU shall be capable of accepting at least 8 multi-point function cards. It shall be possible to insert any function card into any of the available card slots. There shall be four types of function cards corresponding to industry nomenclature. They are:
      a. Digital In for monitoring status, alarms and accumulating pulses.
      b. Digital Out for commanding two and three state devices.
      c. Analog Out for positioning set points.
   2. Each function card shall be microprocessor based with sufficient memory to retain characterization data for its associated points.
   3. Characterization of point data shall be accomplished on-line at the operators console. The operator shall be able to individually characterize points on each function card through a procedure whereby the operator down-line loads the specific point parameters from the CPU through the operator's keypad to the RPU. This downline loading shall also occur automatically after a power outage to a RPU.
   4. Function cards that require foil path cuts, jumpers, or similar physical modifications to customize them for particular applications will not be acceptable.
   5. To reduce downtime, each function card shall have a built-in self-test diagnostic and be able to visually indicate its operational status at the RPU as well as failure annunciation at the operator's console.

6. The failure of any one function card shall not deter the reporting or command capability of other function cards in the same of other RPU's.
7. Each function card shall have an associated termination module where the field wiring or tubing shall be connected. All termination modules shall have plug connectors interfacing them to their respective function cards through the card cage backplane.
8. Any termination modules requiring on-site hardwire interconnection to their function cards shall not be acceptable.
9. Digital input signals shall be terminated through plug-in isolation relays. These shall be form "C" type relays, located in the RPU.
10. Analog input signals shall be terminated on screw type terminals. Each analog input shall have the capability to accept 2 or 4 wire inputs.
11. Digital output signals shall be accomplished through plug-in form "C" relays, located in the RPU.
12. Analog output signals shall be accomplished through 3" pneumatic tubing fittings.

C. Sensors
1. All analog sensors shall utilize industry standard 4-20 milliamp signals to facilitate owner expansion. Sensors based on proprietary equipment shall not be acceptable.
2. All analog signals shall be converted for digital transmission to the CPU at the function card.
3. All sensoring wiring whether it be analog or digital, input or output, shall be capable of sharing single conduit runs without affecting signal performance. All signal wiring shall also be capable of sharing single conduit runs with switched AC of 120 VAC or 240 VAC.

2.04 SOFTWARE

A. The Automation System Subcontractor shall provide all software required for efficient operation of all the automation system functions required by this Specification. Software shall be modular in design for flexibility in expansion or revision of the system.

B. The software shall include a computer-vendor supplied and supported, unmodified real-time disk operating system. Systems which use an operating system which has been modified or is proprietary to the Automation System Subcontractor shall not be acceptable. The Automation System Subcontractor shall supply all the building automation system software. The building automation system software shall be written in high level language such as FORTRAN IV or Pascal.

2.05 REAL-TIME OPERATING SYSTEM

A. The operating system shall be a general-purpose real-time operating system and shall provide the following features of their equivalent:
1. Program Control: The real-time operating system executive shall control the timing and sequencing of all programs.
2. Multiple Tasking Capability: Multiple Tasking Capability shall be provided to allow the operating system and real-time control programs to run concurrently with the programs assembling or compiling, debugging, loading or executing.
3. Memory Protection: The operating systems shall manage a scheme of storage protection which shall enable assembling, compiling, debugging and execution of programs without direct effect on the real-time programs.
4. Real-Time Clock Routine: The real-time clock routine shall maintain the current date and 24-hour clock time resolved to the nearest second. The real-time clock shall control or be used as reference for time-initiated command signals and printouts and shall be easily resettable by the operator from the operator's console.

5. Input/Output Control: The operating system shall include routines to coordinate all input/output functions of the computer system.
6. Disk File Input/Output: The operating system shall provide routines for disk file input/output including routines to perform the following:
    a. Open file for input and/or output of data.
    b. Input from or output to a disk file sequentially.
    c. Input from or output to a disk file a; record at a time in random order.
7. Powerfail and Automatic Restart: A powerfail routine shall provide an orderly shutdown of the automation system when the power failure to the computer is detected, and which shall automatically restart the automation system when power is restored.
8. Programming Support Capabilities: The operating system shall be capable of supporting the following programs for user program development, compiling, loading and executing.
    a. Fortran Compiler: Compile the source language into machine language object code that can be loaded and executed directly into the instruction set of the CPU. This compiler shall be directly compatible with FORTRAN IV.
    b. Assembler Program: This program accepts and translates symbolic instructions into machine instructions. The assembler also generates object code.
    c. Source Editor: This program allows an operator to edit source programs in assembler and Fortran languages as well as other ASCII text data.
    d. Loader Program: This program combines relocatable object modules produced by the assembler and the Fortran compiler into an executable program.
    e. Disk Utility Program: Routines for manipulating program and data files stored on the disk including the following shall be available:
        1) Creating new files.
        2) Deleting old files.
        3) Copying files.
        4) Creating file directories.
    f. Memory Dump and Modify Program: Provides the capability to modify or dump the contents of selected locations in main memory.
    g. Debug Program: This program aids in the debugging of assembler and FORTRAN programs.
    h. System Generation Provides the capability for reconfiguring the software system to accommodate new software or hardware functions.
    i. System Save and Restore: Provides the capability to save and restore a copy of the software programs and the system data base to facilitate reloading.
    j. Diagnostic Software: Diagnostic software provides the capability to test the computer memory and peripherals.

2.06 BUILDING AUTOMATION SYSTEM SOFTWARE

A. The building automation system software shall be provided in four categories which are defined as:
    1. Operator access to system data base.
    2. User control over system configuration.
    3. Facility monitoring functions.
    4. Energy management control functions.

B. Each category of software shall consist of interactive software modules written in FORTRAN IV. Each module shall have an associated priority level and shall execute as determined by the program controller as defined in the real-time operating system.

C. Systems with software written in other than Fortran IV shall be provided with a cross-compiler to FORTRAN IV.

D. Operator Access to System Data Base:

1. Operator/System Communication: The building automation system shall use English language for each point identification. This shall be full English words with the option to abbreviate at the users discretion. To facilitate different building operators, the system shall accept multiple English language identifiers as well as foreign language identifiers for each point on the system. These shall be known as "User Names". For example:

   ADMINISTRATION BUILDING AHU 1
   SUPPLY FAN 1
   AIR HANDLING UNIT 1

   shall all identify the same desired point. In addition, system formatting shall be provided which shall allow for software grouping of related points.

2. Input Format:
   a. Allowable operators as defined under operator access shall be able to control system functions by their inputs at appropriate operator terminals.
   b. The system shall recognize all inputs as functions or commands to be performed. The system's handling of operator inputs such as requests to start a motor, output a log, change a time program, acknowledge an alarm, or do any of the other commands described in this specification, shall be in a similar format.
   c. All operator interaction with the automation system shall be performed as follows: The operator entry shall begin with the commands he desires the system to perform, followed by the username and any data, such as limit values, program times, etc. Manual commands such as start, stop, log, etc. have no data values associated. Example: COMMAND ON AHU 1.
   d. Upon entry of a command to the point or points desired as described above, the system shall, before performing any command, respond with an echo of the request on the device (Cathode Ray Tube or keyboard printer) being used. This echo feedback shall include the command requested, the username and any entered data.
   e. Should an operator make an error in entry, the system shall output an advisory message detailing the nature of the error. Advisory messages shall be in full English with a unique advisory for each type of operator input error. Typical operator error advisories might be:
      1) System input format is incorrect.
      2) Invalid command entered.
      3) Analog limit is outside specified range.
      4) Point does not respond to the command entered, such as a "start" command to a temperature sensor.
      5) Operator's entry did not contain sufficient information.
      6) Invalid operator password.

3. Output Format:
   a. The system shall operate on a System Format basis, regardless of the manner of hardware configuration in which data is required. A system of points shall consist of a logical grouping of data points related to a piece of mechanical equipment, an energy distribution system, or an architectural area. For example, in some cases it may be desired to display a space temperature with its associated air handling unit, and in other cases to display all space temperatures on a floor or in a building as a single system. The Automation System shall allow such determinations to the made without regard to a point or group of points physical hardware locations(s). Likewise, the system shall accommodate future changes of system groupings and operations without field hardware changes whatsoever.

b. All output displays and logs shall contain a header line indicating the following information:
   1) time
   2) console identifier
   3) date
   4) initials of on-duty operator
   5) day
   6) owner definable information

Example:
12:45 06/23/83 FRI MASTER CONSOLE SMD 76EF 42% RH

c. All output displays or logs of a system point or group of points shall contain as a minimum the following information:
   1) username of point
   2) associated engineering units
   3) point descriptor
   4) alarm descriptor
   5) current value/status

Example:
EAST MECHANICAL ROOM AHU SUPPLY TEMP 85EF

d. User names, point descriptors, and engineering units shall be operator definable on a per point basis. Systems which use fixed vendor-supplied look up tables shall not be acceptable.

4. Split Screen Formatting:
   a. To further simplify operator interpretation of displayed data, the display software shall divide the operator's video display into at least 5 areas. The 5 areas shall be defined as:
      1) Time Line - continuous display of time, date, day, console identifier, operator's initials and other owner-defined data.
      2) Operator Command Line - accept operator English work commands.
      3) System Response Line - acknowledgement of commands carried out or operator error advisories.
      4) Data Display Area - display the current value of a point or group of points.
      5) Alarm Area - Reserved for the display of critical alarm reporting.
   b. It shall be possible for the above defined areas to display independently of and concurrently with each other.
5. Operator Access Restriction:
   a. Operator access to the automation system shall be via user-defined passwords providing at least five access levels.
   b. Each operator shall gain access to the system by entering a unique name and password combination.
   c. Properly signing-on by an operator shall produce a hard copy report indicating the name of the operator, time, and date that operator has signed on.
   d. Invalid operator attempts to enter the system shall also produce a hard copy report as defined above and additionally indicate the nature of the unsuccessful sign-on.
   e. To return the system to a secured mode, the operator shall sign off the system.
   f. Signing off the system shall also produce a hard copy report of the operator's name, time and date.
   g. The automation system shall automatically sign off an operator should that operator not sign off after a specified period of time.
   h. In addition to producing hard copy reports of valid or invalid sign-on and sign-off attempts, the automation system shall store in nonvolatile memory a historical record for a minimum

of 30 system entries, valid and invalid. This information shall only be available to the operator with the highest access level.

i. All information pertaining to operator access shall be user-defined while the system is on-line and fully operational.

j. Typical operator access levels are:

1) LEVEL 0 - Normal operator functions such as log and display request, alarm acknowledgement.

2) LEVEL 1 - All Level O functions plus analog limit changes, point lockouts and comment functions.

3) LEVEL 2 - All lower level functions plus modification to calculations and system messages.

4) LEVEL 3 - All lower level functions plus changes to point descriptors, user names.

5) LEVEL 4 - All lower level functions plus access to add, modify or delete any and all user-defined parameters and access levels.

k. It shall be possible for the user to define the distinctions between various access levels.

l. Systems that utilize fixed vendor defined operator access levels shall not be acceptable.

6. Dynamic Color Graphics: The automation system shall include a software program allowing an operator to create, modify or delete dynamic color graphics on-line.

a. Generation of Graphics:

1) Through the use of a high level English language, an operator shall be able to create, modify or delete dynamic color graphics while the automation system is on-line and fully operational.

2) A complete set of standard symbols and building systems shall be stored in the computer system memory to aid in creating graphic displays.

3) Each system, symbol or graphic character shall be able to display in any one of the eight colors.

4) Each system, symbol or graphic character shall be able to display in variable size.

5) A mechanism shall be provided for copying graphics of similar requirements. Example: Dual-duct air handling system (2-thus). After the first graphic is created, a one-line input shall make an identical copy.

b. Dynamic Data Display:

1) Dynamic data shall be located for display at any location on the CRT screen. Each graphic shall be able to accommodate any combination of dynamic (analog or binary) information, graphic symbols and text displayed on the entire screen. The number of dynamic points being displayed and updated shall be limited only by the area of the CRT screen. A graphic shall be constructed to include any dynamic points regardless of the physical location of these points.

2) Dynamic data shall update automatically without manual initiation at user-defined intervals. Update intervals shall have resolution down to one second.

c. Manual or Automatic Operation:

1) Each graphic shall be manually or automatically displayed.

2) In the manual mode an operator shall display a graphic by inputting the appropriate graphic name.

3) In the automatic code, a graphic shall display as a result of:

a) An alarm occurrence

b) A change of state

c) Specific time, day, or date

d. Dynamic Graphics Capacity: The automation system shall have the capacity to store a minimum of 170 unique dynamic color graphics. Graphics shall be stored on hard disk.

E. User Control Over System Configuration:
1. Data Base Creation and Modification:
a. The intent of this specification is to allow the owner to independently do his own modifications to the system.
b. All changes shall be done utilizing standard procedures and must be capable of being done while the system is on-line and operational.
c. To aid an operator, instructive prompting software shall be provided. An operator shall be required to simply answer to "yes" and "no" type questions as well as provide information such as English user names, desired engineering units, point descriptors, etc.
d. The owner must have the minimum capability to:
1) Add and delete points.
2) Modify any point parameter.
3) Change, add or delete English language descriptors.
4) Change add or delete engineering units.
5) Change add or delete points in start/stop programs, trend logs, etc.
6) Select analog alarm limits.
7) Characterize each function card to accept different analog inputs, pulsed or steady state digital signals.
8) Adjust analog differentials.
9) Create custom relationships between points. A general purpose user language shall be provided, such that the user can implement software interlocks, master/slave relationships, and calculations.
e. The operator shall be able to modify all points within the data base. This modification shall include adding, deleting and modifying required additional or ranges, engineering units, mode of operation, etc. The addition of a new field point may be totally accomplished from the keyboard once the proper field hardware devices are installed, or the change function may modify existing field hardware to serve a new purpose.
f. As points are added to the field, they may be grouped into new system and building displays or they may be substituted for existing points within existing systems or added to existing systems.
2. Multiple Console Support:
a. The automation system software shall support a minimum of six operator consoles. A console shall be defined as at least one input/output device.
b. Once the hardware terminal devices are installed, the operator shall be able to modify the system software to accommodate the new or reconfigured devices. This modification shall take place while the system is on-line.
c. It shall be possible to limit the capabilities of any console on the system.
d. It shall be possible to further assign on a per point basis the ability to command, display or alarm a point at a specific console.
3. Custom Equations and Point Relationships: The system shall provide a comprehensive processor which allows a user (chief engineer, supervisor, etc.) to develop custom operational sequences, unique control algorithms, interactive point relationships, custom calculations, etc. This capability shall use on-line dynamic system data.
a. Mathematical and Logical Functions:
1) The processor shall provide as a minimum the following mathematical operators:
a) addition, subtraction
b) multiplication, division
c) square root, exponentials
d) linear equations, quadratic equations
2) The processor shall provide as a minimum the following logical operators:

a) and, or
b) equal to, not equal to
c) less than, greater than

b. System Inputs: Any of the system connected points such as temperature, pressure, humidity, flow rate, start/stop, status and alarm points shall be valid real time inputs. Also, inputs shall include real time, day of week, date, constants and results of other calculations.

c. Result Performance:
1) As a result of evaluating any combination of mathematical or logical functions and dynamic system data, the automation system shall perform as a minimum system changes such as:
a) Issuing and off commands
b) Increasing/decreasing system set points
c) Initiating logs and displays
d) Activating/inactivating application programs
e) Enabling/disabling alarm functions.

d. Processor Implementation:
1) Operator entries to this comprehensive processor shall be through the operator's terminal in an English language format. A step-by-step interactive prompting routine shall be provided to guide operator entries.
2) Systems requiring binary, hexadecimal, machine language, or coded numeric input shall not be acceptable.

e. Applications:
1) The following is a brief list of the types of operational sequences, control algorithms, point relationships and custom calculations required by this comprehensive processor:
a) If outside air is above 70deg F, close OSA dampers.
b) If freeze stat is in alarm, start circulating pump.
c) Start pump one, wait two minutes, start pump two.
d) Display operator instructions on alarm.
e) Calculate energy input to monitored equipment.
f) Calculate BTU output of boiler.
g) Calculate differential temperature.
h) Calculate degree days.
i) Calculate department energy allocation costs.

F. Facility Monitoring Functions:
1. Report and Logs:
a. An operator shall be able to manually request reports and logs from the console keyboard. The operator shall have the capability to direct any log or report to either a report printer or CRT display.
b. It shall be possible for the automation system to automatically initiate logs and reports. These logs and reports shall be initiated on time, date, or day basis, or any combination of time, date or day.
c. Each report shall be in English language with information logically grouped in a format that facilitates easy interpretation. Reports and logs shall be attainable on a per point basis or user-defined group of points. Groups of points shall be logically combined without regard to the hardware physical locations. Example:
1) Current value of a discharge temperature in a particular air handler.
2) Current value of all discharge temperatures in a specific building.

3) Current value of all discharge temperatures in a multi-building complex.

d. As a minimum, the following report categories shall be provided:
1) Summaries
2) Access Reports
3) Historical Trends
4) Data Base Management Reports
5) Profile Reports
6) System Diagnostic Report
7) Totalization Logs
8) Energy Management

2. Summaries:
a. All Point
1) A summary shall be provided detailing the current values of any and all points associated with the automation system.
b. Building or System or Custom Group
1) A summary shall be provided detailing the current values of any and all points within a building or system as detailed by the Owner.
c. Motor Status
1) A summary shall be provided detailing the current status of any and all motors connected to the system. This summary shall also have the capability of detailing the current values of points associated with any of the system motors.
d. Alarm
1) A summary shall be provided to detail the status of any and all the points currently in alarm.
e. Alarm Limit
1) A summary shall be provided to detail the operator assigned high and/or low alarm limit for any and all alarmable points on the system.
f. CPA Set Point
1) A summary shall be provided detailing the set point for any and all CPA points supported by the system.
g. Point Lockout
1) A summary shall be provided of the most recent status of any and all locked out (disabled for alarm reporting) points by the system or operator.
h. Message
1) A summary shall be provided detailing the contents of any and all messages within the system.
i. Graphics
1) A summary shall be provided detailing the instruction listings for any and all dynamic color graphics.

3. Historical Trend Log: A log shall be provided for each defined trend group which shall include as a minimum; username(s) assigned to that group, time increment in real-time, and associated values per time increment.

4. Totalization Logs
a. A log shall be provided including any and all points as defined in the point list. Log shall include username(s)and associated totalized values.

5. Access Reports
a. Access Level Assignments

1) A report shall be provided detailing operator access level assignments. This report shall include as a minimum operator's name, password, access level assignment and on-duty initials.

b. System Entry

1) A report shall be provided detailing which operator signed on or off the building automation system. The report shall include: operator's name, password, time and date, console number and elapsed time of operator access.

6. Data Base Management Report
   a. A report shall be provided including a report of the current system data base.
7. System Diagnostic Report
   a. A report shall be provided detailing any system hardware software errors. This report shall include as a minimum those errors occurring within the central processing unit including disk subsystem.
8. Energy Management Reports
   a. A report shall be provided for each application program as detailed in the appropriate section of this specification.
9. Alarm Processing
   a. The automation system shall have the following alarm processing features, all of which shall be owner defined through the input keyboard.
      1) Alarm Reporting
   b. Each alarm as determined by the system shall cause the following information to be logged:
      1) Current time, date and initials of on-duty operator.
      2) User name assigned to point.
      3) Point descriptor.
      4) Current value or status.
      5) Appropriate engineering units.
      6) Alarm designator -nature of alarm - high or low.
      7) Operator instructive message.
   c. The operator message shall be an owner-defined message with a text capability of at least 256 characters per message. These messages shall be generated by the operator while the system is online and fully operational.
   d. The operator shall have the ability to direct the alarm report and message to any output device on the system.
   e. Any point which goes into alarm and has a graphic display associated with that point shall automatically display that graphic for operator review.
   f. An operator shall be able to define any alarm as being critical or non-critical.
   g. All critical alarms shall be displayed in a separate area of the operator's terminal.
   h. In the event of multiple alarms, all alarms shall be buffered according to priority until displayed or printed.
   i. All operator acknowledgement of critical alarms shall be logged including time, date, operator's initials and username of point being acknowledged. Alarms shall be acknowledged on a per point basis in the order they reported on the operator's terminal.
10. Analog Limits
    a. Each analog point shall have associated high and low limits. If the measured or calculated value drops below the low limit or exceeds the high limit that point shall be considered in alarm and report as previously defined in alarm reporting.
    b. Each high and low limit shall have an associated user defined limit differential to prevent nuisance alarms caused from floating about the alarm limit.
    c. Any analog point shall be disable from alarm reporting if it is associated with a previously defined master point which is turned off.

11. Binary Alarms
    a. Each binary point detected as being in alarm shall report as previously defined in alarm reporting.
    b. Any binary point shall be disabled from alarm reporting if it is associated with a previously defined master point which is turned off. The operator shall be able to define an adjustable time delay which disables alarm checking during starting and stopping of equipment.
12. Analog/Binary Totalization
    a. The automation system software shall support both analog and binary totalization.
    b. The operator shall be able to:
        1) enable to disable individual points from totalizing.
        2) assign upper limits for each point enabled for totalization.
        3) reset a totalized value.
13. Display the current value of an individual point, group of points of all system points.
14. Reporting: Any point's current value exceeding its assigned upper limit shall report as a totalized alarm point.
15. Analog Points: It shall be possible to totalize analog values with appropriate engineering units such as kilowatt hours, gallons, pounds, liters, etc.
16. Binary Points: It shall be possible to totalize the accumulated:
    a. Run time in hours or minutes
    b. Contact status in hours or minutes
        (Example: magnetic contact switch indicates a door open for 45 minutes).

G. History Trending:
1. The system software shall provide the ability to historically trend operator selectable points.
2. The operator shall be able to assign any system point, analog or binary, real or calculated to a trend group. Trend groups shall consist of a single point or multiple point groups with a capacity of at least 50 points.
3. Operator assignments shall be through the operator's terminal in simple English language. Points assigned to a trend group shall be the point's English username.
4. Trended values shall be historically retained on the system disk for future inquiry.
5. Operator shall be able to request trended values to be retrieved from disk and printed out at operator defined time intervals.
6. Operator shall be able to define time intervals to one minute resolution.

H. Preventive Maintenance Work Orders:
1. The system shall provide preventive maintenance instructive work orders which can be displayed manually or automatically.
2. The operator shall have the capability to create, modify and delete work orders while the system is on-line and fully operational.
3. Operator entries shall be through the operator's keyboard and all entries shall be in English language.
4. A report shall be provided to display or log the contents of any and all work orders in the system.
    a. Capacity:
        1) The system shall have the capacity to store on-line a minimum of 750 operator defined work orders.
        2) Each work order shall have a capacity of not less than 256 characters.
        3) A mechanism shall be provided which allows for lengthy work orders by linking more than one together.
    b. Display:

1) Work orders shall manually or automatically be displayed on a specified CRT or printed on a specified printer.
2) Manual - The operator shall be able to display or print any and all maintenance work orders by requesting the same.
3) Automatically - The system shall have the capability of displaying or printing maintenance work orders on the following occurrences:
   a) A designated point exceeding a specified run time limit.
   b) A specific time, day or date.
   c) Any combination of time, day and date.
   d) A designated point having gone into "ALARM".

I. Powerfail/Automatic System Restart:
1. Power failures affecting the Central Processing Unit (CPU) shall cause the CPU to go into an orderly shutdown with no less of memory under any circumstances.
2. Upon resumption of power to the CPU, the system shall automatically restart the print-out the time and date of the power failure.
3. The restart program shall automatically restart affected field equipment. Restart shall be of a static nature (restart of operator pre-assigned equipment) or an appropriate state restart (places the building equipment in the proper operational state as of the time of return to commercial power.) The nature of the restart program shall be user-definable.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine location where this equipment is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components.

3.03 SYSTEM TURN-OVER AND SERVICE

A. System Start-up and Acceptance
1. Upon completion of the installation, the Automation System Sub-Contractor shall startup the system and perform all necessary testing an debugging operations. An acceptance test in the presence of the Owner's representative, the Architect, and the Engineer shall be performed. When the system performance is deemed satisfactory in whole or in part by these observers, the system parts will be accepted for beneficial use and placed under warranty.

B. Owner's Instruction
1. The Automatic System Subcontractor shall provide two copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the system. The

Automatic Subcontractor shall instruct the Owner's designated representatives in these procedures during the start-up and test period. The duration of the instruction period shall be no less than eighty hours. These instructions are to be conducted during normal working hours. The instructions shall consist of both hands-on and classroom training at the job site.

END OF SECTION

SECTION 232000
PIPING FOR HVAC

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The Work includes providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all piping as shown on the Drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. "Manufacturers"-Firms regularly engaged in manufacture of pipe whose products have been in satisfactory use in similar service for not less than ten (10) years.

B. Provide pipe whose performance, under specified conditions, is certified by the manufacturer.

C. Piping systems and installation of piping shall comply with ANSI/ASME B31.9, Building Service Piping (B31.1, Power Piping).

D. All piping and fittings shall comply with the Buy American Act, shall be made in the USA and shall be labeled as such. Piping shall also be labeled with ASTM number for easy identification/verification at the site.

SUBMITTALS

A. Refer to Section 01 31 46, "Special Requirements for Mechanical and Electrical Work", and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46, "Special Requirements for Mechanical and Electrical Work".

B. Furnish fabrication detail drawings for all pipe hangers and supports for piping 2½" inches nominal size and larger.

C. Furnish hanger and support location drawings for piping 2½" inches nominal size and larger.

D. Perform calculations necessary for the design and selection of hangers, supports, anchors, guides, restraints, snubbers, and supplementary supporting steel for piping 2½" inches nominal size and larger. Perform weight distribution, expansion and movement calculations for all piping. Such calculations shall be based on the piping shop drawings and shall be signed and sealed by the Contractor’s independent Professional Engineer (P.E.) licensed in the State of NY.

E. Shop Drawings and Data: Contractor shall prepare the following drawings:
   1. Fabrication Detail Shop Drawings: These drawings shall show each pipe hanger or support for piping 2½" inches nominal size and larger and shall include location of hanger with reference to nearest building columns or beams, arrangements and detail of hanger, detail of concrete anchor or detail of welded or bolted attachment to structural steel, bill of materials for all components with ASTM specification numbers and direction and magnitude of movement and thrusts and weight at hanger point. Provide the load at each concrete anchor (applicable only on projects where concrete anchors are permitted).
   2. Piping Erection Detail and Layout Drawings: Provide scaled detailed piping arrangement drawings showing all piping systems and connected components. Indicate piping in double line detail for all piping 2" and larger. Show piping with insulation thicknesses. Indicate all valves and valve handles, gear operators and handwheels, automatic actuators, strainers and access space, reducers, instruments, anchors/guides and supports, seismic components (if applicable) and all equipment to which piping is connected.
   3. Hanger and Support Location Shop Drawings: Contractor shall mark all pipe hanger and support locations for piping 2½" inches nominal size and larger on Piping Erection Detail and Layout drawings. Contractor shall also show all structural grids and support points on these drawings.

1.06 WARRANTY

A. Refer to Section 01 31 46, "Special Requirements for Mechanical and Electrical Work".

PART 2 - PRODUCTS

2.01 PIPE

A. All pipes shall be new, free from scale or rust, of the material and weight specified under the various services. Each length of pipe shall be properly marked at the mill for proper identification with name or symbol of manufacturer.

B. All steel piping, except where otherwise rated, shall be standard or extra strong weight, in conformance with the ASTM A-53 Grade B seamless, for piping 2" and larger, as manufactured by National Tube Division, Republic Steel Corp., or approved equal. Piping shall be ASTM A-53 Type F continuous butt weld, for piping less than 2".

C. All copper tubing shall be of weight as required for service specified, with conformance with ASTM B-88 for Types "L" and "K" tubing, as manufactured by Chase, Anaconda, Revere, or approved equal. Tubing and fittings shall be thoroughly cleaned with sand cloth and treated with an approved non-corrosive flux before solder is applied.

D. Generally, unless otherwise specified, joints in steel piping of sizes 2 inches and under shall be screwed, and all sized 2½" inches and over shall be welded or flanged. Brass pipe shall be screwed 2 inches and smaller and flanged 2½" inches and over. Copper tubing shall be silver-soldered or 95-5 solder as herein specified.

Screwed Piping
   1. All connections to apparatus with screwed piping shall be made with 250-pound brass seat unions.
   2. All screwed nipples shall be Schedule 80 nipples.

Pipe Schedule: Pipe for the various services shall be as follows:

Service	Material	Schedule
Hot Water (Heating) and Reheat	Steel	40 or standard
Gas	Steel	40 or standard

2.02 FITTINGS

A. Fittings shall be specified under "Fitting Schedule" for various services.

B. Fittings shall be of material conforming to the following schedule:

Steel Welding Fittings	ASTM A-106
Forged Steel Fittings	ASTM A-234
Malleable Iron Fittings	ASTM A-197
Ductile Iron Fittings	ASTM A-395 & A-536
Cast-Iron Fittings	ASTM A-126
Brass Fittings	ASTM B-62
Wrought Copper Fittings	ASTM B-75 & B-152
Bronze Cast Fittings	ASTM B-584
Solder Fittings	ASTM B-88
Stainless Steel	ASTM A-403, Grade WP, Class S or W

C. All fittings used at expansion loops or bends shall be extra heavy.

D. Cast-iron, malleable-iron and bronze fittings shall be of Crane manufacturer or approved equal.

E. Flanges shall be raised face, of the same weight as the fittings in each service category. All flanges shall be drilled to "US Standard" hex nuts and washers. Bolting shall conform to ASTM 193 Grade B-7, threads Class 7 fit. Nuts shall be semi-finished hexagonal, ANSI B18.2 ASTM A194 Grade 2H.

1. Flange Adapters for grooved end pipe shall be ASTM A-395 and A-536 ductile iron, with synthetic rubber gasket. (Grade to suit the intended service.) Flange Adapters shall be CL 150, Victaulic Style 741.

F. Unions - Unions 2 inches and smaller shall be screwed. Unions 2½” inches and larger shall be flanged. Screwed unions on steel pipe, unless otherwise specified, shall be of malleable iron with bronze ground seats suitable for 300 pounds W.S.P. Screwed unions on copper or brass pipe shall be brass, ground joint suitable for 300 pounds W.S.P. Flanged unions shall be malleable iron for steel pipe, and brass for copper or brass pipe, gasket type suitable for 150 pounds W.S.P. If grooved mechanical pipe couplings are used, additional unions are not required. Couplings shall serve as unions. Unions shall be manufactured by Crane or approved equal.

Unless otherwise specified, all flanged joints shall be fitted with Manville or equal ring gaskets designed for the intended service.

H. Fitting Schedule: Fittings for the various services shall be as follows:

Service	Size	Material	Weight	Type
Hot Water (Heating)	2" & Below 2½" & Above	CI Steel	125# Sch. 40	Screwed Welding
Gas	ALL	MI	150#	Screwed

2.03 PIPE HANGERS AND SUPPORTS

A. Provide necessary structural members, hangers and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations. In all cases where hangers, brackets, etc., are supported from metal decking and/or concrete construction, care shall be taken not to weaken decking and/or concrete or penetrate waterproofing. All hangers and supports shall be capable of screw adjustment after piping is erected. Hangers supporting piping expanding into loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction, when the supported piping is hot, or chilled, as required. Hangers in direct contact with copper or brass pipe shall be solid copper.

B. Pipe hangers shall be the clevis and pipe roll types, except where otherwise noted.

PIPE HANGER SCHEDULE				
Pipe	Type of Hanger	Make and Model		
		Grinnell Fig. No.	B-Line Fig. No.	Carpenter & Paterson Fig. No.
2" & smaller (steel)	Clevis Hanger	260	B3100	100
2" & smaller (copper)	Adjustable Wrought Iron	CT-65	B3104CT	100 CT
2½" to 4" (steel)	Adjustable Steel Yoke Pipe Roll	181	B3110	140
2½" to 4" (copper)	Adjustable Swivel Ring	CT-69	B3170CT	
5" & above	Two Rod Roller Hanger	171	B3114	142

C. Beam clamps - Hangers supported from floor steel shall be approved I beam clamps. I beam clamps for hangers shall be wrought steel. B-Line Fig. B3055 (C&P Fig. m 268) or equal.

D. Where piping is run near the floor and not hung from the ceiling construction but is supported from the floor, such supports shall be of pipe standards with base flange and adjustable top yoke similar to B-Line Fig. B3091 (C&P Fig. 247) or equal.

E. Hanger rods shall be of the following diameters:

Pipe Size	Rod Diameter	Max. Spacing
1¼ inch & below	⅜ inch	6'-0"
1½" and 2 inch	⅜ inch	10'-0" (copper 8'-0")
2½ inch 3 inch	½ inch	10'-0" (copper 8'-0")

F. Hanger rods shall be attached to preset concrete inserts with steel reinforcing rod through the insert and both ends hooked over the reinforcing mesh (when concrete inserts are permitted). For pipes 4 inches and larger, rods shall extend through concrete slab above where they shall be attached to steel bearing plates 6" x 6" x ¼".

All trapeze pipe supports shall be constructed of angle iron or C-channel. Uni-strut type supports are prohibited for use on HVAC piping, except insulated refrigerant piping may be supported using strut type supports as long as AP Armaflex insulation is used and the strut clamp is a Series 72 Klo-Shure by Hydra-Zorb which is intentionally oversized to match the O.D. of the insulation and includes a plastic clamp collar insert. All angle iron supports

located outdoors or in loading docks (trapeze supports or vertical components) shall be hot-dipped galvanized or stainless steel, including all related support rods and hardware.

H. Piping shall not be hung from other piping, ducts, conduits or from equipment of other trades and no vertical expansion shields will be permitted. Hanger rods shall not pierce ducts.

All piping running on walls shall be supported by means of hanger suspended from heavy angle iron wall brackets. No wall hooks will be permitted.

J. Lateral bracing of horizontal pipe shall be provided where required to prevent side sway or vibration. The lateral bracing shall be of a type approved by the Architect and shall be installed where directed by the Architect.

K. Assume the responsibility for the proper transfer of the loads of the piping systems to the structure. No additional cost to the Owner should be expected for any corrective work during construction.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where the piping is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Coordinate with other work as necessary to interface installation of piping with other components of systems.

B. Provide and erect in a workmanlike manner, according to the best practices of the trade, all piping shown on the Drawings or required to complete the installation intended by these Specifications.

C. The Drawings indicate schematically the size and location of piping. Piping shall be set up and down and offset to meet field conditions and to provide adequate maintenance room and headroom in the Mechanical Rooms.

D. Study the General Construction Specifications and Plans, of the exact dimension of finished work and of the height of finished ceilings in all rooms where radiation, units, equipment or pipes are to be placed and arrange the work in accordance with the Schedule of Interior Finishes, as indicated on the Architectural Drawings.

E. All piping shall be run perpendicular and/or parallel to floors, interior walls, etc. Piping and valves shall be grouped neatly and shall be run so as to avoid reducing headroom or passage clearance. Provide min. 7'-6" headroom under passageway in Mechanical Equipment Room. All valves, controls and accessories concealed in furred spaces and requiring access for operation and maintenance shall be arranged to assure the use of a minimum number of access doors.

F. All piping with screwed fittings must be provided with a sufficient number of flanges or unions to enable the removal of piping without breakage of fittings.

G. All piping shall be erected to insure a perfect and noiseless circulation throughout the system. No bullhead tees will be permitted.

H. All valves and specialties shall be placed so as to permit easy operation and access.

I. Provide proper provision for expansion and contraction in all portions of pipe work, to prevent undue strains on piping or apparatus connected therewith. Provide signed and sealed pipe expansion calculations by an independent Professional Engineer licensed in the State of NY to substantiate all such provisions for said expansion and contraction. These calculations shall be based on the piping shop drawings. Provide double swings at riser transfers and other offsets wherever possible, to take up expansion. Arrange riser branches to take up motion of riser.

J. Provide pipe supports within 1-1/2” of every elbow.

K. Approved bolted, gasketed, flanges (screwed or welded) shall be installed at all apparatus and appurtenances, and wherever else required to permit easy connection and disconnection. Screwed unions shall be used on piping 2" or less.

L. All piping connections to coils and equipment shall be made with offsets provided with screwed or welded bolted flanges arranged so that the equipment can be serviced or removed without dismantling the piping.

M. If, after plant is in operation, any coils or other apparatus are stratified or air bound (by vacuum or pressure), they shall be repiped with new approved and necessary fittings, air vents, or vacuum breakers at no extra cost. If connections are concealed in furring, floors, or ceilings, the Contractor shall bear all expenses of tearing up and refinishing construction and finish, leaving same in as good condition as before it was disturbed.

N. Steel pipe bends shall be made of the very best grade open hearth, low carbon steel, leaving a smooth uniform exterior and interior surface. Pipe bends shall be made with seamless steel pipe, having a minimum radius of not less than five (5) pipe diameters.

O. Tubing shall be erected neatly in a workmanlike manner. Bends in soft copper tubing shall be formed using benders to prevent deformation of the tubing in the bends. Approved seat-to-pipe threaded adapters shall be provided for junctions with valves and other equipment having threaded connections.

P. The ends of all pipe and nipples shall be thoroughly reamed to the full inside diameter of the pipe and all burrs formed in the cutting of the pipes shall be removed.

Q. All piping shall be concealed above furred ceilings in rooms where such ceilings are provided (except where specifically indicated otherwise on the drawings, or in walls or partitions, except as otherwise indicated).

R. Piping, fittings or valves of dissimilar materials shall be connected with dielectric connectors as made by Ebco Company or approved equal.

S. Components including all fittings, valves, flow meters, steam traps, instrument taps, etc., used in stainless steel piping shall be of all-stainless steel construction.

T. Piping at all equipment and valves shall be supported to prevent strains or distortions in the connected equipment and valves. Piping shall be sufficiently supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without causing excessive stress or damage to the

remaining piping, valves or equipment, without requiring additional supports after these items are removed.

U. Pipe nipples - Any piece of pipe 3" in length and less shall be considered a nipple. All nipples with unthreaded portion 1½" and less shall be extra heavy. Only shoulder nipples shall be used. No close nipples will be permitted.

V. Screw threads shall be cut clean and true. Screw joints made tight without caulking. No caulking will be permitted. A non-hardening lubricant shall be used. No bushings shall be used.

W. Reductions, otherwise causing objectionable water or air pockets, to be made with eccentric reducers or eccentric fittings. Reducers installed in horizontally oriented piping shall be of the eccentric type, where changes of size occur in horizontal piping to provide for proper drainage or venting. Eccentric reducers installed in steam piping shall be installed flat-on-bottom; eccentric reducers installed in liquid carrying pipes shall be installed flat-on-top.

X. Pitch water piping upward one inch per 100 feet in direction of flow to ensure adequate flow without air binding, and to prevent noise and water hammer. Pitch drain piping 5/8 inch per foot in the direction of flow. Branch connections to mains are to be made in such a manner as to prevent air trapping and permit free passage of air. To meet job conditions, mains shall set up to maintain headroom, and clear other trades. Provide oversized float operated automatic air vent (with valve). Avoid 90-degree lift set-ups in supply lines by using 45 degree ells. Where 90-degree lifts exceed 1½" install automatic air vent in supply lines. All lifts in return lines shall be installed with automatic air vents. Pipe outlet of all automatic air vents to an open sight drain if the vent is concealed, or to within two feet of the floor within machine rooms. All water piping shall pitch back to low points for drainage. Low points shall be provided with capped ¾ inch hose cocks.

Y. Provide drain valves at the heel of all interior main water risers. Provide capped drain valves at the heel of all perimeter water risers.

Z. Provide isolation valves where tying new piping into the existing system. Refer to the valves specifications for the proper valve type for the service. Refer to the Drawings for the pipe/valve size. In addition to the isolation valves at the tie-in points, also provide a balancing valve on the supply side for chilled water, chilled glycol/brine, condenser water and heating/reheat hot water system tie-ins.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of piping (partial or complete) test piping to demonstrate compliance with requirements. Where possible, field correct malfunctioning piping, then retest to demonstrate compliance. Replace piping which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 232500
WATER TREATMENT AND CLEANING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all cleaning as shown on the drawings and hereinafter specified.

1.03 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.04 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 CLEANING OF PIPING SYSTEMS

A. Preliminary Cleaning:
   1. Clean new piping internally by flushing prior to the application of pressure tests and before the chemical cleanout procedures specified herein. Provide temporary strainers at the inlet to the chilled water and hot water pumps before the start of cleaning procedures.
   2. Block off and isolate circulating pumps, cooling coils, heating coils and steam traps during the preliminary flushing and draining process.
   3. Thoroughly flush piping clear of foreign matter with City water under pressure, and then drain before proceeding with pressure testing. Blow down accumulations of grit, dirt and sediment at each strainer and each low point in the piping systems.
   4. Clear compressed air piping of foreign matter by progressively blowing compressed air through the piping.
   5. Provide bypass flush valves and required piping to permit full circulation of water during the washout of the piping systems. Close shutoff and balancing valves on branch piping to the terminal equipment units during the washout operation to prevent water circulation through the automatic control valves.

B. Chemical Cleanout:
   1. After completion of pressure testing, chemically clean internally each recirculating water system (including chilled water, hot water, and condenser water).

2. Provide temporary connections with valves to fill the piping and remaining equipment with water for the purpose of draining piping and equipment after completion of the chemical cleanout procedure. Provide temporary blind flanges and/or caps to isolate the piping and equipment noted herein.
3. Provide temporary piping connections, valves, strainers, bypasses, and blank connections where required to clean out systems. Line each strainer basket with a fine mesh nylon screen and replace the screens at the end of each day's circulation until each system is thoroughly cleaned.

C. Hot Water Heating System: Fill each system with City water; start circulation pump and vent high points manually until all air is released from the system.
1. All new recirculating water systems, both open and closed, to be filled and flushed with a solution of a non-foaming chemical detergent, to remove all foreign matter. Circulate the solution for a minimum of 8 hours and drain as rapidly as possible to remove suspended matter. Flush the system with fresh water, drain a second time and refill. After final filling, the pH of the water must not exceed the pH of the fresh incoming water by more than 0.5 pH.
2. Introduce the chemical solution into the system gradually by injecting into the suction side of the circulating pump, or by means of a bypass chemical feeder located on the discharge side of the permanent hot water secondary system circulating pump. Slowly raise and then maintain the temperature of the circulating water at 150 degrees F. by circulating through the hot water converter.
3. While the water is being heated and circulated, open each drain connection for a short flow. Repeat at hourly intervals. Replace any water drained during blowdown with chemical solution as required until air is eliminated from the system. The chemical cleanout procedure to be continuous in this manner for 2 full 8-hour periods.
4. At the conclusion of the chemical cleanout period, completely drain the entire system and allow to cool. Flush out with fresh City water prior to final activation of the system. Remove temporary equipment and strainers, reconnect permanent pump and replace items previously removed.

D. Filling of Water Systems:
1. After completion of the chemical cleanout, fill each water system with fresh water, air vent, and add chemical treatment.

2.02 INTERNAL TREATING OF PIPING

A. This work shall include the internal protective coating of all distribution systems on this construction such as, but not limited to hot water heating systems and components.

B. This method of treating is to be applied to all piping supply and return and then back to the source of equipment.

C. The Contractor shall clean the piping for the purpose of removing lime, oil, grease, oxides and other wastes therefrom. After the removal of these impurities, a protective coating shall be applied to all inner surfaces, which will inhibit oxidation as well as protect the metals against impurities that may be present in the water. This coating shall be guaranteed for five years from date of completion at no cost to the Owner, covering labor and materials. Valve-off heat exchangers to avoid coating surfaces.

D. The treating materials use for this purpose must have been in use successfully for at least five years in comparable systems.

E. It shall be compounded of non-corrosive, non-toxic, non-alkaline and non-injurious ingredients that have been investigated and reported as a "Neutral Compound" by a recognized engineering firm or laboratory,

other than the submitting company's own laboratory. Brochures and unbiased test reports shall be submitted to the Architects within 90 days from job acceptance for approval. This treating firm shall show proof, that said firm has been established and accepted for this work, for a minimum of 10 years. The ingredients used shall have no deleterious effects on seals, O-rings, glands, packing, etc.

F. It shall be the sole responsibility of the approved firm for the application of this process. He shall supply all labor, materials, and equipment for this purpose. A competent supervisor and/or equipment operator shall be kept at the site from commencement of his work until completion. None but experienced men shall provide treating of piping. Any repairs or servicing of components of these systems shall be done by the Contractor.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, and after motors have been energized with normal power source, test equipment to demonstrate compliance with requirements. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION

SECTION 233113
SHEET METAL DUCTWORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all Sheet Metal Ductwork as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Fabrication and installation shall be by a single firm specializing and experience in metal ductwork for not less than 10 years.

B. Comply with SMACNA's (Sheet Metal and Air Conditioning Contractors National Association) 2005 HVAC Duct Construction Standards, Metal and Flexible, Third Edition recommendations for fabrication, construction and details and installation procedures, except as otherwise indicated.

C. Comply with ASHRAE (American Society of Heating Refrigeration and Air Conditioning Engineers) recommendations, except as otherwise indicated.

D. Compliance to SMACNA and ASHRAE is a minimum requirement. In case of disagreement between sheet metal work described in this Section and SMACNA or ASHRAE, the specification shall govern.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work and submit shop drawings and coordinate drawings.

B. Before submitting any sheet metal drawings, submit a complete set of shop standards for review and approval. Sheet metal shop drawings may be submitted only after approval of the shop standards.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work.

B. Contractor will guarantee all work for one year from the date of acceptance against all defect in material, equipment and workmanship. This guarantee shall include repair of damage to any part of the premises resulting from leaks or other defects in material, equipment or workmanship.

1.07 PRODUCT HANDLING

A. Protect shop fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Protect ends of ductwork and prevent dirt and moisture from entering ducts and fittings.

B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclosed with waterproof wrapping.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR DUCTWORK

A. Furnish and install the size, connections and run of ducts as indicated on the drawings.

B. While the Drawings shall be adhered to as closely as possible, the Architect's right is reserved to vary the run and size of ducts during the progress of the work if required to meet structural conditions.

C. Install all ductwork in strict adherence to the ceiling height schedule indicated on the Architect's Drawings. Consult with the Plumbing, Fire Protection and Electrical Contractors and, in conjunction with the above Contractors, establish the necessary space requirements for each trade.

D. The sheet metal ductwork shall, whether indicated or not, rise and/or drop and/or change in shape to clear any and all conduits, lighting fixtures, piping and equipment to maintain the desired ceiling heights and to provide adequate maintenance room and headroom in mechanical equipment rooms.

E. The ductwork shall be continuous, with airtight joints and seams presenting a smooth surface on the inside and neatly finished on the outside. Ducts shall be constructed with curves and bends so as to affect an easy flow of air. Unless otherwise shown on the Drawings, the inside radius of all curves and bends shall be not less than width of ducts in plane of bend.

F. All rectangular ductwork, unless otherwise noted, shall be built from galvanized sheet steel and thoroughly braced and stiffened.
   1. Provide 18" x 18" access doors for every 30'-0" run of supply and return air duct for cleaning purposes. For ducts whose height or width is less than 20", provide access doors which are 18" wide by a height calculated as 2" less than the height of the duct (thereby providing 1" of clearance between the bottom of the access door and the bottom of the duct, and similar for the top).

2.02 DUCT PENETRATION THRU FLOOR

A. Provide 4" high and 4" wide concrete curb all around opening at duct penetration thru floors. Fill in space between duct and floor construction with mineral wool.

2.03 MISCELLANEOUS DUCTWORK

A. All ductwork from all laboratory fume hoods shall be 18 gage type 304 stainless steel construction. All **fume exhaust ductwork** shall be constructed with **continuously welded joints and seams**. Flanged connections may be provided only where required for equipment connections, access, maintenance, or duct section assembly. Welded construction shall provide a gastight system suitable for laboratory exhaust applications and shall comply with the project specifications and applicable code requirements. All welds shall be continuous and free of defects to prevent air leakage and ensure long-term system integrity.

B. All joints shall be sealed tight with Foster 32-19, Childers CP-146 or 3M EC-800 or approved equal sealer. Connections from fume hood ductwork to fans shall be thru acid resistant rubber, not less than 6" long, fume tight and securely fastened with copper metal bands.

2.04 INSTALLATION OF HVAC DEVICES

A. Installation of variable air volume system control devices: Install in sheet metal ductwork all control devices furnished by the manufacturer of the variable air volume system controls. Provide an access door at each location.

2.05 CANOPY HOODS

A. Canopy hoods, where shown, shall be as per catalog number length, 36" wide, 24" high. Hoods shall be fabricated of 18-gauge high quality cold rolled mild steel conforming to ASTM Specification MA-336, U.S. Standard gauge. All joints shall be spot welded and, where required to be watertight, shall be soldered.

B. Hoods shall be fabricated in single section units, for ease and convenience in handling and installation. Four (4) ½" diameter solid aluminum rods attached to #16 gauge braces shall provide installation means. The 6" wide fascia shall be on front and both ends. The roof shall slope three ways to a 1" high exhaust outlet, of size as indicated on the drawings.

C. The underside of the hood shall have a removable two-piece baffle set up 3" with a 1" wide solid piece around entire perimeter. Fable shall be flanged and lapped on all edges and turned up :". Gauge angles shall support the baffles. A watertight condensation gutter shall surround the interior perimeter.

D. Finish of canopy hood shall be #1145 plastic metallic on all exterior and interior surfaces.

2.06 DUCT FABRICATION

A. Ducts shall be neatly finished on the outside with all sharp edges removed.

B. Inside surfaces shall be smooth with no projections into the air stream except where otherwise indicated.

C. Longitudinal joints shall be Pittsburgh lock at corners or Acme lock on flat surfaces double seams hammered tight and shall be located above the horizontal axis of the duct. A snap lock seam shall not be permitted as a substitute for the Pittsburgh lock at corners of ducts.

D. Transverse joints shall be made airtight with all laps in the directions of air flow.

E. All fasteners and attachments shall be made of the same material as the ducts.

F. Furnish test wells 12" on the center horizontally and vertically in the suction and discharge duct of each fan. Test wells shall consist of a 1" x ¾", 125 lb., bronze, screwed hex bushing, secured to the duct with a bronze hex locknut on the inside of the duct. A ¾" x 2" long standard weight bronze, screwed nipple and cap shall be fitted to the housing on the outside of the duct. Test wells shall be No. 699 as made by Ventlok or approved equal.

G. All turns in ductwork shall be accomplished using radius elbows rather than square elbows. Square elbows will only be permitted in instances where the Contractor, through depiction on their sheet metal shop drawings, proves that only a square elbow may be installed due to such limited space availability. All radius elbows shall have a minimum centerline radius of 12 times the width of the duct.

H. All square elbows shall have factory-designed and built single thick turning vanes. Shop fabricated vanes will not be approved. Where turning vanes are in conflict with the access doors to fire dampers, they shall be made movable so that fire dampers shall be accessible.

I. Dissimilar metals shall be connected with flanged joints made up with fiber or neoprene gaskets to prevent contact between dissimilar metals. Flanges shall be fastened with bolts protected by ferrules and washers made of the same materials as the gaskets. Where an aluminum duct is to be connected to a galvanized steel duct, the end of the galvanized steel duct shall be coated with heavy black asphaltum paint before connecting it to the aluminum duct.

J. Changes in shape and dimension shall conform to the following: Except where otherwise noted, for increases in cross-sectional area, the shape of the transformation shall not exceed 1" in 7". Except where otherwise noted, for reductions in area, the slope shall not be less than 1" in 4" but 1" in 7" preferred.

K. Wherever it may be necessary to make provisions for vertical hangers of the ceiling construction passing through ducts, provide streamlined shaped sleeves around such ceiling construction hangers as to fully protect the duct from being penetrated with holes for the passage of such hangers. Any such streamlined sleeves shall be made air tight at top and bottom of ducts. In no case shall there be more than two rods in any 9 sq. ft. area. No rods shall pierce ducts smaller than 12" in horizontal area.

L. Ductwork shall be constructed in accordance with the latest version of the SMACNA Duct Construction Standards for both rectangular and round duct. The duct Pressure Class for each duct system shall be determined from the maximum possible (shut-off) static pressure achievable by the supply, return or exhaust fans, and in no instance shall the minimum pressure class be lower than 1" WC. The Sheet Metal Subcontractor shall obtain the associated fan curves from the Mechanical Contractor in order to confirm the maximum static (shutoff) pressure of the fan(s). This pressure class shall extend from the air handlers to the first automatic damper (including fire dampers, smoke dampers and combination fire/smoke dampers). For VAV systems, the pressure class of the ductwork between the first automatic damper and the VAV or CV boxes shall be equal to the external static pressure (ESP) rating of the fan.

M. Seal Class: All ductwork shall be sealed to SMACNA Seal Class A, with no exceptions.

N. Ductwork Testing:
1. The intent is to test all ductwork and all ducted systems. All ductwork shall be tested in accordance with SMACNA Procedures, including SMACNA Duct Performance Test Standard m DPTS-1995 and the latest editions of the SMACNA HVAC Duct Construction Standards and the SMACNA HVAC Air Duct Leakage Test Manual.
2. Additional requirements for all ductwork:
    a. The testing of all joints for air leakage after erection and the repair of any leaks are positive requirements. Leakage must be kept to a specified minimum. The test for air leakage is divided into two phases; namely, testing of individual vertical risers and testing of all branches. Provide all required instruments.
    b. All risers, branches and runouts shall be tested after installation before insulation is applied and before the air mixing units are installed. The total allowable leakage for the entire system shall be tested, measured and proven to be in accordance with Table 4-1, Applicable Leakage Classes, of the SMACNA HVAC Air Duct Leakage Test Manual; joints, seams and all wall penetrations shall meet Leakage Class 6 for rectangular ducts and Leakage Class 3 for round ducts.
    c. Equipment necessary for performing this test shall include a rotary hand blower calibrated orifice section and a “U” tube gauge board complete with cocks and rubber tubing. The test hookup, as well as details for the fabrication of the orifice section shall be in accordance

with the recommendation of the "High Velocity Duct Manual" of Sheetmetal and Air Conditioning Contractors National Association, Inc.

O. The construction for low pressure rectangular sheet metal ducts shall be made in accordance with recommendations of ASHRAE Guide, Latest Edition, or as per SMACNA Manual but not less than the following weights and construction:

LOW PRESSURE - RECTANGULAR DUCTWORK				
Dimension Longest Side Inches	Sheet Metal Gauge All Four Sides			Transverse Reinforcing at Joints and Between Joints
	Steel Gauge	Aluminum Thickness In.	Copper Oz. Per Sq. Ft.	
Up thru 12	26	0.020	16	1" pocket lock 24 gauge, standing seam joint 24 gauge, 1" standing S slip 24 gauge. Joint max. on 8 ft. centers.
13 thru 18	24	0.025	24	Same as for up thru 12.
19 thru 30	24	0.025	24	1" pocket lock 22 gauge. Joints max, on 8 ft. centers with 1 x 1 x c in. angles 4 feet from joint.
31 thru 42	22	0.032	32	Same as for 19 thru 30.
43 thru 54	22	0.032	32	1" standing S slip 22 gauge with 1½" x 1½" x ⅛ in. angles, 1½" standing seam joint, 1½" pocket lock 22 gauge. Joints on 8 ft. centers with 1½" x 1½" x ⅛ in. angles max. 4 feet from joint.
55 thru 60	20	0.040	36	Same as for 43 thru 54.
61 thru 84	20	0.040	36	1" standing S slip gauge with 1½" x 1½" x ⅛ in. angles, 1½ standing seam joint, with 1½" x 1½" x ⅛ in. angels, 1½" in. pocket lock 22 gauge with 1½" x 1½" x ⅛ in. angels. Joints max. on 8 ft. centers with 1½" x 1½" x ⅛ in. angels max on 2 ft. centers.
85 thru 96	18	0.050	48	Same as for 61 thru 84 except all angles shall be 1½" x 1½" x 3/16 in.
over 96	18	0.050	48	Same as for 61 thru 84 except all angles shall be 2 x 2 x ¼ in.

1. Flat areas of duct over 18 in. wide shall be stiffened by cross breaking of beading.
2. All joints to have corner closures.
3. All joints (longitudinal and transverse) shall be sealed with Foster 32-19, Childers CP-146 or 3M EC-800 mastic or equal UL181A approved mastic, to provide sealing equivalent to SMACNA Seal Class A.

P. The construction for low pressure round sheet metal ducts and fittings shall be as follows:

Girth Reinforcing			
Duct Diameter Inches	Steel-Galv Sheet Gage	Minimum Reinforcing Angle Size & Maximum Longitudinal Spacing	Girth Joints (Continuously Welded or as Below)
Up thru 8	26	None required	Crimped and beaded joint
9 thru 13	26	None required	Crimped and beaded joint

Girth Reinforcing			
Duct Diameter Inches	Steel-Galv Sheet Gage	Minimum Reinforcing Angle Size & Maximum Longitudinal Spacing	Girth Joints (Continuously Welded or as Below)
14 thru 22	24	None required	Crimped and beaded joint
23 thru 36	22	None required	--
37 thru 50	20	1¼ x 1¼ x ⅛ @ 72 in.	--
51 thru 60	18	1¼ x 1¼ x ⅛ @ 72 in.	--
61 thru 84	16	1½x 1½ x ⅛ @ 72 in.	--

NOTE: Flanged joints may be considered as girth reinforcing.

1. Ductwork up to 36 in. diameter shall be spiral lockseam construction and it shall be assembled with prefabricated fittings made up of 20 gauge galvanized iron.
2. All joints (longitudinal and transverse) shall be sealed tight with EC-800 to provide sealing equivalent to SMACNA Seal Class A. Joints shall, in addition, be fastened with self-tapping screws.

Q. Ductwork for medium pressure systems shall conform to the following:
1. Medium pressure ductwork is defined as more than 2" w.g.
2. Duct construction shall consist of gauges and reinforcing framing specified in latest ASHRAE Guide for medium pressure ductwork or as per SMACNA Manual, but not less than the following weights and construction.

Construction for Rectangular Medium Pressure Duct		
Dimension of Longest Side Inches	Galvanized Sheet Gauge (All 4 Sides)	Transverse Reinforcing Between Joints and at Joints
Up thru 12	24	Inside slip joint, double S slip, welded flange, standing seam, flanged joint, pocket lock, compassion angle flanged joint with 1¼ x 1¼ x ⅛ angles. No tie rods required at joints. Joints max. on 8 ft. centers.
13 thru 18	24	Between Joints: 1 tie rod at 48 in. intervals on centerline of ductside or without tie rods with 1 x 1 x 16 gauge angle @ 48 in.
		At Joints: Inside slip joint, double S Slip and welded flange, each with 1 x 1 x 16 gauge angle. Standing seam, flanged joint, pocket lock, companion angle flanged joint with 1¼ x 1¼ x ⅛ angles. Joints max. on 8 ft. centers.
19 thru 24	22	Between Joints: 1 tie rod @ 48 in. intervals on centerline of duct side or without tie rods with 1 x 1 x ⅛ angle @ 48 in.
		At Joints: Inside slip joint, double S slip and welded flange, each with 1 x 1 x ⅛ angle. Standing seam, flanged joint, pocket lock, companion angle flanged joint with 1¼ x 1¼ x ⅛ angle. Joint max. on 8 ft. centers.
25 thru 36	22	Between Joints: Without tie rods with 1 x 1 x ⅛ angle @ 32 in. or 1¼ x 1¼ x ⅛ angle @ 40 in.

Construction for Rectangular Medium Pressure Duct		
Dimension of Longest Side Inches	Galvanized Sheet Gauge (All 4 Sides)	Transverse Reinforcing Between Joints and at Joints
		At Joints: Inside slip joint, double S slip, welded flange, each with 1¼ x ⅛ angles. Standing seam, flanged joint, pocket lock, companion angle flanged joint with 1¼ x 1¼ x ⅛ angles. Joint max. on 8 ft. centers.
37 thru 48	22	Between Joints: Without tie rods with 1½ x 1½ x ⅛ angle @ 30 in.
		At Joints: Inside slip joint, double S slip, welded flange, each with 1½ x 1½ x ⅛ angles. Reinforced standing seam, with 1½ x 1½ x ⅛ angles, companion angle flanged joint with 1¼ x 1¼ x ⅛ angles. Joints max. on 8 ft. centers.
49 thru 60	20	Between Joints: 1½ x 1½ x ⅛ angle @ 24 in. with tie rod in center or without tie rods with 2 x 2 x ⅛ angle @ 24 in.
		At Joints: Inside slip joint, double S slip, welded flange, each with 2 x 2 x ⅛ angles or 1½ x 1½ x ⅛ angles with tie rod in center. Reinforced standing seam with 2 x 2 x ⅛ angle, companion angle flanged joint with 1½ x 1½ x ⅛ angles. Joints max. on 8 ft. centers.
61 thru 72	20	Between Joints: 1½ x 1½ x ⅛ angle @ 24 in. with tie rod in center or without tie rods with 2½ x 2½ x 3-16 angle @ 24 in.
		At Joints: Inside slip joint, double S slip, welded flange, each with 2½ x 2½ x 3/16 angles or 1½ x 1½ x ⅛ with tie rod in center. Reinforced standing seam with 2½ x 2½ x 3/16 angles. Companion angle 2 x 2 x 3/16. Joints max. on 8 ft. centers.
73 thru 84	18	Same as for 61 thru 72.
85 thru 96	18	Between Joints: 1½ x 1½ x ⅛ angles @ 24 in. with tie rod in center.
		At Joints: Inside slip joint, double S slip, welded flange each with 1½ x 1½ x ⅛ angles with tie rod in center. Companion angle flanged joint with 2 x 2 x 3/16 angles or 1¼ x 1¼ x ⅛ angles with tie rod in center. Joints max. on 8 ft. centers.
97 and over	18	Between Joints: 2 x 2 x ⅛ angle @ 24 in with tie rods @ 48 in. along angle.
		At Joints: Inside slip joint, double S slip, welded flange, each with 2 x 2 x ⅛ with tie rods @ 48 in. along angle. Companion angle flanged joint with 1½ x 1½ x ⅛ angles with tie rods @ 48 in along angle. Joints max. on 4 ft. centers.

3. Transverse reinforcing must be applied on all four sides and tied together at each corner by riveting, bolting or welding, to prevent air leakage and shall be installed with ⅛" thick 3M gasket EC-1202. Gaskets shall have overlapped corners and cove entire frame. Connecting angles shall be bolted to each other with stove bolts, spaced not more than 6" apart. In addition, each such angel frame shall be itself welded at the corners for rigidity. The longitudinal spacing of the transverse reinforcing between joints may necessarily be less than the spacings recommended in the table in order to conform to the selected length module.
4. In addition to the above, all medium pressure ductwork at supply fans, for a minimum of 30 ft. - 0 in. from supply fan shall have bracing, on each of four sides, as follows:

Up to 60 inches	On 2 ft. - 0 in centers
Over 60 inches	On 2 ft. - 0 in. centers, plus a longitudinal angle on sides over 60 inches.

5. All bracing angles shall be 2" x 2" x ⅛" and shall be tack welded or spot welded to the ducts.
6. All joints (longitudinal and transverse) shall be sealed with Foster 32-19, Childers CP-146 or 3M EC-800 mastic to provide sealing equivalent to SMACNA Seal Class A.

R. The construction of round medium pressure ducts shall be galvanized steel of gauges noted in the latest issue of ASHRAE Guide or as per SMACNA Manual but not less than the following weights and construction.

Construction for Round Medium Pressure Duct					
	Steel - Galv. Sheet Gage			Girth Reinforcing Angle Size & Maximum Longitudinal Spacing	Girth Joints Continuously Welded or as Below
Duct Diameter Inches	Spiral Lock Seam Duct	Longitudinal Seam Duct	Welded Fittings		
Up thru 8	26	24	22	None required	2 in. long slip joint
9 thru 22	24	22	20	None required	4 in. long slip joint
23 thru 36	22	20	20	None required	4 in. long slip joint
37 thru 50	20	20	18	1¼ x 1¼ x ⅛ @ 72 in.	1¼ x 1¼ x ⅛ angle flanged
51 thru 60	-	18	18	1¼ x 1¼ x ⅛ @ 72 in.	1¼ x 1¼ x ⅛ angle flanged
61 thru 84	-	16	16	1½ x 1½ x ⅛ @ 72 in.	1½ x 1½ x ⅛ angle flanged

NOTE: Flanged joints may be considered as girth reinforcing.

1. Provide 3M Co.'s gasket EC-1202 gasket at flanged joints and all slip joints shall be sealed with Foster 32-19, Childers CP-146 or 3M Co.'s EC-800 duct sealant. Joints shall be maximum on 8 feet center.
2. This trade may elect the option of using standard prefabricated spiral construction conduit and prefabricated fittings as made by United Spiral Co. or approved equal. All joint shall be sealed with Foster 32-19, Childers CP-146 or 3M Co.'s EC-800 duct sealant.
3. All joints (longitudinal and transverse) shall be sealed with Foster 32-19, Childers CP-146 or 3M EC-800 mastic to provide sealing equivalent to SMACNA Seal Class A.

2.07 DAMPERS

A. At each main branch take-off and in such other locations where required to properly balance the system, provide volume dampers of the opposed blade, multi-louvered type, which shall be operated by indicating locable quadrants and set screws, for adjusting the system.

B. Volume dampers shall be constructed as follows: Damper blades shall not be wider than 12", shall be complete with heavy angle iron frames, connecting and operating links, brass trunnions, and bronze bearings. Dampers, unless otherwise noted, shall be fabricated with not less than No. 16 gauge sheet steel. Blades shall overlap and shall be provided with continuous stops on all four sides of dampers to prevent leakage. Blades shall be galvanized. Blades of dampers shall be set into a flat steel frame with frame securely bolted to the duct. All dampers shall be fitted with a hexagonal brass spindle which shall extend through the exterior of duct and be fitted with an indicating self-locking regulator. Regulator shall be similar to Ventlok 641 or approved equal. All hardware shall be Ventlok or approved equal. For insulated ductwork provide No. 644 self-locking regulator as made by Ventlok or approved equal.

C. All automatic dampers shall be furnished as a part of the automatic temperature control system by the automatic temperature control manufacturer. Install dampers and provide safing in ductwork for automatic dampers smaller than duct size.

D. For stainless steel and aluminum ductwork, provide dampers of same material as ductwork.

E. All dampers shall be made accessible from building construction. Access doors in building structure shall be furnished or provided as herein before specified.

2.08 ACCESS DOORS IN SHEET METAL WORK

A. Wherever necessary in ductwork, casings or sheet metal partitions, provide suitable access doors and frames to permit inspections, operation and maintenance of all valves, coils, humidifiers, controls, smoke dampers, smoke detectors, fire dampers, filters, bearings, traps, or other apparatus concealed behind the sheet metal work. All such doors shall be of double construction of not less than No. 20 gauge sheet metal and shall have sponge rubber gaskets around their entire perimeter. Doors in insulated ducts of insulated casings shall have rigid insulation between the metal panels.

B. All access doors in sheet metal ducts shall be hung on heavy flat hinges and shall be secured in the closed position by means of cast zinc clinching type latches. Where space conditions preclude hinges, use four heavy window type latches. Doors into ducts shall in general not be smaller than 24" x 24" except for access door to fire dampers which will depend on size of fire damper.

C. In no case shall access to any items of equipment requiring inspection, adjustment, or servicing require the removal of nuts, bolts, screws, wing nuts, wedges, or any other screwed or loose device.

D. Each sheet metal chamber or plenum shall have access doors for access to all parts of the system (outside air intake, exhaust and return air). Doors shall be fitted with cast zinc door latches, two per door. Latches shall be operable from both sides of casing. Hinges shall be extra heavy, zinc plated hinges, minimum of two per door. The doors shall be felted or provided with rubber gaskets so as to make them airtight. The doors shall be made with inner and outer shells 2 inches apart so that they may be properly insulated and properly operated. Doors shall be a minimum size of 20" x 48".

E. Hinges shall be Ventlok No. 150 or 260 with or without screw holes or approved equal. Latch for walk-in access doors shall be No. 260 as made by Ventlok Co. or approved equal. Latch for access door in ductwork shall be Ventlok No. 100 or approved equal.

F. Where reheat coils are installed in ductwork, provide two (2) access doors; one on the upstream side of the coil and one on the downstream side of the coil, both within 2'-0" of the coil.

G. Access doors at humidifier locations shall be provided on both sides of duct.

H. Provide access doors of adequate size to allow easy access to the equipment that will require maintenance. Provide insulated or acoustically lined doors to prevent condensation where applicable.

I. Manufacturer to provide an installed neoprene gasket around perimeter of access door for airtight seal.

J. Systems 3” w.g. or less shall utilize a hinged, cam, or hinged & cam square-framed access door.

K. Systems 4” w.g. and above shall utilize a sandwich-type access door. Construct doors in accordance with Figure 7-3 of the 2005 SMACNA Manual, HVAC Duct Construction Standards, Metal & Flexible Third Edition.
   1. Approved Manufacturer: Ductmate Industries Sandwich style door or approved equal.

2.09 GRILLES, REGISTERS AND DIFFUSERS

A. Furnish and install where shown on the drawings all metal diffusers, grilles and registers of the sizes and capacities indicated.

B. Ceiling diffusers shall be selected to diffuse the air uniformly throughout the occupied space. The air shall be introduced at a temperature differential of 20 deg. F and shall be diffused at the five (5) foot level to a velocity of not greater than 50 FPM and a temperature differential of not greater than 2 deg. F when compared with mean room temperature. The sound power level of air distribution equipment devices shall not exceed ratings as shown in schedule.

C. Equipment manufacturer shall submit engineering data in a manner to facilitate convenient review of the following factors:
   1. Aspiration ability, including temperature and velocity traverses, throw and drop of each unit, noise criteria ratings for each unit, sizes, free area and quality of construction.

D. Location of ceiling diffusers and registers shown on the drawings are approximate. Coordinate with the acoustic tile ceiling Sub-Contractor for exact locations of ceiling diffusers and registers. They shall be in accordance with approved ceiling layout shop drawings.

2.10 SOUND REDUCTION

A. Furnish and install all soundproofing material specified, indicated or necessary to that all systems will comply with requirement of quiet operation. In general, noise level in any part of building (except in machinery rooms), due to air conditioning or ventilating equipment, ducts, and outlets, shall not exceed 40 decibels at 1200-2400 cycles per second, except as otherwise hereinafter specified.

B. Furnish and install sound-absorptive lining in ductwork for locations and lengths as indicated and/or hereinafter specified. All soundproofing material, installation and arrangement, shall be as approved. Where ducts are acoustically lined and insulation is required per 15850 (23 07 00), external insulation may be omitted provided a minimum R value 6 is maintained for indoor ducts. Dimensions noted for lined ducts are inside clear dimensions. Duct sizes shall be increased for liner.

C. Sound Absorbent Duct Lining for Low Pressure Ductwork - Furnish and install as herein specified and/or shown on the drawings (except where otherwise noted) 2" thick, meeting ASTM C1071 Type I flexible with a NRC of .70 tested per ASTM C423 using a type "A" mounting, fibrous glass duct lining meeting the requirements of NFPA 90A with a FHC of 25/50, limited combustible and ASTM C411 at 250 deg. F.

D. Liner shall be adhered to all interior sides of duct with minimum 90% coverage of fire-retardant adhesive similar to Foster 85-60 or Childers CP-127 and with weld pins and washers or equivalent mechanical fastening starting 3" from edges and sides, 12" on center all sides. Minimum one row per side for duct size of 12" of less. Mechanical fasteners shall cause quilting of surface. Acrylic coated surface shall be toward air stream. Before installing liner, seal all butting edges and final edges with heavy coat of adhesive to seal off air between lining and duct unless the material has factory applied edge coating. All exposed edges of lining shall be installed with sheet metal nosing 12" wide, two gauges heavier than duct at fan discharge and at any section preceded by an unlined section. Installation shall be suitable for duct velocities up to 3,000 fpm. Low pressure duct lining shall be provided where specified and/or where shown and noted on the drawings.

E. Sound Absorbent Duct Lining for Medium Pressure Ductwork.
   1. Furnish and install 1" thick meeting ASTM C1071 Type II (board) with a NRC of .80 tested according to ASTM 423 using a Type “A” mounting, acoustical lining and meeting requirements of NFPA 90A

with a FHC of 25/50, limited combustible and ASTM C411 at 250 deg. F, as herein specified and/or as shown on the drawings.

2. Liner shall be adhered to all interior sides of duct and plenums with minimum 90% coverage of fire-retardant adhesive similar to Foster 85-60 or Childers CP-127 and with weld pins and washers or equivalent mechanical fastening on not more than 16" centers on all sides, top and bottom of duct. Acrylic coating surface shall be toward air stream. Before installing liner, caulk all butting edges and final edges with heavy coat of adhesive to seal off air between lining and duct unless material has factory applied edge coating. Coat cap of fasteners with brush coat of fire retardant Foster Eclipse 40-11 insulation coating. Use metal corners and nosing to protect leading edges of liner insulation at fan discharge or after and any section preceded by an unlined section and at any section with an air velocity in excess of 4000 fpm. Apply light brush coat (150 sq. ft. per gallon) of fire retardant Foster Eclipse 40-11 insulation coating over all interior insulation surfaces. Installation shall be suitable for duct velocities up to 5,000 fpm.
3. The Contractor has the option to use elastomeric closed-cell insulation for lining medium and high pressure ducts. Refer to the low pressure duct lining section covering elastomeric closed-cell lining for requirements.
4. When indicated in the drawings, the sound absorption material in mechanical and high pressure ducts shall be faced with a galvanized perforated metal facing having the same dimensions as the unlined ductwork connecting to the lined section of the ductwork. The perforated metal shall be 26 gauge and have one of the following perforation patterns or approved equal.

	Open Area
7/64" round holes on 3/16" staggered centers	29%
⅛" round holes on 7/32" staggered centers	29%
⅛" round holes on ¼" staggered centers	23%
.085" round holes on 5/32" staggered centers	29%
1/16" round holes on ⅛" staggered centers	22.5%

F. Duct sizes indicated on drawings are clear inside dimensions. Increase sheet metal sizes as required to install acoustic lining.

G. The following ductwork shall be acoustically lined whether or not shown on Drawings:

All supply ductwork downstream of VAV terminals and all exhaust ductwork upstream of exhaust VAV terminals.

H. It is the intent of this Specification that noise levels due to air conditioning and/or ventilating equipment, ducts, grilles and registers, diffusers and air light fixtures, will permit attaining sound pressure levels in occupied spaces conforming to the following NC curves as explained in the ASHRAE Guide and Data Book.

Room Type	**NC Level**
Group Teaching Lab	NC 35-45

I. Grilles, Registers, Diffusers
1. The maximum permissible sound power levels of air terminal devices when installed and operating per plans and specifications shall be as follows:

Maximum PWL re 10-12 Watts			
Octave Band	NC-30	NC-35	NC-40
1	62	64	66
2	52	56	60
3	44	49	54
4	41	46	51
5	38	43	48
6	37	42	47
7	36	41	46
8	37	42	47

J. Sound Power Levels for air outlets and inlets shall be tested in accordance with ASHRAE Standard 70.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where ductwork is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF DUCTWORK

A. Install ductwork in accordance with recognized industry practices, to ensure that ductwork complies with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation or ductwork with other components of systems.

C. Duct sizes shown on the drawings at connection to fans or other equipment may vary in actual installation. Contractor shall provide transition pieces as required.

D. Ducts, casings and hangers shall be installed straight and level and shall be free of vibration and noise when fans are operating.

E. Ducts at ceilings shall be suspended from inserts in concrete slabs except where otherwise indicated. Inserts shall be Grinnell Fig. 279, 282, or 152 as required. Ducts at floor shall be supported by steel angles suitably anchored to floor construction. Each duct shall be independently supported and shall not be hung from or supported by another duct, pipe, conduit or equipment of any trade.

F. Supports shall be placed at each joint and change in direction up to a maximum spacing of 8 feet on centers. Prevent buckling of ductwork.

G. All fastenings to building structure shall be adequate to insure permanent stability of sheet metal work and shall be capable of resisting all applied forces.

H. Vertical ducts in shafts or passing through floors shall be supported by steel angles or channels, welded, riveted, screwed or bolted to ducts and fastened to building structural members at each floor level.

Provide safing to close all floor openings around ductwork - pack annular space with rockwool and 18 gauge sheet metal safing. Floor openings in plenums shall have ½ inch diameter steel bars.

I. Rigid connections between ductwork and non-rotating equipment shall be made with flanged joints, sealed with fireproof material (Fiber or Neoprene gaskets).

J. It is the intent to obtain low pressure ductwork construction with minimum leakage. The construction noted in Specifications can produce low or high leakage rates, depending upon the workmanship, particularly with regard to the connection at the top of the ducts. Guarantee that total diffuser volume, measured by means of velometer, shall be at least 95% of actual fan supply (measured by means of a duct traverse taken with a Pitot tube and water manometer). Seal the ductwork at all joints (longitudinal & transverse and duct wall penetrations) with suitable sealers Foster 32-19, Childers CP-146 or 3M EC-800 and tape equivalent to SMACNA Seal Class A. Use of "HARDCAST" or any other material is subject to Architect's approval.

K. For leakage test for medium pressure ductwork refer to Section "Testing and Balancing".

3.03 DUCT HANGERS

A. Low pressure ducts up to 24" on a side or up to 20" diameter shall be suspended with 16 gauge, galvanized strap hangers, 1" wide.

B. Low pressure ducts 25" to 40" on a side or 21" to 42" diameter shall be suspended with galvanized strap hangers 1" wide by ⅛" thick.

C. Strap hangers shall be bent 90°, extended down sides of ducts and turned under bottom of ducts a minimum of 2". Strap hangers shall be fastened at ceiling with nuts, bolts and lock washers and to sides and bottom of ducts with sheet metal screws.

D. All ductwork 43” and larger on a side or diameter and all roof-mounted ducts (regardless of size) shall be suspended with steel angle type hangers with rod and angle steel trapeze. The use of strut for support of any HVAC work (ducts, piping or equipment) is prohibited.

E. For any ducts which require seismic bracing, provide trapeze and rod type hangers regardless of duct size.

F. Trapeze type hangers shall have steel rods threaded at both ends and bottom bracing angles on ducts, with nuts and lock washers. Threaded rod diameter shall be as scheduled on the drawings based on the size of the duct supported.

G. Angle type hangers shall be extensions of side bracing angles on ducts, bent 90 at ceiling and fastened with nuts, bolts and lock washers.

H. The minimum spacing intervals for all duct supports shall be as scheduled on the drawings based on the size of the duct supported.

I. Hangers for vertical ducts shall be as per SMACNA Duct Manual.

J. Stainless steel ductwork shall be supported with rod or angle type hangers, so that there will be no penetration of the stainless steel ducts.

K. Any steel and hardware used for support of aluminum ductwork or any supports for ductwork located outdoors shall be constructed of hot-dipped galvanized or stainless steel. Carbon steel, painted steel or zinc-coated steel is unacceptable.

3.04 CLEANING AND PROTECTION

A. Clean ductwork internally, unit by unit as it is installed of dust and debris. Clean external surfaces of foreign substances, which might cause corrosion, deterioration of metal or interfere with painting.

B. At end of ducts which are not connected to equipment or air distribution devices at the time of ductwork installation, provide temporary closure of polyethylene film or other covering.

C. Cleaning of new and existing supply ductwork: After completion of ductwork installation clean ductwork as follows.
   1. Cover all supply registers and diffusers with temporary filter mesh.
   2. Use supply fan or install temporary fan to provide air to the system for four (4) hours.
   3. Remove temporary filter mesh.

END OF SECTION

SECTION 233400

FANS AND GRAVITY VENTILATORS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all fans and ventilators as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12, "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 HIGH PLUME BLOWER

A. GENERAL
1. Base fan performance at standard conditions (density 0.075 Lb. /ft^3).
2. Fans selected shall be capable of accommodating static pressure and flow variations of +/-15% of scheduled values.

3. Each fan shall be belt driven.
4. Each fan to be equipped with 316 stainless steel lifting lugs for corrosion resistance.
5. Fasteners exposed to corrosive exhaust shall be stainless steel.
6. Fan assembly shall be designed for a minimum of 125 MPH wind loading, without the use of guy wires.

B. CORROSION RESISTANT COATING
1. All steel fan and system components (fan, nozzle, windband and plenum) shall be corrosion resistant coated with LabCoat™, a two part electrostatically applied and baked, sustainable, corrosion resistant coating system. Standard finish color to be RAL 7023, concrete grey.
2. All parts shall be cleaned and chemically prepared for coating using a multi-stage wash system which includes acid pickling that removes oxide, increases surface area, and improves coating bond to the substrate.
3. The first powder coat applied over the prepared surface shall be a zinc rich epoxy primer (no less than 70% zinc) and heated to a gelatinous consistency (partial cure) at which the second powder coat of polyester resin shall be electrostatically applied and simultaneously be cured at a uniform temperature of 400°F.
4. The coating system, a total thickness of up to 6 mils, is not affected by the UV component of sunlight (does not chalk), and has superior corrosion resistance to acid, alkali, and solvents. Coating system shall exceed 4000 hour ASTM B117 Salt Spray Resistance.
5. Note that 10-20 mil thick wet coating systems pollute the environment (air and water), and that these manually applied coatings are not uniform over the impeller surface and can cause fan imbalance and vibration.

C. FAN HOUSING AND OUTLET
1. Fan housing to be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence.
2. Fan housing shall be welded steel and meet specification section 2.15 for corrosion resistant coating. No uncoated metal fan parts shall be acceptable.
3. Load bearing or structural fan components that are fabricated of polypropylene or fiberglass that have lower mechanical properties than steel, have rough interior surfaces in which corrosive, hazardous compounds can collect, and / or which chalk and structurally degrade due to the UV component of the sunlight shall not be acceptable.
4. A high velocity conical discharge nozzle shall be supplied by the fan manufacturer and be designed to efficiently handle an outlet velocity of up to 6000 FPM (30.48 m/s). Discharge nozzles shall be steel with corrosion resistant coating or chemical resistant medium density polyethylene with UV inhibitors to prevent chalking and have smooth interior surfaces. Discharge stack caps or hinged covers, impeding exhaust flow shall not be permitted.
5. Provide housing drain for removal of rain and condensation.
6. A bolted and gasketed access door shall be supplied in the fan housing allowing for servicing and cleaning. Access door can also be used for impeller inspection or removal of impeller, shaft and bearings without removal of the fan housing.
7. A fan isolation damper, either gravity backdraft or two position actuated, fabricated of steel or aluminum and coated with minimum 4 mils of Hi-Pro Polyester resin, electrostatically applied and baked, shall be provided as shown on the project documents.
8. Blower / Plenum vibration isolation shall be limited to neoprene / cork vibration pads.

D. FAN IMPELLER
1. Fan impeller shall be centrifugal, backward inclined, with non-stall characteristics. The impeller shall be electronically balanced both statically and dynamically per AMCA Standard 204.
2. Fan impeller shall be manufactured of aluminum (AMCA type B spark resistant), fully welded and meet specification section 2.15 for corrosion resistant coating.

E. ROOF CURB
1. Exhaust system manufacturer shall supply a structural support curb for the plenum, of specified height, as shown on the drawings.
2. Curb shall be fabricated of a minimum of 12 gauge of corrosion resistant coated steel and structurally reinforced.
3. Curbs shall be insulated.
4. When properly anchored to the roof structure, the standard curb / plenum / blower assembly shall withstand wind loads of up to 125 mph without additional structural support.

F. FAN MOTORS AND DRIVE
1. Motors shall be premium efficiency, standard NEMA frame, 1800 or 3600 RPM, Totally Enclosed Fan Cooled (TEFC) with a 1.15 service factor. A factory-mounted NEMA 3R disconnect switch shall be provided for each fan. Motor maintenance shall be accomplished without fan impeller removal or requiring maintenance personnel to access the contaminated exhaust components.
2. Drive belts and sheaves shall be sized for 200% of the motor horsepower, and shall be readily and easily accessible for service, if required. Drive shall consist of a minimum of two belts under all circumstances.
3. Fan shaft to be turned and polished of 1040 steel material as standard, coated with corrosion resistant coating.
4. Fan shaft bearings shall be Air Handling Quality, ball or roller pillow block type and be sized for an L-10 life of no less than 100,000 hours. Bearings shall be fixed to the fan shaft using concentric mounting locking collars, which reduce vibration, increase service life, and improve serviceability. Bearings that use set screws shall not be allowed.
5. All shaft bearings shall have extended lube lines with Zerk fittings.

2.02 BELT DRIVE CABINET INLINE CENTRIFUGAL FANS

A. General Description:
1. Maximum continuous operating temperature is 130 Fahrenheit (54.4 Celsius)
2. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number

B. Wheel:
1. Forward curved centrifugal wheel
2. Constructed of galvanized steel
3. Statically and dynamically balanced in accordance to AMCA Standard 204-05

C. Motors:
1. Motor enclosures: Open driproof
2. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
3. Mounted on vibration isolators located in airstream
4. Accessible for maintenance

D. Shafts and Bearings:
1. Fan shaft shall be ground and polished solid steel with an anti corrosive coating
2. Permanently sealed bearings or pillow block ball bearings
3. Bearing shall be selected for a minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed
4. Bearings are 100 percent factory tested
5. Fan Shaft first critical speed is at least 25 percent over maximum operating speed

E. Housing:
1. Constructed of heavy gauge galvanized steel
2. Rectangular design construction and shall include rectangular duct mounting collars
3. Includes prepunched mounting brackets
4. Profile as low a 11 inches

F. Housing Supports and Drive Frame:
1. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators
2. Designed with belt adjustment to eliminate scroll damage

G. Duct Collars:
1. Provided for easy duct connections for outlet and inlet collars

H. Drive Assembly:
1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower
2. Belts: Static free and oil resistant
3. Pulleys: Cast type, keyed, and securely attached to wheel and motor shafts
4. Motor pulleys are adjustable for final system balancing
5. Readily accessible for maintenance

I. Access Panel:
1. Panel type: Removable
2. Access to all internal components

J. Mounting Brackets:
1. Fully adjustable for multiple installation conditions

K. Options/Accessories:
1. Disconnect Switches:
   a. NEMA rated: 1
   b. Positive electrical shut-off
   c. Wired from fan motor to junction box
2. Insulated Housing:
   a. Thickness: 1 inch
   b. Fiber frees duct liner shall be located in the interior of fan housing to provide noise reduction and condensation control
3. Vibration Isolators:
   a. Types: Restrained Spring Mount
   b. Isolators are sized to match the weight of each fan
4. Wiring Pigtail:
   a. Direct hook-up to the power supply which eliminates field wiring at the fan

2.03 UTILITY FANS

A. Furnish and install utility type centrifugal fans of the sizes and types called for in the equipment schedule and as shown on the plans. All fans shall be rated and tested in accordance with the AMCA test code and shall bear the certified rating label of AMCA.

B. Fan and motor housings (weatherproof hood) shall be constructed of heavy gauge steel of lockseam construction with Bonderite finish and shall be constructed to permit rotation on the job to any discharge position, in 45 deg. increments. Fan wheels are to be of the type as scheduled on the drawings, except

as noted below, with blades riveted to the back plate and inlet shroud. Wheels shall be locked in position on cold rolled steel shaft with a tapered key. Fan bearings shall be of the heavy duty cast iron pillow block grease lubricated type, supported independent of the fan housings. Wheels shall be dynamically balanced at the factory.

C. Where belt driven fans are indicated in the equipment schedule "V" belt drive shall be of the high capacity type. Fan sheave shall be located outboard of the two bearings supported fan shaft to permit replacement of drives without removing bearings or disturbing position of wheel and shaft. Motor base shall be fully adjustable in all directions to provide for proper drive alignment and to allow for adjustment of belt tension.

2.04 PREFABRICATED ROOF CURBS

A. Furnish and install a roof curb for each roof exhaust fan, as indicated on the Drawings. The curbs shall be all aluminum curbs.

B. All roof curbs for roof exhaust fans shall have fiberglass linings.

C. All roof curbs shall be 12" high or higher if indicated as such on the drawings.

D. Roof curbs shall be of same manufacturer as roof fans.

2.05 IN-LINE FANS

A. Furnish and install In-line Centrifugal Fans (direct or belt drive) of size and capacities as indicated on Drawings.

B. The fans shall be the square shaped and of heavy gauge formed steel. One of the sides shall be hinged and shall support the entire drive assembly (motor only for direct drive fans) and wheel allowing the assembly to swing out for cleaning, inspection or service without dismantling the unit in any way.

C. For direct drive fans, the motor shall be isolated from the air stream by a motor enclosure and shall draw cooling air from outside the fan housing.

D. For belt drive fans, the motor shall be mounted on the hinged side exterior isolated from air stream. The belt and pillow block ball bearings shall be protected from air stream by an enclosure. The shaft shall be keyed to both the wheel and pulley. Provide double groove sheaves and two (2) belts per fan.

E. The fan inlet shall be spun Venturi throat overlapped by a backward curved centrifugal wheel with spun cone for maximum performance.

F. Air and sound shall be A.M.C.A. certified.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts or motors and equipment within tolerances recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, test equipment to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 233600
DUCT TERMINAL UNITS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all Duct Terminal Units as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12 "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 CONSTANT (C.A.V.) AND VARIABLE (V.A.V.) VOLUME AIR TERMINAL UNITS

A. Furnish and install pressure independent constant and variable air volume terminal units of size and capacities as shown on Drawings. Units shall be DESV as manufactured by Titus or approved equal.

B. Unit casings shall be 22 gauge galvanized steel and be fully lined with 1 inch, 1½ lb. density, fiber-free closed-cell polymeric foam insulation. The insulation shall comply with U.L.-181 for erosion, ASTM C-

534 and NFPA-90A, NFPA-90B, ASTM-84 and UL-723 for fire resistivity. There shall be no cut edges of the lining exposed to the moving air stream.

C. Unit inlets shall be round or rectangular. Rectangular inlets shall have S and Drive connections. Attenuation section where called for in the Schedule shall be integral to the basic unit casing to minimize casing leakage and eliminate all field assembly.

D. Damper to be heavy gauge metal with Delrin self-lubricating bearings. Tight close-off. Damper leakage is less than 2% of nominal cfm at 3 inches sp. Terminals shall be certified under the ARI Standard 880 Certification Program and must carry the ARI Seal.

For optimum control, the inlet duct must be of the same size as the assembly inlet.

E. If flexible duct is used, a section of straight duct 1½ diameters long shall be installed between the flexible duct and the assembly inlet.

F. Units shall be tested in accordance with ARI Standard 880. Unit sound power levels (second thru seventh octave band) and minimize pressure drop ratings shall not exceed those in the schedules.

G. Pressure independent air terminal units shall operate over an inlet velocity range of 0 to 3000 fpm. Terminals shall incorporate a multipoint center averaging sensor. Measuring ports in series are not acceptable. Sensors must provide control signal accuracy within ± 5%. CFM delivery shall be in accordance with (maximum-minimum) settings and/or as required by thermostat to satisfy space-served conditions. Adjustable minimum and maximum cfm limits gauge tee for flow measurement and balancing.

H. All actuators, controls, and circuitry shall be factory furnished and installed. Control and CFM settings must be easily accessible. Access shall also be provided to inspect, clean, and remove the velocity sensing device.

I. Provide integral hot water coils. Coils shall be as specified under "COILS" section of this Specification.

J. The integral hot water heating coils shall be of size rows and capacities as indicated in schedules.

K. Where integral hot water coils are provided, provide an access door upstream of the coil. Access door shall be factory installed. An access door shall also be provided immediately downstream of the reheat coil and may be installed in the supply air ductwork.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts or motors and equipment within tolerances recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, test equipment to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 238213

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 SUMMARY OF WORK IN THIS SECTION

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all variable frequency drives as shown on the drawings and as specified elsewhere in this specification. Variable frequency drives for rooftop air handling units shall be provided with rooftop air handling units. See Section 23 73 02.

B. Provide a separate variable frequency drive, VFD, for each motor drive.

1.03 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Variable frequency drive (VFD) shall be produced by Allen Bradley/Rockwell, Square D, Emerson, Siemens or approved equal. For pumps, provide VFD controller and sensors manufactured by Bell and Gossett or approved equal. All VFD’s for the project shall be the product of a single manufacturer.

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

D. Start-up services and customer training shall be provided by a factory trained and authorized representative. Provide a minimum of 24 hours of training for VFD's.

E. VFD shall be UL listed and shall have NYC approvals (BSA number) for NYC projects. Submit proof of approvals.

F. Control of fan VFD's shall be provided under Section 15950 (or 23 09 00).

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Workand submit shop drawings.

B. In addition, submittals shall include the following:
1. System summary sheet
2. Sequence of operation

3. System profile analysis including variable speed pump and fan curves and system curves. The analysis shall also include fan, pump, motor and AFD efficiencies, job specific load profile, staging points, horsepower and kilowatt/hour consumption.
4. Fan data sheets

1.05 DELIVERY STORAGE AND HANDLING

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

B. In addition to the requirements of Section 01 31 46 regarding Guarantee, the manufacturer and/or supplier of variable frequency drives shall provide a 36-month warranty from the date of certified start-up and shall include all parts, labor, travel time and expenses. Any repairs of variable frequency drives shall be done on an emergency basis during the warranty period.

C. The manufacturer shall assume "Unit Responsibility" for the complete pumping control package for pump applications. Unit responsibility shall be defined as responsibility for interface and successful operation of all system components supplied by the pumping system control manufacturer.

D. Manufacturer shall be listed by Underwriter's Laboratories.

PART 2 - PRODUCTS

2.01 VARIABLE FREQUENCY DRIVE

A. The variable frequency drive(s) (VFD) shall be pulse width modulation (PWM) type, microprocessor controlled design.

B. The VFD, including all factory installed options, shall have UL approval.

C. Enclosure shall be NEMA 1 ventilated for installation as a wall mounted or free-standing unit, depending on the amp rating. Drive shall be equipped with an input disconnect switch and fuses to protect against ground faults. A hand- off-automatic switch and speed potentiometer shall be mounted on the front of the enclosure.
1. Electrical Control Devices
    a. Allen-Bradley® Electrical Control Devices are the basis of design,
    b. The electrical control devices shall include:
        1) Pilot Devices
        2) Relays and Timers
        3) Miniature Circuit Breakers
        4) Terminal Blocks and Fuse Blocks
        5) Alarms and Signals
        6) Power Supplies
    c. The electrical control devices shall be interoperable with standard electrical equipment.
2. Pilot Devices
    a. 30.5 MM Push Buttons, Selector Switches and Pilot Lights
        1) 30.5 mm push buttons, selector switches and pilot lights shall be Allen-Bradley heavy industrial Type 4/13 watertight/oiltight metal [Bulletin 800T].

2) 30.5 mm push buttons, selector switches and pilot lights shall provide EN/IEC 60529 IP66/65 degree of protection.
3) 30.5 mm push buttons, selector switches and pilot lights shall have electrical ratings of:
   a) Dielectric strength – 2200V for 1 minute [or 300V for 1 minute (Logic Reed)]
   b) Electrical design life cycles – 10,000,000 at max. rated load [200,000 at max rated load (Logic Reed)]
4) 30.5 mm push buttons, selector switches and pilot lights shall have an operating range of -40 to 131°F (-40 to 55°C).
5) Illuminated devices shall offer universal LED that accepts 12 to 130 VAC/VDC voltage input.
6) 30.5 mm push buttons shall have a diaphragm seal for protection from liquids, particles and corrosive agents.
7) 30.5 mm selector switches shall incorporate a positive detent to prevent the switch from hanging up between positions.

b. Potentiometer Devices
1) 30.5 mm potentiometer devices shall be Allen-Bradley heavy industrial Type 4/13 watertight/oiltight metal [Bulletin 800T].
2) Potentiometer devices shall be rated for 300 VAC/VDC, 2 W maximum (6 VDC minimum):
   a) Mechanical design life – Min. 25,000 cycles
   b) Rotational torque – 3 to 12 in-oz
   c) Stopping torque – Min. 12 in-lb
3) Potentiometer devices shall have single-turn operation, 312 degree rotation.
4) Potentiometer devices shall be finger-safe.

c. Control Stations
1) Control stations shall provide Allen-Bradley heavy industrial 30.5 mm push button(s) or selector switch with appropriate contact action, button/lever type and color/legend marking. Devices shall be Type 4/13 watertight/oiltight metal [Bulletin 800T].
2) Control stations shall be constructed of die-cast aluminum

3. Relays And Timers
a. Relays – Time Delay
1) Allen-Bradley time delay relays [Bulletin 700-HT] shall mount on tube-type bases with pin-style socket mounting.
2) Time delay relays shall have 10A, B300, DPDT contact ratings and coil voltages as shown on drawings.
3) Time delay relays shall have adjustable timing ranges [or fixed timing ranges to avoid tampering]. Timing ranges shall be as shown on drawings.

b. Relays – General Purpose
1) Allen-Bradley general purpose relays [Bulletin 700-HA] shall have tube-base/Octal 8-pin [or 11-pin] terminals and ON/OFF flag indicators.
2) General purpose relay contacts shall be silver nickel [or silver nickel bifurcated or gold-plated bifurcated] and have 10A, B300, DPDT [or 3PDT] ratings. Coil voltages shall be as shown on drawings.
3) General purpose relays shall have an electrical schematic on the faceplate, a clear cover for visual inspection and snap-in marker ability.
4) General purpose relays shall have LED status indicators, push-to-test and manual override.

c. Relays – Miniature

1) Allen-Bradley miniature relays [Bulletin 700-HC] shall be square-base, 4-pole, plug-in type with blade-style terminals and ON/OFF flag indicators.
2) Miniature relay contacts shall be silver nickel [or gold-plated silver nickel] and have 7A [or 10A], DPDT [or 4PDT] ratings. Coil voltages shall be as shown on drawings.
3) Miniature relays shall have an electrical schematic on the faceplate and a clear cover for visual inspection.
4) Miniature relays shall have LED status indicators and push-to-test button with incorporated manual override lever.

d. Relays – Industrial-Type
1) Allen-Bradley industrial-type relays [Bulletin 700-P] shall be ruggedly constructed (10 million operation mechanical life), 2-pole [or 4-pole, 8-pole, 12-pole], configured N.O./N.C. as shown on drawings, and panel- [or strip-, DIN rail-] mounted.
2) Industrial-type relays shall be finger-safe.
3) Industrial-type relay contacts shall be silver nickel with a double-break and bifurcated design and 10A, A600 rating for AC [5A, P600 rating for DC].
4) Accessories shall include adder decks, time delay, latching, surge suppressors and/or mounting strip.

e. Timers – Solid-State
1) Allen-Bradley solid-state timers [Bulletin 700-FS] shall be DIN rail-mounted.
2) The solid-state timer contacts shall be available as SPDT or DPDT, 8A.
3) Solid-state timers shall be available with On-Delay, Off-Delay, On- and Off-Delay, One-Shot and Flasher operating modes as required on the drawings.
4) Solid-state timers shall have coil surge protection and adjustable timing ranges of 0.05 seconds to 60 hours as shown on drawings.

f. Timers – Programmable
1) Allen-Bradley programmable timers [Bulletin 700-HX] shall be digital timing relays with LCD display and shall be socket- [or panel-] mounted.
2) Programmable timer contacts shall be SPDT, rated 5A, B300.
3) Programmable timer panel surface shall offer Type 4X/IP66 protection.
4) Programmable timers shall be configurable for Signal On-Delay, Power On-Delay, Off-Delay, Repeat Cycle, One-Shot and Cumulative operating modes as required on the drawings.
5) Programmable timers shall have timing ranges of 0.000 seconds to 9999 hours, depending on selected mode and as shown on drawings.

4. Miniature Circuit Breakers
a. Miniature circuit breakers shall be Allen-Bradley Circuit Breakers [Bulletin 1489-M].
b. Miniature circuit breakers shall be thermal-magnetic, current-limiting type, sized as specified on the drawings:
1) 0.5A to 63A current rating
2) 1-, 2- or 3-pole
3) Type C or Type D tripping characteristic
c. Miniature circuit breakers shall be UL Listed (E197878), CSA Certified (259391), CE Marked, VDE and CCC Certified and RoHS Compliant. Standards compliances shall include:
1) UL 489
2) CSA C22.2, No. 5.1
3) EN 60947-2
4) GB 14048.2
d. Miniature circuit breakers shall be rated for:
1) Voltage – Max. 480Y/277 VAC (UL/CSA); U_e 230/400 VAC (IEC)
2) Interrupting capacity – 10 kA (UL/CSA); 15 kA (IEC)

e. Housing shall satisfy Insulation Group II/RAL 7035, shall have IP20 finger-safe design, shall be suitable for DIN rail mounting and shall include status indicator window and scratch- and solvent-resistant printing.
f. Miniature circuit breakers shall support reversible line and load connections and shall have dual terminals that:
    1) Connect up to 4 wires, or 2 wires and a bus bar.
    2) Clamp from both sides.
    3) Have a unique design that directs wires into openings to prevent wiring misses.
g. Miniature circuit breakers shall be compatible with UL 508 Listed bus bars, auxiliary contacts, signal contacts, shunt trips and toggle-mount lockout attachments.

5. Terminal Blocks And Fuse Blocks
    a. Terminal Blocks – Control, #22 to #8 AWG
        1) Control terminal blocks shall be Allen-Bradley screw-type, feed-through [Bulletin 1492-J].
        2) Control terminal blocks shall be certified:
            a) UR/CSA – #22 to #8 AWG wire range, 50A maximum current, 600 VAC/VDC voltage rating
            b) IEC – 6 mm^2 wire range, 41A maximum current, 800 VAC/VDC voltage rating
            c) ATEX – 6 mm^2 (#20 to #10 AWG) wire range, 36A maximum current, 550 VAC/VDC voltage rating
        3) Control terminal blocks shall have a snap-in card marking system.
    b. Terminal Blocks – Power
        1) Power terminal blocks shall be Allen-Bradley [Bulletin 1492-PD]:
            a) Open-style power distribution block with aluminum or copper connectors – 3-pole [or 1-pole], rated at 600 VAC/VDC, 175 to 760A
        2) Power terminal blocks shall be certified by UR, CSA and CE.
        3) Wire ranges and tightening torques shall be labeled on the block.
        4) Power terminal blocks shall have a write-on marking surface or marker retention feature.
    c. Fuse Blocks
        1) Allen-Bradley fuse block kits [Bulletin 1491] shall be used for protection of transformers and control circuits capable of delivering no more than 200,000 RMS symmetrical amps, 600V maximum.
        2) Fuse block kits shall be 1-pole, 2-pole or 3-pole.
        3) Each pole shall have a fuse cover.

6. Alarms And Signals
    a. Alarm Horn
        1) The alarm horn shall be an Allen-Bradley High Performance Electronic Horn [Bulletin 855H] and shall have up to 4 stages and low current consumption.
        2) The alarm horn shall have a UV-stable plastic housing and non-moving parts.
        3) The alarm horn shall have an on-board microphone, 45 alarm tones selectable by DIP switch and fine volume control via potentiometer.
        4) The alarm horn shall allow synchronized output in multi-horn installations and shall have the ability to replicate content to other devices (master/slave).
    b. Alarm Beacon
        1) The alarm beacon shall be an Allen-Bradley [Bulletin 855B] with high-intensity, minimum 5-Joule Xenon, minimum 20-Watt Halogen or LED illumination as required on the drawings.
        2) The alarm beacon shall have polycarbonate housing and lens, available in square or round configuration, and Type 4/4X/13, IP65/IP66 ingress rating as required on the drawings.

3) Flashing frequency shall be 1 Hz.
4) Alarm beacon lens colors shall be red, green, amber, blue, yellow or clear as required on the drawings.

c. Alarm Light Tower
1) The alarm light tower shall consist of Allen-Bradley Control Tower™ Stack Lights [Bulletin 854J or K], stacked 1 [or 2, 3, 4, 5] module(s) high and shall be surface- [or vertical-, quick-release-, pole-] mounted.
2) The alarm light tower shall be 40 mm [or 60 mm] size and the terminal block shall be top-mounted on the base.
3) The light modules shall be Type 4/4X/13, IP65 and are:
a) LED (steady, flashing or strobe)
4) The alarm light tower shall include a continuous (or pulsing) piezo [or transducer] sound module.
5) The alarm light tower shall have a DeviceNet base.

d. Signal Alarm (Panel Mount)
1) The signal alarm shall be an Allen-Bradley Panel Mount Signaling Alarm [Bulletin 855P] in a 30 mm [or 45 mm, 65 mm] size, that mounts in a standard 22.5 mm hole.
2) The signal alarm shall have polycarbonate base and lens.
3) The signal alarm shall be combination sounder and LED
4) The signal alarm shall be rear-securing and finger-safe.

7. Power Supplies
a. Control Power Transformer
1) The control power transformer shall be an Allen-Bradley Global Control Transformer [Bulletin 1497], single-phase and sized as shown on drawings.
2) The control power transformer shall be epoxy encapsulated and shall offer EN 60-529 finger-safe protection.
3) The control transformer shall have a dual primary and secondary fuse block, pre-wired and top-mounted.

b. 24 VDC Power Supplies
1) 24 VDC power supplies shall be Allen-Bradley [Bulletin 1606-XL] with active or passive PFC choke and input as shown in drawings [or auto-select input].
2) 24 VDC power supplies shall have low inrush current, and power supplies with greater than 100-Watt output shall incorporate a minimum 120% Power Burst design.
3) 24 VDC power supplies shall have NEC Class 2 “Limited Power” output.

c. UPS
1) The UPS shall be an Allen-Bradley Industrial Uninterruptible Power Supply [Bulletin 1609-B/D] with 120 VAC input voltage and output power as shown on drawings.
2) The UPS shall be back-of-panel- [or DIN rail-] mounted.
3) The UPS shall provide:
a) Surge protection to 380 Joules
b) Overload protection, resulting in delayed shutdown at 110 to 130% and immediate shutdown at 130%
c) Protection against output short on line – over-current protection from premises branch circuit
d) Protection against output short on battery, resulting in shutdown
e) Thermal protection
4) The UPS shall have USB communications and software, integrated remote on/off and dry I/O contacts.
5) The UPS shall have EtherNet/IP communications, expandable battery capacity and/or pure sine wave output.

6) The UPS shall perform to 40°C [50°C, with hi-temp battery].

8. Disconnect/breakers shall be external flange mounted type, all metal construction with painted handle, lockable, similar to Allen Bradley Model 1494F-M1-412. Plastic switches, disconnects and breakers and twist types shall not be used.

D. VFD shall utilize a diode bridge rectifier to convert three phase AC to a fixed DC voltage or a phase controlled rectifier. Drives utilizing a phased controlled rectifier shall employ a three phase line reactor on the line side of the rectifier.

E. PWM type drives shall use Insulated gate bipolar transistors (IGBTs) shall be used in the inverter section to convert the fixed DC voltage to a three phase, adjustable frequency, AC output. A DC line reactor shall be provided to minimize harmonic and current distortion of the input power line.

F. The following customer modifiable adjustments shall be provided:
1. Acceleration time: 0.1 to 1800 seconds
2. Deceleration time: 0.1 to 1800 seconds
3. Minimum frequency: 0 Hz
4. Maximum frequency 66 Hz

G. Speed reference signal shall be customer selectable for 0-10 VDC or 4-20 mA.

H. The VFD shall be suitable for elevations to 3300 feet above sea level without derating. Maximum operating ambient temperature shall not be less than 104EF. VFD shall be suitable for operation in environments up to 95% non- condensing humidity. PWM type drives shall be capable of operating at carrier frequencies of 12000 Hz without derating.

I. The VFD shall be capable of displaying the following information via the display:
1. % speed
2. Voltage
3. % load
4. Fault identification

J. All VFDs shall be equipped with a bypass switch to allow the fan to operate at constant speed while the drive is being serviced.

K. The following communication features shall be provided to the BAS:
1. Remote start/stop
2. Failure of any system component
3. VFD speed

L. VFD's shall meet the requirements as outlined in the latest edition of IEEE-519 for total harmonic voltage and current distortion. Individual or simultaneous operation of the VFD's shall not add more than 5% total harmonic voltage distortion to the normal bus, nor more than 10% while operating from standby generator.

The step-up transformers shall be the point of common coupling, as indicated on the project electrical drawings. The short circuit current at point of common coupling under utility operation shall be provided by the Engineer. Standby generator rating shall be as indicated on the electrical drawings. The minimum subtransient reactance shall be provided by the Engineer. The maximum number of VFD's which will operate simultaneously from the generator are indicated on the equipment schedule as having emergency power (E.P.) Maximum allowable total and individual harmonic current distortion limits for each VFD shall not exceed limits as set forth by IEEE 519 latest edition. If harmonic filters are

required to meet these requirements, it is the responsibility of the VFD manufacturer to provide filter. It is the responsibility of the VFD manufacturer to design and manufacture any required filters. A preliminary detailed harmonic analysis must be submitted by the VFD manufacturer at bid time, which includes all harmonics to the 99th. Compliance shall be verified by the VFD manufacturer with field measurements of the harmonic distortion difference at the point of common coupling with and without VFD's operating.

The variable frequency control shall include transient voltage suppression to allow reliable operation on a typical industrial or commercial power distribution system.

M. Bypass for fans on emergency power (E.P.) shall be both manual and automatic. When the VFD is in fault mode and the fan in smoke purge mode, the VFD shall automatically switch to bypass mode. A signal shall be provided under Section 23 09 00 to the VFD indicating that the fan is in smoke purge mode.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify construction manager in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts of motors and equipment within tolerances recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, energized with normal power source, test equipment to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactory corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 238217
COILS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all coils as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12 “Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 WATER COILS

A. All water coils shall be of the continuous flat plate fin type for minimum resistance to air flow. Fins shall be fabricated with drawn collars and shall be bonded to the tubes by a hydraulic expansion process. Openings in unit casing for coil connections to be sealed against leakage. Coil casings shall be not less than 16 gauge galvanized steel.

B. Water coils shall be of the continuous tube type and circuited so as to be completely drainable by gravity through the supply header. Headers and tubes are to be fabricated of a seamless .024 inch thick wall copper tubing. Fins are to be .009 inch thick aluminum for heating coils and .005 inch thick copper for cooling coils. Supply and return headers shall be complete enclosed within the unit casing or external where called for on the drawing, and shall be equipped with steel nipples of extra length equipped with drain and vent plugs outside unit casing. Coils shall have capacities as called for and shall have the minimum number of rows as shown on the schedule.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install coils where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that coils comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of coils with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts of motors and coils within tolerances recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of coils, test coils to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 238236
FIN TUBE RADIATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all fin tube radiation as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 FIN TUBE RADIATION AND ENCLOSURES

A. Provide finned tube radiation complete with enclosures of one piece back panel, one piece front panel, heating element, hangers and accessories.

B. Fin tube radiation shall be I.B.R. rated.

C. Enclosure front panel, one-piece #16 USSG Steel cabinet, with [1]*_____. Each enclosure front panel, rigidly braced by integral vertical channel braces in at least two locations. Each front panel shall extend to wall and be fastened to back panel at both top and bottom. Enclosures shall be finished with baked-on gray enamel primer and final baked enamel finish, color as selected by the Architect.

D. Back panel shall be of one-piece construction #20 USSG steel, and shall provide continuous support at both top and bottom for rigid fastening of front panel. Back panel shall be pre-punched for fastening to wall and for attaching of heating element hangers.

E. Support brackets shall be a minimum 4'-0" on centers for heating element shall attach to back panel; vertically adjustable for pitch, and providing free longitudinal movement for expansion and contraction. Where pipe runs under enclosures they too shall be supported from back panel. No sheet metal screws or other fastening devices shall be visible when enclosure is installed below eye-level. Where two or more enclosure sections are joined end to end, rolled enclosure edges shall form neat butt joint without butt straps or other concealing devices. No unfinished metal edges shall be visible in the installed ensemble.

F. Heating elements shall be constructed of corrugated aluminum fins mechanically bonded to seamless copper tubing. They shall be provided with swagged ends to permit end to end jointing without coupling.

G. Where fin-tube radiation with expanded metal cover is used, it shall be same element as specified for enclosed fin-tube radiation.

H. Fin tube elements shall have a capacity as shown on the Drawings when supplied with hot water at 190 degrees F average water temperature. Elements shall be 1¼" IPS with 5¼" x 5¼" steel fins spaced 40 per foot, unless otherwise noted on the Drawings as copper. Copper elements shall be 1¼" copper tubing of 0.024" wall thickness, with 4¼" x 4¼" aluminum fins of 0.015" thickness spaced 40 per foot. All elements shall be one row high unless otherwise noted on the Drawings.

I. Provide end caps where radiation terminates at doors, walls, pilasters or columns and inside or outside corners where required.

J. Provide knob-operated dampers above all radiation where radiation is not controlled by individual room automatic control valves. Provide access doors in enclosures at control valves, balancing valves, shut-off valves and air vents.

K. All radiation enclosures and access door locations shall be field measured prior to fabrication.

L. Fin tube radiation shall be of type as scheduled on the drawings.

2.02 CONVECTORS

A. Units shall be of size, type and capacity called for on the Drawings when supplied with 190EF average water temperature.

B. Units shall be complete with 16-gauge steel cabinet with baked enamel finish, color as selected by Architect, heating coil of copper tubes, aluminum fins and cast iron headers and dial-operated damper.

[1]*INSERT: Stamped top outlet or, extruded grille top outlet, or front outlet or sloping top.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, test equipment to demonstrate compliance with requirements. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

    a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
    b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Metraflex Co.
    d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM, NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestopping system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

Qualification Data: For testing agency.

Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

Manufacturers: Subject to compliance with requirements, provide products by the following] [provide products by one of the following or approved equal:

Basis-of-Design Product: Subject to compliance with requirements, provide products by the following or comparable product approved equal:

1. Alcan Products Corporation; Alcan Cable Division.
2. Alpha Wire.
3. Belden Inc.

4. Encore Wire Corporation.
5. General Cable Technologies Corporation.
6. Southwire Incorporated.

C. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

D. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2, Type THHN-2-THWN-2 and Type XHHW-2.

E. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

F. VFC Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.

Type TC-ER with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.

2.2 CONNECTORS AND SPLICES

Basis-of-Design Product: Subject to compliance with requirements, provide products by the following or comparable product approved equal:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. Ideal Industries, Inc.
4. NSi Industries LLC.
5. O-Z/Gedney; a brand of the EGS Electrical Group.
6. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with local electrical codes.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway, Metal-clad cable, Type MC.

Exposed Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Metal-clad cable, Type MC.

VFC Output Circuits: Type XHHW-2 in metal conduit.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and 486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

Use oxide inhibitor in each lug, splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

Contractor shall field test and inspect components, assemblies, and equipment installations, including connections.

Perform the following tests and inspections:

After installing conductors and cables and before electrical circuitry has been energized, test all service entrance and all feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:

a. All conductors serving emergency and standby power system fuel-oil pumps and gas-booster pumps.
b. All conductors serving motors 3 hp and larger.
c. All conductors serving data center and computer room HVAC system equipment.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. **Perform insulation resistance (megger) testing on all feeder and service conductors.** Provide testing as per ANSI/NETA ATS-2013 (InterNational Electrical Testing Association Standard for Acceptance Testing Specifications) part 7.3.2. Test results shall be validated as per ANSI/NETA ATS-2013 Table 100.1. Applied potential shall be 1000VDC for a duration of one minute. Record on NETA standard forms or other forms approved by engineer. Identify specific feeder tested on each form including equipment name/reference at each end of feeder. Test equipment must measure values accurately up to a minimum of 100 meg-ohms (not a ‘pass-fail’ tester). Record actual meg-ohm readings below 100 meg-ohms. Submit completed test forms to engineer for review & approval.

Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice and all terminations in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, and New York City Electrical Code by a qualified testing agency and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 and New York City Electrical Code and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Compression fittings that are installed with hydraulically operated tools, approved for the class type.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions. Only welded connectors for connections and splices concealed in concrete structure or buried in earth.

E. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 ELECTRODES

A. Ground Rods:

1. Material: Copper-clad steel.
2. Diameter: 3/4 inch (19 mm).
3. Rods shall be not less than 120 inches (3050 mm) long.

B. Ground Plates:

1. Material: Copper.
2. Thickness: 1/4 inch (min).
3. Plates shall be not less than 24 inches by 24 inches.

2.5 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

C. Grounding Bus: Install in electrical and telecommunication equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.

2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.
5. Connections within Concrete Structure: Welded connectors.
6. Lightning Protection System Connections: Welded connectors.

2.6 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

B. Provide copper grounding bar in all electric service rooms and at all telecom points-of-entry (PoE). Provide copper bar for intersystem bonding bus (if required). Provide copper grounding bar as otherwise indicated on plans.

2.7 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the frame of the generator; and, only where generator is identified as a separately derived system, to the equipment grounding conductor.

2.8 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70 and New York City Electrical Code:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Computer and rack-mounted electronic equipment circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

2.9 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, unless otherwise noted, and install in conduit.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Exothermic welding: Exothermically weld all grounding and bonding connections and splices that will be installed to be inaccessible, including underground and within concrete slabs, columns, walls, floor slabs, etc.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to **all** metal water service entrances to building. Connect grounding conductors to all metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve and utility meter(s).

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for New Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Grounding for concrete reinforcing bars in new buildings: Connect grounding electrode system to reinforcing bars via exothermic weld.

I. CORROSION PROTECTION

1. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
2. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

2.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81. Submit test report to Engineer for approval prior to closing up any related underground work.

4. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:

1. Power and lighting equipment or system with capacity of 500 kVA and less: 10 ohms.
2. Power and lighting equipment or system with capacity of 500 to 1000 kVA: 5 ohms.
3. Power and lighting equipment or system with capacity more than 1000 kVA: 3 ohms.
4. Power distribution units (PDUs) or panelboards serving electronic equipment: 1 ohm(s).

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor as recommended by structural engineer.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

C. Comply with all local electrical, building and fire codes.

D. Note that components of this specification may not be permitted in all jurisdictions. This includes certain expansion anchors in New York City. Contractor shall be aware of local jurisdiction product prohibitions. Where required by the AHJ, contractor shall ensure all inspections, including special and progress inspections, are performed and approved.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product approved equal:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. Thomas & Betts Corporation.
d. Unistrut; Tyco International, Ltd.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: [Steel] [Steel and malleable-iron] hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product approved equal:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product approved equal:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Hilti Inc.
        3) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        4) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted [or other]support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb. (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in other sections.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements as described in architectural sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Surface raceways.
5. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel, threaded conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC, fire protection and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable products approved equal:

1. Allied Tube & Conduit.
2. O-Z/Gedney.
3. Thomas & Betts Corporation.
4. Western Tube and Conduit Corporation.
5. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70 and local electrical code, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit and IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: Steel.
b. Type: Setscrew.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70 and local electrical code, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable products approved equal:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Condux International, Inc.
4. Lamson & Sessions; Carlon Electrical Products.
5. RACO; Hubbell.
6. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70 and Local electrical code, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. LFNC: Comply with UL 1660.

E. RTRC: Comply with UL 1684A and NEMA TC 14.

F. Fittings for ENT: Comply with NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable products approved equal:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Mono-Systems, Inc.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 and Type 3R, unless otherwise indicated, and sized according to NFPA 70 and Local electrical code.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70 and Local electrical code, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Flanged-and-gasketed type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable products approved equal:

1. Cooper Technologies Company; Cooper Crouse-Hinds.
2. Hoffman.
3. Milbank Manufacturing Co.
4. O-Z/Gedney.
5. Thomas & Betts Corporation.
6. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular or as required by field conditions, subject to engineer’s approval.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70 and Local electrical code, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70 and Local electrical code, by a qualified testing agency, and marked for intended location and application.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: As required by field conditions, subject to engineer's approval.

K. Gangable boxes are allowed.

L. Cabinets:

1. NEMA 250, Type 1 and Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC; except where IMC or GRC, PVC coated is specified in the Contract Drawings.
2. Concealed Conduit, Aboveground: IMC.
3. Underground Conduit: Refer to Section 260543 – Underground Ducts and Raceways for Electrical Systems. Refer to utility specifications for all raceways under utility jurisdiction.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R].

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew cast-metal fittings except below design flood elevation (DFE). Comply with NEMA FB 2.10.
4. EMT below design flood elevation (DFE): Rainproof compression connectors. Comply with NEMA FB 2.10.
5. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 and Local electrical code limitations for types of raceways allowed in specific occupancies and number of floors.

B. Comply with all relevant federal, state and local codes including local building, fire and electrical codes.

C. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

D. Complete raceway installation before starting conductor installation.

E. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches (300 mm) of enclosures to which attached.

J. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC or IMC before rising above floor.

K. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or flexr raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and Local electrical code and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70 and Local electrical code.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways with American Polywater catalog # ‘FST’ at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where underground raceways enter a building or structure.
3. Where otherwise required by NFPA 70 and Local electrical code.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Locate boxes so that cover or plate will not span different building finishes.

AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeve-seal systems.
2. Sleeve-seal fittings.
3. Grout.
4. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels. Refer to the drawings for equipment identifications for electrical equipment.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with New York City Electrical Code.

D. Comply with New York City Building Code.

E. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

F. Comply with ANSI Z535.4 for safety signs and labels.

G. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

B. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.5 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.6 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
3. Electrical room: “WARNING, ELECTRICAL EQUIPEMNT, NO STORGAE PERMITTED”.

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with white letters on black face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.8 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, paint. Minimum letter height shall be 1 inch (25 mm.

2.9 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

G. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 30-foot (10-m) maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Switchgear.
    d. Switchboards.
    e. Emergency system boxes and enclosures.
    f. Enclosed switches.
    g. Enclosed circuit breakers.
    h. Enclosed controllers.
    i. Variable-speed controllers.
    j. Power transfer equipment.
    k. Contactors.
    l. Remote-controlled switches, dimmer modules, and control devices.
    m. Power-generating units.
    n. Monitoring and control equipment.

END OF SECTION

SECTION 260572

OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Short-circuit study input data, including completed computer program input data sheets.
2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient

study data to ensure that the selection of devices and associated characteristics is satisfactory.

b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

c. This study may be combined with studies required by specification sections 260573 and 260574 if required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

A. Software Developers:
1. Eaton CYME International
2. ESA Inc.
3. Operation Technology, Inc.
4. Power Analytics, Corporation
5. SKM Systems Analysis, Inc

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

6. Contractor is responsible to coordinate levels of over-current protection as per electrical code requirements and to size interrupting rating of boards, panels and over-current devices as per the study results at no additional cost to owner.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article.

G. Short-Circuit Study Output:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated fault-current magnitude and angle.
c. Fault-point X/R ratio.

d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. Calculated asymmetrical fault currents:

1) Based on fault-point X/R ratio.
2) Based on calculated symmetrical value multiplied by 1.6.
3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.

1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Engineer.
2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.

3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is the complete electrical distribution system unless otherwise indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 75 kVA and having impedance of 4.5% or greater.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

1. Electric utility's supply termination point.
2. Incoming switchgear and service switches.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.

6. Control panels.
7. Standby generators and automatic transfer switches.
8. Distribution panelboards.
9. Branch circuit panelboards.
10. Switchboards
11. Disconnect switches.
12. All overcurrent protection of systems rated 1000 volts or greater.

3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

END OF SECTION

SECTION 260573

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

A. Coordination (Selective): Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the choice of overcurrent protective devices and their ratings or settings. Two overcurrent protective devices shall be deemed selectively coordinated if their respective time-current characteristic curves do not intersect at a time of 0.1 seconds (6 cycles on 60 Hz systems) or longer.

B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

C. OCPD: Overcurrent protective device.

D. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

E. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

F. SCCR: Short-circuit current rating.

G. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and equipment evaluation reports.
3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
b. This study may be combined with studies required by specification sections 260572 if required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. The following parts from the Protective Device Coordination Study Report:

1) One-line diagram.
2) Protective device coordination study.
3) Time-current coordination curves.

b. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:
1. Eaton CYME International
2. ESA Inc.
3. Operation Technology, Inc.
4. Power Analytics, Corporation
5. SKM Systems Analysis, Inc

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

    a. Phase and Ground Relays:

        1) Device tag.
        2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
        3) Recommendations on improved relaying systems, if applicable.

    b. Circuit Breakers:

        1) Adjustable pickups and time delays (long time, short time, ground).
        2) Adjustable time-current characteristic.
        3) Adjustable instantaneous pickup.
        4) Recommendations on improved trip systems, if applicable.

    c. Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

    a. Power utility's overcurrent protective device.
    b. Medium-voltage equipment overcurrent relays.
    c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.

e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
f. Cables and conductors damage curves.
g. Ground-fault protective devices.
h. Motor-starting characteristics and motor damage points.
i. Generator short-circuit decrement curve and generator damage point.
j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.
6. Provide adequate time margins between device characteristics such that selective operation is achieved.
7. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied includes the entire electrical distribution system, unless otherwise indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Selective coordination between overcurrent protective devices shall be required to be achieved as follows:
1. Normal (utility) power system(s)

a. Where the service OCPD rating or setting is over 601 amps, include this OCPD and all OCPDs in the next level downstream.
b. Where a second level OCPD has the same rating or setting as the service OCPD, include the third level OCPDs and the two upstream OCPDs in the study.
c. Note that selective coordination shall not be required between two OCPDs in series with one another when no loads are connected in parallel with the downstream device.
d. Note that selective coordination shall not be required between transformer primary and secondary OCPDs, where only one OCPD exists on the transformer secondary.

2. Emergency and legally-required standby power system(s): all supply-side OCPDs and all OCPDs on the load side of transfer switches and other transfer equipment.
3. Ground-fault protection devices for health-care facilities as per Article 517 of the applicable electrical code.
4. Where otherwise indicated on the Drawings

H. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

I. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

J. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

K. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

L. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

M. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

1. Electric utility's supply termination point.

2. Incoming switchgear and service switches.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.
6. Control panels.
7. Standby generators and automatic transfer switches.
8. Distribution panelboards.
9. Branch circuit panelboards.
10. Switchboards
11. Disconnect switches.
12. All overcurrent protection of systems rated 1000 volts or greater.

N. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.

4. Contractor is responsible to coordinate levels of over-current protection as per electrical code requirements and to size interrupting rating of boards, panels and over-current devices as per the study results at no additional cost to owner.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Engineer.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.

7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
17. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.
    k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.4 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

END OF SECTION

SECTION 260923

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lighting Contactors
2. Occupancy and Vacancy Sensors
3. Photosensors and Daylighting Controls
4. Panel/Modules Systems
5. Timer switches.
6. Wallbox Dimmers
7. Emergency Lighting Control Relays

B. Related Sections:

1. Section 260500 “Common Work”
2. Section 262726 "Wiring Devices"

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting control product.

1. Physical description of each lighting control device including dimensions.

B. Shop Drawings: Show project specific installation details of system including wiring between devices.

1. Interconnection diagrams showing field-installed wiring.

2. Include diagrams for power, signal, and control wiring.

C. Samples:
1. Provide faceplate finishes as requested by the architect.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device..

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined by NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 WARRANTY

A. All occupancy/vacancy sensors, photosensors, timer switches and wallbox dimmers to carry a minimum of five-year warranty.

B. All other lighting control components to carry a minimum two-year warranty.

PART 2 - PRODUCTS

Unless otherwise and specifically noted elsewhere in the contract documents, wireless lighting control devices and equipment, other than handheld remote controllers, are not permitted. Provide wired lighting control solution including both power and control wiring to all sensors, switches and equipment.

2.1 LIGHTING CONTACTORS

A. Approved Manufacturers:
1. ASCO Power Technologies.
2. Eaton.
3. Siemens Industry, Inc.

B. Description: Electrically operated and mechanically held, combination-type lighting contactors with non-fused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as matching the NEMA type specified for the enclosure.

2.2 OCCUPANCY AND VACANCY SENSORS

A. Approved Manufacturers:
1. Acuity Brands
2. Cooper Lighting Solutions
3. Crestron Electronic, Inc.
4. Hubbell Control Solutions
5. Leviton Mfg. Company Inc.
6. Lutron Electronics Co., Inc.
7. Wattstopper

B. Description: Solid-state sensors provided based on applications indicated on drawings.

1. All sensors to be wired unless otherwise noted.

2. All sensors shall be dual technology with PIR and Ultrasonic technology unless otherwise noted.

3. Listed and labeled as defined in NFPA 70, and marked for intended location and application.

4. Refer to the lighting control narrative on the drawings programming and timeout requirements.

C. Configuration:

1. Wall-Mounted: Sensors shall be mounted in a single-gang wall box and be gangable with other designer style electrical devices and faceplates. Sensors shall be provided with a designer style screwless faceplate with the color as selected by the Architect. A red LED will indicate when unit is being triggered and it will glow when off to facilitate location in an unlit room. Sensors to have sensitivity and timing adjustment.

2. Ceiling-Mounted: Sensors with a separate relay/power pack unit. Sensors shall have an LED indicator to provide feedback to the power pack when detecting a change in heat or movement and shall have a sensitivity and timing adjustment. Unit shall not detect motion through glass and shall be mounted a minimum of six (6) fee away from air turbulent devices.

D. Remote Relay/Power Pack/Control Module: Where indicated or required, provide a remote power pack that interfaces with the sensor. Remote pack shall accept multiple input voltages and shall contain a transformer to prove low-voltage outputs to compatible sensors, and a dry-contact relay (normally open) for switching lighting loads. Control module shall be sized to fit inside a standard 4 in. X 4 in. junction box, and shall be fitted with a ½ in. EMT threaded male fitting the line voltage end such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low-voltage wiring external. Module shall be rated for switching 20 A of ballast load at 120 V and 277 V.

E. Low-Voltage Momentary Switch: Where indicated, provide a single-pole momentary switch. Switch to be provided with a screwless faceplate.

F. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms that are to be provided with sensors. Contractor is responsible for arranging a preinstallation meeting with the manufacturer's factory-authorized representative, at the Owner's facility, to verify placement of sensors and installation criteria. Contractor is responsible for coordinating the appropriate voltage and maximum/minimum load conditions as well as coordinated with other work such as painting, raceways, electrical boxes, etc.

G. Locate and aim all sensors in correct position required for complete and proper volumetric coverage within the range indicated in the manufacturer's recommendations. Rooms shall have a 90% to 100% coverage of the specified area to accommodate all occupancy habits.

H. Field of view templates shall be installed, as required, to mask the viewing lens to prevent fals triggering for auto-on operation.

I. Provide, that the Owner's facility, the training necessary to familiarize the Owner's personnel with the operation, use, adjustment and problem-solving diagnosis of the sensors.

2.3 Photosensors and Daylighting Controls

A. Approved Manufacturers:
1. Acuity Brands
2. Cooper Lighting Solutions
3. Crestron Electronic, Inc.
4. Hubbell Control Solutions
5. Leviton Mfg. Company Inc.
6. Lutron Electronics Co., Inc.
7. Wattstopper

B. Description: Solid state photoelectric device that measures amount of available daylight. Sensors to interface directly with a controller and provide amount of daylight or an analog signal proportional to the light measured. Sensors to be class 2 low-voltage.

1. All sensors to be wired unless otherwise noted.

2. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Sensors to interface directly with a controller and provide amount of daylight or an analog signal proportional to the light measured.

4. Sensors to have a minimum time delay of 3 minutes to prevent false operation.

5. Sensors to have an accuracy of +/- 1%

C. Configuration

1. Indoor
   a. Light-Level Monitoring Range: 0 to 100 fc (0 to 10,000 lux)
2. Outdoor
   a. Light-Level Monitoring Range: 0 to 750 fc (0 to 7,500 lux)
   b. Sensors to be rated for wet location.
   c. Sensor to have a hood to shield from direct sunlight.
3. Atrium or Skylight
   a. Atrium Light-Level Monitoring Range: 0 to 2,500 FC (0 to 25,000 lux)
   b. Skylight Light-Level Monitoring Range: 10 to 7,500 FC (100 to 75,000 lux)
   c. Sensor to have a translucent dome with 180 degree field of view.

2.4 PANELS/MODULES SYSTEMS

A. Approved Manufacturers:
1. Cooper Lighting Solutions
2. Crestron Electronic, Inc.
3. ETC
4. Hubbell Control Solutions
5. Leviton Mfg. Company Inc.
6. Lutron Electronics Co., Inc.
7. Wattstopper

B. Description: Lighting control systems consisting of switching and dimming. Refer to drawings/narrative for connection between controls and networking requirements, if required.
1. Provide timeclock, head end, interfaces, and other lighting control devices as indicated on the drawings/narratives.
2. System to consists of panels and/or modules utilizing 1, 2, 4, 12, 24, 48 or 96 zones.
3. The number of relays in each panel or module shall be determined by the number of circuits to be controlled or relay zones, as indicated on the plans.
4. Provide barriers where 120 and 277 volt circuits and normal and emergency circuits are used in the same panel.
5. Provide, in addition to zones/relays indicated, an additional four (4) spare relays.
6. Receptacles to be controlled via relays suitable for receptacles.
7. Switching and dimming protocol to be compatible with luminaire.
8. Providing wiring between devices, as required, to provide a working system.

C. Configuration
1. Panels: 12 or more relays within an enclosure
   a. Panels to be located in electrical closet, unless otherwise noted.
   b. Panels to be preassembled and shall consist of a back box, hinged lockable cover, 120 V or 277 V power supply, and an interior back plane with required number of relays factory-installed. Panels shall be suitable for surface or flush installation. Panel interior shall have a suitable divider separating Class 1 and Class 2 compartments. Panel enclosure shall be UL-approved.
   c. Relays shall be 2-wire single-pole full loaded relays suitable for controlling all types of lighting loads and receptacles up to 20 A. Load contacts shall be able to sustain 1,500 amp fault currents for up to 20 milliseconds.
2. Modules: Modules/room controllers consisting of 1, 2 or 4 zones.
   a. Modules to be located within enclosure capable of mounting above an accessible ceiling. Modules to be located within room controlled, unless otherwise noted.
3. Control Stations
   a. Provide preset stations as indicated on drawings.
   b. Control stations shall be mountable in a standard 2, 3 or 4 gang backbox.
   c. Stations shall have nameplate capability for either graphic insert style or factory applied “silkscreen” lettering. Switch covers shall have no exposed screws. Color to be almond, gray, ivory or white as specified by the Architect.
   d. Power failure memory of ten (10) years in duration shall return the control unit to the last selected scene once power is restored and shall ensure retention of all programmed information.
4. Interfaces: Provide interfaces, where required, for communication with other systems.
   a. AV

1) The AV interface shall allow an AV system to access the preset scenes in each area shown via isolated momentary dry contact closures, RS-232 communication link, or other industry standard interface to override lighting control scenes to select any preset plus “off.”

b. BMS

1) The BMS interface shall allow a BMS system to access the preset scenes in each area via BACnet communication link to override lighting control scenes to select any preset plus “off.”

2) Where indicated, provide occupied and unoccupied status of occupancy and vacancy sensors.

c. Fire Alarm

1) Where indicated, provide contact closure. Emergency lights to be change to full “on” upon activation of a fire alarm system.

d. Low Voltage

1) Contact closure input device shall accept both monetary and maintained contact closures for control of lights scenes, shade group presets, or other system.

5. Timeclock
   a. Timeclock to have 10 year astronomical timeclock, providing control 365 days per year, with daily and weekly time schedules. Overrides of time clock events shall be maintained for a maximum of two (2) hours, followed by a sweep-through of all zones. Timeclock shall have the ability to be override via remote low-voltage local switches.
6. Wiring
   a. Where (1) or more module or panel is connected, they shall be interconnected with a plenum-type data line, run in ¾” EMT.
7. Occupancy and Vacancy Sensors
   a. Refer to Occupancy and Vacancy Sensors Section.
8. Photosensors and Daylighting Controls
   a. Refer to Photosensors and Daylighting Controls Section
9. Emergency Capability
   a. For panels and modules fed with a normal/emergency feeder, the system shall bring all zones to full-on condition upon the loss of normal power and the subsequent presence of emergency power. The emergency control circuity shall control both intensity signal and on/off signal of each zone connected to an emergency circuit between the local control stations and a full-on constant drive supply.
   b. When normal power fails, emergency zones shall operated at full intensity (or be bypassed entirely) until normal power is restored.
   c. Manufacturer to provide listed emergency lighting transfer switches/shunt relays.

D. Operation
1. Systems shall have the following capabilities:
   a. System to have the ability to separate each control zone and independently operate the associated zone.
   b. Each lighting zone shall be independently controlled via local control or head end lighting control.

2.5 TIMER SWITCHES

A. Approved Manufacturers

1. Cooper Lighting SolutionsIndustries, Inc
2. Hubbell Control Systems
3. Leviton Mfg. Company Inc.

4. Lutron
5. Wattstopper

B. DescriptionSolid state, electronicprogrammable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70 bya qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 30-A inductive or resistive, 240-V ac.
4. Astronomic Time: All channels.
5. Automatic daylight savings time changeover.
6. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.6 Wallbox Dimmers

A. Approved Manufacturers:
1. Acuity Brands
2. Cooper Lighting Solutions
3. Crestron Electronic, Inc.
4. Hubbell Control Solutions
5. Leviton Mfg. Company Inc.
6. Lutron Electronics Co., Inc.

B. WattstopperDescription: Provide dimmer suitable for specific lighting loads in all areas as indicated on drawings.
1. Dimmers shall be compatible with dimming protocol of luminaires.
2. Faceplants to have screwless covers with finish, as per Architect.
3. Location of all dimmers to be coordinated and dimensions with Architectural drawings.
4. Dimmers shall provide full-range, smooth and continuously variable control of light intensity.
5. An actuator, accessible from the front of the unit, with the wall plate attached, shall activate a mechanical air-gap switch disconnecting power from the load during “safety off” condition; no-leakage current shall be present at the fixture(s.)
6. Dimmers shall be capable of on/off, raise/lower and mechanical air-gap “safety off” from up to nine (9) additional locations using aesthetically coordinated remotes.
7. Dimmers shall be capable of operating at the rated capacity; this includes modified capacities for ganging configurations that require the removal of fins. Operation at rated capacity shall be possible across the full ambient temperature range without shortening design lifetime.
8. Dimmers shall be designed to reduce interference with radio, audio and video equipment.
9. Dimmers shall incorporate power-failure memory. Should power be interrupted and subsequently returned, the lights shall come back on to the same light level set prior to the power interruption.
10. Dimmers shall operate in an ambient temperature range of 32° F to 104° F.
11. 3-way controls shall be wired using conventional 3-way and 4-way wire runs.
12. Multi-location dimmers without neutral shall be capable of operating either 3-way switch location.
13. Wall controls shall fit a decorator wall plate opening with a flush tap switch. Dimmers and remotes shall have a small, raised rocker to the right of the tap switch. Tap switches shall remain flush in both the “on” and “off” state. Wall controls shall have a gloss finish.
14. A single tap of the tap switch shall raise lights from “off” to the preset light level or fade light to “off.” The raise/fade rate shall travel the dimming range in 3 seconds.
15. The LEDs on the tap switch shall indicated the light level when the dimmer is on.

2.7 EMERGENCY LIGHTING CONTROL

A. Approved Manufacturers:
1. Acuity Brands
2. Bodine
3. Hubbell
4. Wattstopper

B. Description: 20 amp emergency transfer relay for the quantity of circuits or zones, as indicated in the Electrical Drawings.

1. The relay devices shall comprise of normal voltage-sensing circuity and transfer relay to automatically bypass lighting controls or/and transfer load circuits from the normal to the emergency power feeds when normal power is lost.
2. On restoration of normal power supply, load circuits shall be transferred to be fed from the lighting controls automatically or/and from the emergency feeds to the normal supply automatically.
3. An integral test switch shall be provided to simulate normal power source loass for periodic verification of system operation.

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive and store all necessary materials and equipment for installation of the lighting controls. It is the intent of these specifications and plans to include everything required for proper and complete installation and operation of the system, even though every item may not be specifically mentioned. Deliver on a timely basis to other trades any equipment that must be installed during construction.

B. The system shall be installed utilizing complete manufacturer’s shop drawings and in accordance with these specifications. Dimmers shall not be used to furnish any temporary light or power for construction activities.

C. Provide accurate as-built drawings to the Owner for correct programming and proper maintenance of the lighting control system.

D. Install control stations only after “wet” work such as plastering has been completed and the area has been cleaned.

E. Mount equipment at locations and heights indicated on approved shop drawings or as directed by the Owner/Architect. Locations indicated on the Electrical Drawings are general and approximate. Verify locations with Architect’s plans and elevations prior to installation. Check for adequacy of headroom and clearance with other equipment such as ducts, pipes, and opening. Bring any conflicts to attention prior to proceeding with work.

F. Upon completion of the installation and prior to the removal of the bypass jumpers, completely test all line-voltage power and low-voltage control wiring for continuity and accuracy of connections. The jumpers shall remain in place until all loads have been full tested and found to be free of miswires, short circuits or other wiring defects.

G. On completion of the installation, the lighting control equipment shall operate per specifications and be free from defects in condition and finish. Movable parts must operate freely and with uniform friction throughout their range. Prior to inspection, replace any damaged parts.

H. Provide all required relays, transformers, power supplies, wiring, conduit or other necessary or auxiliary devices not specifically listed on the Contract Documents, but that are needed to affect the functional requirements of the control systems.

I. Field terminations in these systems shall be made to numbered screw terminals on circuit breakers or switches or on numbered barrier terminal blocks. Wire nuts and crimped connectors are not acceptable.

J. Provide separate grounded conductors (neutrals) for all branch load circuits that include dimmers or dimming systems.

K. Grounded conductors (neutrals) shall be run to all switch locations.

L. All breakers that serve wiring with shared neutrals shall be provided with common trip action.

M. Occupancy and Vacancy Sensors
1. Sensor layout shown on plans is diagrammatic. Contractor shall provide complete sensor coverage of spaces as required to provide a 100% fully-functional system at no added costs for additional sensors. Contractor shall adjust quantity of all sensors, including occupancy sensor, vacancy sensor, daylight sensor, photosensor and any additional sensors as required and submit sensor layout shop drawings review and approval.
2. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
3. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
4. Provide plans showing sensor locations, devices and control sequences.
5. Review the installation, perform functional tests and document the results and operating and maintenance information prior to receiving final project approval.
6. On completion of installation and after circuitry has been energized, demonstrate capability and compliance with system requirements. Where possible, correct any malfunctioning units at the

site, then retest to demonstrate compliance; otherwise, remove and replace with new units or relocate devices, if required, and proceed with retesting. Testing and retesting shall be done at no expense to the Owner.

N. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

O. Photocells
1. Prior to commissioning, Contractor shall verify that all photosensors have been properly located, factory-calibrated (proof require) or field-calibrated and set for appropriate set points and threshold light levels. Contractor shall provide documentation of set points, setting and programming for each device.
2. Contractor shall demonstrate that only the luminaires in the daylit zone are affected by the daylight control. The contractor shall simulate both bright and dark conditions in the dimming system in order to determine the following:
   a. Automatic daylight control system reduces and increases the amount light delivered to the space uniformly based on available daylight.
   b. In continuous dimming systems, demonstrated that the dimming control system provides reduce flicker operation over the entire operating range. Additionally, in stepped light level control systems, demonstrate that the minimum time delay between steps is three (3) minutes to prevent short cycling and that the automatic daylight control system reduces the amount of light delivered to the space per manufacturer’s specifications for power level versus light level.
   c. Contractor shall document illuminance measurements in the space, location of measurements and specific device settings, program settings and any other measurements, as required.

P. Wiring
1. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
2. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
3. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
4. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.2

3.3 SYSTEM START-UP
1. On completion of the installation, the system shall be commissioned by a factory-trained technician. The commissioning will be performed upon notification that the system installation is complete and that all loads have been tested live for continuity and free from defects and that all control wiring has been connected and checked for continuity.
2. Advise the Owner’s Representative prior to scheduling start-up so that all persons designated by the Owner are present for training.
3. Contractor shall make any necessary adjustments and calibrations necessary prior to Final Inspection by the Owner.

3.4 SYSTEM FUNCTIONAL TESTING

1. Occupancy sensors, vacancy sensors, photocells, and timelock controls shall be tested by an approved testing agency to ensure that control hardware and software are calibrated, adjusted, programmed, tested and in proper working order per the construction documents and manufacturer's instructions. Functional testing to occur after system start-up.
2. Documentation shall be provided to the Owner within 90 days of the date of receipt of the certificate of occupancy and include construction documents, operating and maintenance manual and report of the test results.

3.5 SYSTEM ONSITE PROGRAMMING

1. Manufacturer shall provide technical support for one (1) full day of onsite set-up to program scenes and settings. Manufacturer and contractor shall confirm that system is properly installed, fully operational and commissioned prior to scheduling on-site programming. Set-up shall be prior to instruction and training periods.
2. Prior to programming, the Owner/Architect/Lighting Consultant shall provide a lighting control narrative indicating description of zones, operational hours, timed events, light levels and sequencing requirements with other building systems.

3.6 TRAINING

1. A Factory Engineer or Manufacturer representative shall demonstrate the operation and maintenance of all system components to the Owner's Representatives. Factory technician shall schedule, in coordination with the Owner, a training period for the Owner's staff or designated appointees. This training period shall be a minimum of three (3) hours. Training shall encompass the entire scope for the system, including operation, adjustment, maintenance and troubleshooting, until completely understood. Factory technician shall submit names and period of attendance of those instructed.

END OF SECTION

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

C. SPD: Surge protection device.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means" the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.

2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

1.6 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares of each size for each panelboard.

3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.9 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Comply with local electrical codes.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.11 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than 7 business days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's and Owner's written permission.
3. Comply with NFPA 70E.

1.12 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.13 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R, unless otherwise indicated.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
4. Finishes:

a. Panels and Trim: Galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.

5. Directory Card: Inside panelboard door, mounted in metal holder frame with transparent card protector.

C. Incoming Mains Location: Top and bottom, coordinate with field conditions.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box, where specifically indicated.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads, where specifically indicated.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical or compression type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical or compression type.
4. Feed-Through Lugs: Mechanical or compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical or compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Mechanical or compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus. Provide where extra-capacity neutral bus is required.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible products approved equal:

1. ABB Ltd.
2. All City Switchboard Co., Inc.
3. Atlas Switch Co., Inc.
4. Electrotech Service Equipment Corp.
5. Eaton Electrical Inc.; Cutler-Hammer Business Unit
6. Lincoln Electric Products Co., Inc.

7. Mac Products, Inc.
8. Raycap, Inc.
9. Schneider Electric
10. Siemens Energy & Automation, Inc.

B. power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: As specified on drawings.

E. Branch Overcurrent Protective Devices: Fused switches, unless otherwise noted.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible products approved equal:

1. ABB Ltd.
2. All City Switchboard Co., Inc.
3. Atlas Switch Co., Inc.
4. Electrotech Service Equipment Corp.
5. Eaton Electrical Inc.; Cutler-Hammer Business Unit
6. Lincoln Electric Products Co., Inc.
7. Mac Products, Inc.
8. Raycap, Inc.
9. Schneider Electric
10. Siemens Energy & Automation, Inc.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: As indicated on the drawings.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 LOAD CENTERS

Load centers with plug-in circuit breakers are acceptable only for residential dwelling units and where specifically described within contract drawings.

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible products approved equal:

1. ABB Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Load Centers: Comply with UL 67.

C. Mains: As indicated on the drawings.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible products approved equal:

1. ABB Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time time adjustments.
    c. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
g. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1, whichever is more stringent.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1, whichever is more stringent.

B. Retain first paragraph below for floor-mounted distribution panelboards. Even if floor mounted, all panelboard cabinets must still be securely attached to a vertical wall or surface.

C. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

G. Install filler plates in unused spaces.

H. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Contractor shall inspect components, assemblies, and equipment installations, including connections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Instruments and Equipment:

        1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 10 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Tamper-resistant receptacles.
3. Weather-resistant receptacles.
4. Snap switches and wall-box dimmers.
5. Solid-state fan speed controls.
6. Wall-switch and exterior occupancy sensors.
7. Communications outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Approvals: All submittals shall be approved by the Engineer and Architect. Architect shall approve wiring devices and wall plates for style and finish.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles, subject to approval by architect:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

C. Provide wiring devices as specified in this section unless otherwise noted by the Architect and /or Interior designer. Listed manufacturers are subject to approval by the Architect and /or Interior designer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with the current New York City Electrical Code.

D. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

B. Tamper-Resistant Convenience Receptacles, 125 V, 15 A and 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; TR8300.
b. Hubbell; HBL8300SGA.
c. Leviton; 8300-SGG.
d. Pass & Seymour; TR63H; 885TR.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 15 A and 20 A:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Hubbell; GFTR20.
b. Pass & Seymour; 2095TR.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

1) Single Pole:

2) Cooper; AH1221.
3) Hubbell; HBL1221.
4) Leviton; 1221-2.
5) Pass & Seymour; CSB20AC1.

6) Two Pole:

7) Cooper; AH1222.
8) Hubbell; HBL1222.
9) Leviton; 1222-2.
10) Pass & Seymour; CSB20AC2.

11) Three Way:

12) Cooper; AH1223.
13) Hubbell; HBL1223.
14) Leviton; 1223-2.
15) Pass & Seymour; CSB20AC3.

16) Four Way:

17) Cooper; AH1224.
18) Hubbell; HBL1224.
19) Leviton; 1224-2.
20) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; AH1221PL for 120 and 277 V.
b. Hubbell; HBL1201PL for 120 and 277 V.
c. Leviton; 1221-LH1.
d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; 1995.
    b. Hubbell; HBL1557.
    c. Leviton; 1257.
    d. Pass & Seymour; 1251.

2.6 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; 6252.
    b. Hubbell; DR15.
    c. Leviton; 16252.
    d. Pass & Seymour; 26252.

B. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; TR6252.
    b. Hubbell; DR15TR.
    c. Pass & Seymour; TR26252.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

C. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; TWRBR15.
    b. Hubbell; DR15TR.
    c. LevitonTRW15.
    d. Pass & Seymour; TRW26252.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

D. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; VGF15.
    b. Hubbell; GF15LA.
    c. Leviton; 8599.
    d. Pass & Seymour; 1594.

E. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; TWRVGF15.
    b. Hubbell; GFTR15.
    c. Pass & Seymour; 1594TRWR.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

F. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; 7621 (single pole), 7623 (three way).
    b. Hubbell; DS115 (single pole), DS315 (three way).
    c. Leviton; 5621-2 (single pole), 5623-2 (three way).
    d. Pass & Seymour; 2621 (single pole), 2623 (three way).

G. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; 7631 (single pole), 7633 (three way).
    b. Hubbell; DS120IL (single pole), DS320 (three way).
    c. Leviton; 5631-2 (single pole), 5633-2 (three way).
    d. Pass & Seymour; 2625 (single pole), 2626 (three way).

2. Description: With neon-lighted handle, illuminated when switch is "off."

2.7 RESIDENTIAL DEVICES

A. Residential-Grade, Tamper-Resistant Convenience Receptacles, 125 V, 15 A and 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; TR270.
b. Hubbell; RR155TR.
c. Leviton; T5320.
d. Pass & Seymour; TR62.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

B. Weather-Resistant and Tamper-Resistant Convenience Receptacles, 125 V, 15 A and 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; TWR270.
b. Hubbell; RR155WRTR.
c. Leviton; TWR15.
d. Pass & Seymour; 3232TRWR.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

C. Telephone Outlet:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; 3560-6.
b. Leviton; 40649.

2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

D. Combination TV and Telephone Outlet:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; 3562.
b. Leviton; 40159.

2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

2.8 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.

3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.9 MULTIOUTLET ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following or comparable product approved equal:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold/Legrand.

C. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

D. Raceway Material: Metal, with manufacturer's standard finish.

2.10 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected... Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections. No. 10 AWG may be directly wired to devices listed for 10 AWG using side-wire clamping terminals.
8. Tighten all unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down and on horizontally mounted receptacles to the right, unless otherwise indicated.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.

3. Install unshared neutral conductors online and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports, upon request.

END OF SECTION

SECTION 262813

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Motor-control centers.
c. Panelboards.
d. Switchboards.
e. Enclosed controllers.
f. Enclosed switches.

2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in PDF format.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures," Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in PDF format.
4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than 3 of each size and type.

1.6 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than **40 deg F (5 deg C)** or more than **104 deg F (40 deg C)**, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.8 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by only one of the following:

1. Cooper Bussmann, (Eaton Electrical, Inc.)
2. Edison Fuse, (Eaton Electrical, Inc.)
3. Mersen, USA (Ferraz Shawmut, Inc.)
4. Littelfuse, Inc.

B. Source Limitations: Obtain fuses from single source from single manufacturer.

C. Where Engineer has indicated specific fuse manufacturer, model, class, characteristics and/or part number on project drawings, substitutions are not acceptable.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting or time delay, as required.
4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, fast acting or time delay, as required.
5. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC (min), time delay.
7. Type T: 600-V, zero- to 800-A; 250-V, 801- to 1200-A rating, 200 kAIC, very fast acting or time delay as required.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

2.3 PLUG FUSES

A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.4 PLUG-FUSE ADAPTERS

A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

2.5 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay, Class RK1, time delay, Class J, time delay.
2. Feeders: Class L, time delay, Class RK1, time delay, Class RK5, time delay, Class J, time delay.
3. Motor Branch Circuits: Class RK1, Class RK5, Class CC, motor duty, time delay.
4. Large Motor Branch (601-4000 A): Class L, time delay.
5. Other Branch Circuits: Class RK1, time delay Class RK5, time delay Class J, fast acting Class J, time delay.
6. Power Electronics Circuits: Class J, high speed, Class T, fast acting.
7. Other Branch Circuits: Class RK1, time delay, Class RK5, time delay, Class J, time delay, Class CC, fast acting.
8. Control Transformer Circuits: Class CC, time delay, control transformer duty.
9. Or as indicated on drawings.

10. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable from the front of the equipment, or with partially opened cabinet door, without removing fuse.

B. Furnish & install spare-fuse cabinet(s). Provide at least one spare fuse cabinet in main electric service room, and at least one additional cabinet in each elevator machine room; and additional cabinets as indicated on drawings.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Molded-case circuit breakers (MCCBs).
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 or as specified by the structural engineer.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.

3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. Comply with local electrical codes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than 7 business days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Construction Manager's and Owner's written permission.
4. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible product approved equal:

1. ABB, Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.
7. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac/208-V ac.

2.2 NONFUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ABB, Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Mechanical type, suitable for number, size, and conductor material.
4. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac/208-V ac.

2.3 SHUNT TRIP SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible product approved equal:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power source of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

E. Accessories:

1. Oiltight key switch for key-to-test function.
2. Oiltight green ON pilot light.
3. Isolated neutral lug; 200 percent rating.
4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Form C alarm contacts that change state when switch is tripped.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible product approved equal:

1. ABB, Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time time adjustments.
3. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

H. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Zone-Selective Interlocking: Integral with ground-fault trip unit; for interlocking ground-fault protection function.
7. Electrical Operator: Provide remote control for on, off, and reset operations.

2.5 MOLDED-CASE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible product approved equal:

1. ABB, Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.

B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Features and Accessories:

1. Standard frame sizes and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

2.6 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R, unless otherwise indicated.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Contractor shall field inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
b. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study.

END OF SECTION

SECTION 283113

FIRE PROTECTIVE ALARM SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, wherever applicable to Mechanical and Electrical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

C. Section 26 05 00 - General Provisions for Electrical Work shall apply.

D. Drawings are diagrammatic and are a graphic representation of contract requirements to beed available standards at the scale required.

1.2 DESCRIPTION OF WORK

A. The system shall consist of addressable, intelligent devices, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. Generic terms such as “sub system”, “the system”, “a system”, “the fire alarm system”, etc. shall be deemed to apply to the complete intelligent analog addressable fire alarm system, unless specifically noted elsewhere.

B. The features and capacities described in this specification are a requirement for this project and shall be furnished by the successful Contractor. The system as described shall be installed, programmed, tested, and delivered to the Owner in fully operational condition. The system shall include all required hardware, software, raceways and interconnecting wiring to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein. The system shall consist of, but not be limited to, the following:
1. Fire Command Station with Integral Flashing “FIRE” Visible Signal. (FCS)
2. Remote System Panel. (RSP)
3. Remote Annunciator Panel(s) with LCD alphanumeric display. (If required)
4. Fire System Alarm Printer(s).
5. System CRT Terminal with Keyboard.
6. Addressable Analog Duct Smoke Sensors.
7. Addressable Interface Modules.
8. Audible and Visual Notification Devices.

C. Devices to be controlled by the FCS and/or RSP’s panel programmable relays, duct smoke detector programmable relays, remote system programmable addressable relays and/or intelligent addressable interface module relays:
1. Connections to the appropriate Receiving Agency for smoke alarm, supervisory, and system trouble conditions.
2. Air handling fan systems alarm shutdown operations.
3. Fire/smoke dampers operations. (If required)

1.3 RELATED DOCUMENTS / WORK AND EXISTING CONDITIONS

A. RELATED DOCUMENTS

1. Prior to the commencement of work, the Contractor shall obtain all permits necessary for installation of the work. All permit costs and inspections fees shall be included as part of the required work.
2. Local requirements shall be adhered to with regard to submitting specifications, wiring diagrams, shop drawings and plans. Responsibility for furnishing the quantities of copies on cloth and/or paper, as directed by such requirements, shall be included as part of the work of this Section.
3. Prior to commencement and after completion of work, the Contractor shall notify all authorities having jurisdiction.
4. The Contractor shall submit a letter of approval of the installation, from the local code authority, before requesting final acceptance of the system.

B. RELATED WORK

1. The Contractor shall coordinate work in this Section with all related trades. Work and/or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:
2. Duct smoke sensors to be installed by the Mechanical Contractor. See Division 23. They shall be furnished, wired and connected to the fire alarm system by the Contractor.
3. Air handling system, smoke exhaust fan and smoke damper control circuits and fan status contacts to be provided by the fan systems control equipment. See Division 23. They shall be wired and connected to the fire alarm system by the Contractor.
4. Coordinate with all other trade Contractors for the mounting of and/or interfacing with any and all other fire alarm system related devices.
5. The Contractor shall visit the site to determine and verify all existing conditions. Existing conditions that would, in the Contractor's opinion, prohibit or greatly delay construction progress shall be brought to the Architect's and Engineer's attention in writing.
6. No additional compensation shall be permitted for variations due to field conditions that would affect the installation of the fire alarm system.

C. RETROFIT COORDINATION REQUIREMENTS

1. VERIFICATION TESTING: The fire protection Contractor shall test and document the operation of existing fire protection system(s) prior to new installation. The purpose of testing is to establish a benchmark of functional reliability prior to altering or removing existing protection. The Contractor shall maintain the condition and integrity of existing life safety equipment as found after verification testing. Interfacing requirements shall be provided for all new installed work during the phasing of this project. Interfacing shall mean that both existing and new work shall operate and/or function as one system during the life cycle of installation.
2. CRITICAL PATH - INSTALLATION SCHEDULE: The fire protection Contractor shall prepare, and gain approval by the Owner or owners Engineer, an installation schedule based on owners priorities prior to the start of work. Any deviation from the agreed work schedule, unless requested in writing and approved, shall not be acceptable. Minimizing impact on normal business activities shall be the contractor’s responsibility, should “off-hour” work be required outside of the approved installation schedule, the Contractor shall request a change order prior to starting work.
3. FIRE WATCH RESPONSIBILITIES: Prior to the start of work the Owner and Contractor shall determine fire watch activities. This shall include, but not be limited to, the who, what, where, when and how fire watch activities shall be performed. As a minimum, the Owner shall provide the necessary manpower to conduct fire watch activities during scheduled installations. Non-scheduled work shall be the fire protection contractor’s responsibility to provide all necessary manpower and equipment to conduct fire watch duties.

4. RETROFIT FINAL ACCEPTANCE TESTING: Partial system modifications and add on changes shall be accepted tested as per NFPA 7-1.6.2. Complete fire system replacement shall use NFPA 72 - 1-7.2.
5. Other (e.g. Project Meetings, Installation Progress Reports to Engineer)

D. MODIFICATIONS TO EXISTING SYSTEM
1. The system shall consist of, but not be limited to, the following: indicated plans and associated REFERENCES - APPLICABLE LISTINGS, CODES, STANDARDS, DOCUMENTS

E. STANDARDS AND CODES
1. All equipment shall be installed and complied with the current adopted provisions of the following codes and standards.
2. All equipment shall be U.L. listed for its intended use, as a minimum, the following standards shall apply:
   a. U.L. 268 and 268A - Smoke Detectors for Fire Protective Signaling Systems. - Detectors Duct Application.
   b. U.L. 864 - Control Units for Fire Protective Signaling Systems.
3. National Fire Protection Association Standards.
   a. NFPA No. 70 - 2008 Edition with 2011 NYC Amendments- National Electrical Code.
   b. NFPA No. 72 - 2016 Edition - National Fire Alarm Code.
   c. NFPA No. 90A - 1996 Edition - Installation of Air Conditioning & Ventilating Systems.
   d. NFPA No. 101 - 2015 Edition - Life Safety Code
4. All raceways and wiring shall be installed in compliance with NFPA Standard 70 (National Electrical Code - Article 760). Codes shall be implicitly followed, in particular with regard to material type and quality, circuitry extensions from and connections to outlet and junction boxes, panel boards and similar appurtenances.
5. The fire alarm system and its installation shall comply with all applicable requirements of The Americans with Disabilities Act of 2010.
6. The fire alarm system and its installation shall comply with all applicable requirements of the New York State Uniform Fire Protection and Building Code.
7. The fire alarm system and its installation shall comply with all other local codes and authorities having jurisdiction, including but not limited to, owners engineering design guidelines.

1.4 DEFINITIONS

A. Initiating Device: A system component that originates transmission of a change of state condition, such as a smoke detector, manual fire alarm box, supervisory switch, etc.

B. Initiating Device Circuit: A circuit to which automatic or manual initiating devices are connected where the signal received does not identify the individual device operated. Typically known as a “Zone” for conventionally wired systems or circuits.

C. Notification Appliance: A fire alarm system component such as a bell, horn, speaker, strobe, printer, etc., that provides an audible or visual output or both.

D. Notification Appliance Circuit: A circuit or path directly connected to a notification appliance.

E. Signaling Line Circuit: A circuit or path between any combination of circuit interfaces, control units, or transmitters over which multiple system input or output signals or both are carried. (When used with addressable analog initiating devices, these SLC circuits are also known as “Addressable Loops”)

F. Note: Both Signaling Line Circuits and Initiating Line Circuits operate initiating devices, however, they provide different communication capabilities. Code requirements differ greatly for performance and capacities. Refer to NFPA 72, Tables 3-5.1 & 3-6.1.

1.5 SYSTEM DESCRIPTION

A. The system shall operate as an integrated multiplexed protected premises fire alarm/emergency communication monitoring and control system.
   1. Changes in the status of monitored points shall be detected by the microprocessor based fire command station utilizing distributed processing, peer-to-peer networking with remote system panel's located throughout the facility if required.
   2. Sensor "dirty" and "excessively dirty" trouble conditions shall report automatically.
   3. Devices shall be listed by U.L. for sensitivity testing by means of the portable programmer/tester or by readout from the control panel. Each addressable device address shall be set electronically, devices requiring dip switch settings, rotary switch settings, staples or jumper settings are not acceptable.
   4. As a minimum, RSP's shall consist of an enclosure, power supply, digital communications circuitry, mother boards, batteries and hardware, modules, audio hardware, and circuitry described for inclusion in the fire alarm control panel as required to function as specified. System control panels shall function in standalone fail safe mode upon loss of the FCS processing, communications, or communications wiring.
   5. Smoke detectors shall alarm at their programmed sensitivity settings and shall not revert to a common default setting when their operating system segment is in the default mode.
   6. System individually identifies each addressable initiating device and other addressable monitor functions using multiplexing interfacing techniques.
   7. System is capable of individually operating each alarm indicating appliance, and other control functions, using multiplexing techniques.
   8. The FCS shall be listed and capable for the release FM200, Deluge and Pre-action systems.

B. Life safety alarm function programs shall perform automatically upon system alarm actuation. In addition, control points may be operated manually at any time by the attendant through appropriate keyboard commands. The system FCS shall also provide integral programmable function control switches to allow personnel to manually operate specific preprogrammed control output functions, as required.

1.6 QUALITY ASSURANCE

A. It is the intent of these Specifications to provide a complete fire alarm system that complies in all respects with the requirements of all applicable codes and standards. Equipment, materials, software, installation practices, etc. that do not meet these requirements or do not meet the performance standards herein specified shall not be acceptable.

B. Fire alarm system equipment furnished under this Specification shall be UL listed, under the appropriate category, as a product of a single manufacture. All central control equipment shall be listed under UL category UOJZ as a single control unit. The manufacture shall have been engaged in the production of this type of equipment for at least ten (10) years.

C. The equipment furnished under this Specification shall be that of the specified manufacture or approved equal. All information herein is intended to establish minimum standards of performance, quality and construction, and is based upon Compatible equipment MXL addressable analog equipment designed and manufactured by Cerberus Compatible equipment, a Division of Cerberus Technologies, Inc., Cedar Knolls, NJ, USA, whose catalog and numbers are used, shall indicate the materials as well as the operating features required. It is not the intent of these specifications to eliminate competitive equipment.

D. Before commencing work the Contractor shall submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified. The Contractor shall also include the names and locations of at least three installations where such systems have performed satisfactorily for the preceding 18 months.
   1. The Contractor shall submit three copies of all required Licenses and Bonds as required in the State or Province having jurisdiction.
   2. The installing Contractor shall employ on staff a minimum of one NICET level 2 technician or a professional Engineer, registered in the State of the installation.
   3. The installing Contractor shall be qualified by Underwriter's Laboratories certifying the complete system meets UL upon completion of the installation. Ongoing maintenance and testing shall be provided to the Owner under a maintenance contract to maintain the certification.
   4. Installation contractors unable to comply with the provisions of 1.06 shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

E. Provide the services of a representative or technician from the manufacturer of the system. The representative or technician is to be certified and experienced in the installation and operation of the type of system provided. The representative shall be licensed in the State, if required by law. The fire alarm Contractor shall supervise installation, software programming, software documentation, adjustments, preliminary testing, final testing and certification of the system. The fire alarm Contractor shall also be required to provide operational instruction to the Owner's personnel. Instruction shall include system operation, maintenance, programming, and arm/disarm procedures.

F. All fire alarm system equipment furnished under this Specification shall be UL listed, under the appropriate category, as the product of a single manufacturer. All control equipment shall be listed under UL as a single control unit. The manufacturer shall have been engaged in the production of this type of equipment for at least ten (10) years and have a fully equipped service organization capable of responding within 4 hours from the initial contact for warranty or regular service work. Emergency and/or off hours calls shall be responded to within 4 hours of initial contact seven days a week.

G. With bid submittal, the Contractor shall state what, if any, specific points of the proposed system's operation or the equipment's quality differ in any way from this Specification by submission of a complete technical proposal to include supporting literature and drawings. Only those departures from these Specifications, submitted in writing at the time of bid, shall be considered by the Engineer during the submittal review phase. Failure to submit all departures from these Specifications at the time of bid shall be cause for summary rejection of any submittal documents where additional departures are discovered.

H. Acceptance of substitutions, based on submittal documents furnished by the Contractor, shall only be construed as permission to proceed with the installation pending final test and approval of the system. The Contractor shall continue to bear the liability for replacement of substituted equipment, if in the opinion of the Owner or Engineer, the substitute equipment fails to perform as specified, or fails to meet approval of all authorities having jurisdiction within three (3) months after scheduled Project completion.

I. Should conflicts arise between project drawings and/or these Specifications, regarding design, quantities of devices or circuits, the higher quantity or cost shall be considered as correct, unless directed by the Engineer to provide other appropriate measures.

J. It is the Contractor's responsibility to submit acceptable equipment for review by the Engineer. The Contractor shall bear all liability for damages arising from his failure to submit equipment that meets these Specifications, including, but not limited to, any penalties for failure to meet construction deadline.

K. Final determination of compliance with these Specifications shall rest with the Engineers, who, at their discretion, may require proof of performance at the cost of the Contractor. Required proof may include,

but shall not be limited to, expense paid visits by representatives of the Owner and Engineer to sites where identical equipment is installed and providing beneficial use.

1.7 SUBMITTALS

A. Prior to the start of work, the Contractor shall provide a complete and comprehensive submittal for review by the Engineer. These are to describe the proposed system and its equipment. Failure to provide a complete submittal shall be grounds for summary rejection of any incomplete submittal documentation. Contractor's who provide Resubmittal's, due to prior rejection, shall be subject to a review fee, should the Engineer elect to do so. The complete submittal shall include, but not be limited to, all of the following material:

1. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, finish and mounting requirements.
2. Complete drawings covering the following shall be submitted by the Contractor for the proposed system. Floor plans in a CAD compatible format showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
3. A complete proposed system database including a description of all logic strings, control by event programming and point identification labels on a 3.5" high density floppy disk and in a formatted printed form, as required for off site editing, shall be submitted for evaluation by the Owner.
    a. The program shall include all required interactive control functions between the local network systems and the methods for implementing these actions.
4. Provide the address, telephone number, and contact person(s) of the manufacturer's local service facility for normal and off hour warranty issues.
5. If the fire alarm system and its equipment is supplied by a manufacturer's distributor, as part of the submittal documentation, the manufacturer shall provide, on its corporate letterhead, a "letter of support". Said "letter of support" shall state that, when in the opinion of the Engineer, the distributor's efforts require backup and/or assistance, the manufacturer shall provide, at no cost to the Owner, all required technical support and manpower, in a timely manner, during the installation period and for a one (1) year guarantee period starting on the date of final acceptance by the Owner and the Authority Having Jurisdiction. If said "letter of support" is not submitted, the manufacturer's equipment will be deemed unacceptable and shall be grounds for summary rejection.
6. Provide a fire alarm system function matrix. Matrix shall illustrate alarm output events in association with initiating devices input events. Matrix shall represent a summary of the installed system alarm, supervisory and trouble functions. Include any and all departures, exceptions, variances or substitutions from these Specifications and/or drawings at the time of bid. Failure to provide this requirement shall be cause for summary rejection of submittal documents where additional departures are discovered. (See NFPA Appendix A-7-5.2.2(i) 2016).
7. Provide manufacturer's printed product data, catalog pages and descriptions of any special installation requirements and/or procedures. Drawings depicting any special physical installation requirements shall show physical plans, elevations, all dimensions, conduit entry, minimum access clearances and any other details required.
8. Provide a signed letter and notarized statement on the manufacture's letterhead, stating that each analog addressable data communications circuit shall support one hundred (100%) of the circuits and addressable devices in alarm or operated at the same time, during both primary (AC) and secondary (battery) power conditions.
9. Provide shop drawings as follows:
    a. Single line riser diagram showing all equipment, all connections and number and size of all conductors and conduits.
    b. Provide samples of various items when requested by the Architect/Engineer.

10. The fire alarm Contractor shall provide copies of certification for service technicians formal training by the system manufacturer. As a minimum, certification documents shall indicate training dates, systems qualified, name of individual certified and current status.

1.8 SYSTEM OPERATION

A. Description

INITIATION	OPERATION
1. Triggering of duct smoke detector; or of area smoke or heat detector	Initiate an automatic alarm zone verification sequence. Upon verification, sound evacuation and alert tone signals and recorded announcements through loudspeaker stations, and flash visual fire warning signals. Sound audible signal and display "duct smoke" detector and zone identification at fire command station and outlying annunciators. Operate relay at fire command station to accommodate transmission of an "automatic" signal through telephone company wires to a central station location. Operate outlying addressable modules to accommodate transmission of signals to dampers, fans, elevators, and other equipment, as scheduled and/or as specified hereinafter. Display status of affected equipment at Fire Command Station and outlying annunciators.

B. Reset of all alarm initiating device circuits, alarm notification circuits, and equipment control relays shall be accomplished from the fire command station. In no case shall the above alarm reset procedure cause the resetting of equipment control relays (for fans, dampers, etc.). Such devices shall require separate reset from the fire command station.

C. It shall be possible to disconnect any floor, or any device or combination of devices on any floor, from the system to allow for maintenance, repairs, or the addition of system devices and wiring without disabling any other floor. Such disconnection shall cause a visual "disabled" annunciation at the fire command station identifying the floor and/or devices.

D. System operation shall be providing automatic and/or manual shutdown of fans larger than 2,000 CFM, and of dampers and other equipment in response to alarm initiation, as well as central status reporting. Any fans over 2,000 CFM shall be provided with manual control (and status reporting) from FCS. Controls shall be provided in accordance with a schedule on the drawings and/or as described hereinafter. Include provisions at the FCS in outlying system equipment control cabinets, and in outlying addressable module boxes (or cabinets) - each located within 3'-0" of the associated motor starter, smoke purge damper control device or other equipment control device, control circuitry extensions (i.e., final connections) from the addressable module boxes to the controlled equipment and connections, all as required to achieve this control.

E. System Configuration

1. Each duct smoke detector shall constitute a separate zone for reporting to the fire command station. For display at the fire command station (FCS) and at outlying annunciator(s), each reporting zone (i.e., device) shall be individually identified, except that multiple smoke detectors (or multiple heat detectors) located within a single space may be identified by a common display. It shall be possible to separately identify and display the address of the individual detector(s) in alarm within any such space by means of an appropriate command at the FCS keyboard or keypad.

2. Control (automatic and/or manual) and status reporting (monitoring) of equipment via the fire protective alarm system as specified hereinafter shall be accomplished by means of addressable control modules (ACM's) and addressable monitoring modules of the status reporting type (AMM/S's) located within 3'-0" of the controlled equipment in outlying addressable monitor boxes similar to those specified above for the AMM/ID's. Addressable modules (ACM's and AMM/S's) shall be provided in accordance with the following:
    a. ACM's and AMM/S's shall be of a type intended for connection to NFPA 72, Style 6 "branch signalling circuits (SLC's) as described hereinbefore, and shall be connected to the appropriate SLC serving the floor on which they are located.
    b. Each ACM shall provide (2) SPDT contacts suitable for use at voltages up to 250 VAC and capable of interrupting 10 amperes inductive, and shall derive its operating and supervisory current at 24VDC from the SLC. If necessary, these contact ratings shall be accommodated by means of auxiliary control relays mounted within or adjacent to the same addressable monitor boxes as the ACM's, and deriving their operating power from the associated ACM's, or directly from the associated ECC via separate supervised power supply conductors.
    c. Each AMM/S shall function so as to provide a readily identifiable status indication at the FCS in response to a 120 or 208 VAC signal from the associated controlled equipment. Incorporate an auxiliary status (monitoring) relay for each AMM/S to convert a 120 or 208 VAC AC signal to a "dry" contact if the AMM/S requires a "dry" contact for proper status signal initiation. Auxiliary status relays, if required, shall be mounted in the same outlying addressable module boxes as their associated AMM/S's.
    d. At locations (such as motor control centers) where multiple equipment controllers are installed, the addressable modules (and any associated auxiliary relays) may be grouped in common addressable module boxes.
3. Outlying addressable module boxes, each complete as indicated, shall be provided for equipment requiring automatic or manual control by the FPA system on the basis of the following:
    a. One box including two ACM's ("stop", start") and one AMM/S ("running") for each fan over 2,000 CFM (including fans in self-contained air conditioning units).
    b. One addressable module box for each supply or return damper at the duct or shaft entries to each floor supplied by a multi-floor fan system which will be permitted to run during a fire. Include one ACM ("close") and one AMM/S ("closed") intended to accomplish automatic floor-by-floor isolation for smoke control purposes.
    c. One addressable module box for each damper requiring individual manual control from the central damper control panel (specified hereinafter for normal after-hours control), but for which direct manual or automatic control by the fire alarm system is not specified. Include one ACM ("closed") and one AMM/S ("closed").
    d. One addressable module box, including two ACM's ("recall", "recall to alternate floor") and one AMM/S ("elevators recalled") for each bank of elevators. Provide two additional ACM's ("de-energize/re-energize elevator power panel) for each bank of elevators if the elevator machine room and/or associated shaft is sprinklered. Also, include one AMM/S per bank ("panel de-energized").
    e. One addressable box, including one ACM for the fire stair door unlocking system.
    f. One addressable module box, including one ACM, for the fire/smoke door release system.
    g. One addressable module box, including one ACM for each fire stair or elevator machine room smoke vent.
    h. One addressable module box, including one ACM for each escalator controller.
    i. Additional addressable module boxes as necessary to comply with the scheduled control of equipment in response to system alarm actuating devices.
4. Priority of Signals:
    a. Accomplish automatic response functions by the first zone initiated. Alarm functions resulting from initiation by the first zone are not altered by subsequent alarms. The highest

priority is an alarm signal. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even though the lower-priority condition occurred first. Annunciate all alarm signals regardless of priority or order received.

b. Noninterfering: Zone, power, wire, and supervise the system so a signal on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. Systems that require batteries or battery backup for the programming function are unacceptable.

c. Fire Alarm Control Panel (FACP) Response: The manual or automatic operation of an alarm-initiating or supervisory-operating device causes the FACP to transmit an appropriate signal including the following:
   1) General alarm.
   2) Fire-suppression system operation alarm.
   3) Smoke or heat detector alarm.
   4) Valve tamper supervisory.
   5) Door release.
   6) Elevator recall.
   7) Elevator shutdown.
   8) Dumbwaiter shutdown.
   9) System trouble.
   10) Fan shutdown.
   11) Smoke-control initiation.

d. Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service.

e. Silencing at the FACP: Switches provide capability for acknowledgment of alarm, supervisory, trouble, and other specified signals at the FACP; and capability to silence the local audible signal and light a light-emitting diode (LED). Subsequent zone alarms cause the audible signal to sound again until silenced by switch operation. Restoring alarm, supervisory, and trouble conditions to normal extinguishes the associated LED and causes the audible signal to sound again until restoration is acknowledged by switch operation.

5. Smoke detectors indicated in mechanical equipment rooms shall be of the combination photocell plus fixed temperature/rate-of-rise type.
6. Smoke detection devices shall have integrally mounted pilot lamps giving a "triggered" indication.
7. Smoke detection devices which are mounted in ducts shall be supplied with remote "triggered" indication pilot wired in parallel, in an approved manner, with the similar pilots included integrally with detection units. The pilots for duct detectors shall each be flush or surface mounted within 15 feet circuiting distance of its associated detector. Mounting and location to be as directed by the Architect.
8. Smoke detectors indicated as being located in floor or ceiling cavities of the air handling type shall be equipped with "air shields" where air velocities are such as to require these appurtenances for the proper detection of smoke.
9. Recording of Events:
   a. Print a record all alarm, supervisory, and trouble events on the system printer. Printouts are by zone, device, and function. When the FACP receives a signal, the alarm, supervisory, and trouble conditions are printed. The printout includes the type of signal (alarm, supervisory, or trouble) the zone identification, date, and the time of the occurrence. The printout differentiates alarm signals from all other printed indications. When the system is reset, this event is also printed, including the same information for device, location, date, and time. A command initiates the printout of a list of existing alarm, supervisory, and trouble conditions in the system.

1) Circuit Supervision: Indicate circuit faults by both a zone and a trouble signal at the FACP. Provide a distinctive indicating audible tone and LED-indicating light. The maximum permissible elapsed time between the occurrence of the trouble condition and its indication at the FACP is 200 seconds.

F. System Trouble Functions
1. Receipt of a system trouble alarm, shall cause the following actions and indications:
   a. Activate "Trouble Alarm" notification to the FCS computer terminal display indicating device address, device type, device location, time and date.
   b. Activate "Trouble Alarm" notification to the appropriate receiving agency and/or on site location as shown on the drawings.
   c. Audible signals shall be silenced from the control panel by an acknowledge switch.
   d. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.
   e. Record all events at the system alarm printer.
2. The fire alarm system wiring (except control wiring to fans, dampers, 120Vac door holders, etc.) shall be electrically supervised to automatically detect and report trouble conditions to the FCS.
3. Any opens or grounds on Interface Addressable Module alarm initiating or supervisory circuit wiring and any opens, grounds or shorts across the addressable data communications, remote annunciator data communications, alarm speaker, Warden telephone or alarm strobe light circuit wiring shall initiate a system trouble condition.
4. System addressable devices shall be supervised for placement and normal operation. Removal of an addressable device or the failure of its internal electronic circuitry shall initiate a system trouble condition.
5. The following FCS and/or remote transponder control panels shall initiate a system trouble condition when the following occurs:
   a. Primary 120/220 VAC power loss.
   b. Battery disconnects.
   c. Battery low voltage.
   d. FCS remote transponder or graphic LCD annunciator panel power loss.
   e. FCS primary alarm log printer power loss.
6. Operating a central station agency alarm disconnect switch (if equipped), or any manual control commands that alter the system from its normal programmed standby configuration shall initiate a trouble condition.
7. Trouble conditions shall automatically activate an audible signal and flash the general system trouble LED indicator at the FCS. Pressing the trouble acknowledge key on the FCS shall silence the audible signal and continuously light the LED indicator, until the trouble condition is repaired. Subsequent trouble conditions shall resound the audible signal and again flash the LED. Each trouble condition must be individually acknowledged.
8. Removal of or failure of internal electronic circuitry of any addressable device shall initiate a system trouble condition.

PART 2 - SYSTEM OPERATION

2.1 BASIC SYSTEM EQUIPMENT, CIRCUITING, ADDRESSING AND OPERATING CAPABILITIES

1. Duct smoke sensors shall be photoelectric. Each smoke sensor and air duct housing shall be self-compensating for the effects of air velocity (from 300 to 4,000 CFM), temperature, humidity and atmospheric pressure. It shall not be necessary to field adjust the sensitivity to compensate for the above effects. Each smoke sensor shall utilize solid state components and be equipped with an alarm indicating LED which shall flash when the smoke sensor is activated and shall be provided with a form "C" remote relay with contacts rated at 3 amps 120 VAC or 24 VDC. The smoke sensors

address shall be set by electronic means only, no mechanical means such as dipswitches, rotary dials or by inserting programmable pins shall be used. The smoke sensor mounting base shall be of the twist/lock type. Each duct smoke detector shall be provided with remote status panel with LED mounted flush on single gang plate with Legend "Alarm" and system identification name plate.

2. The intelligent interface module shall be listed by Underwriters' Laboratories, Inc. The unit shall incorporate a custom microprocessor based integrated circuit which shall provide communication with main fire control panel. The interface module shall supervise and monitor normally open or normally closed dry contacts. The interface module shall report the contact's status to the control panel. The intelligent interface module shall be dynamically supervised and uniquely identifiable by the control panel. The intelligent interface module's address shall be set by electronic means only, no mechanical means such as dipswitches, rotary dials or by inserting programmable pins shall be used. The intelligent interface module shall be used to uniquely identify field devices such as water flow switches, tamper switches, OS&Y valves or as directed by these specifications and project drawings.
3. The intelligent interface module shall be used when remote relay functions are required for system functional requirements, such as but not limited to, fan shut downs. Relay dry contacts shall be rated at 2 amp. 120 VAC resistive or 30 VDC resistive and shall be Form "C".
4. The FCS addressable data communications circuits shall support one hundred percent (100%) of the addressable devices in alarm or operated at the same time, during both primary (AC) and secondary (battery) power conditions. Systems which cannot support one hundred percent (100%) of the system address capacity in alarm or operated simultaneously cannot assure appropriate system alarm responses and shall not be acceptable.
5. The system shall provide status indicators and control switches for all of the following functions:
    a. HVAC supply and exhaust fans.
    b. Fire and/or smoke dampers.
6. Manual control and annunciation of system audio status shall be provided by a set of modular switch units. Each module shall include eight discreet, momentary push button switched devices. Membrane type switches for this purpose shall not be acceptable.
    a. Each switch shall include space for labeling switch function. The label shall be protected behind a clear protective membrane cover. In addition, each switch shall have two LED's associated with it. One of the LED's shall be amber in color and shall indicate a fault condition on a zone or zone's associated with that switch. The second LED shall be dual color red/green, and be capable through software configuration, to clearly indicate zone status including which audio source is active (i.e. Evacuation, Alert, Page, etc.)
7. Status only annunciation shall be provided by a set of modular visual Led indicators. Each module shall be capable, through system software mapping to include, but not limited to alarms and troubles. Each module shall include eight individual status indicators each containing one dual color LED for red and green status, and one amber color LED for zone integrity monitoring.
8. HVAC supply-exhaust units and fire and smoke dampers shall be provided with a hand off-on-auto switch module with LED indicators. LED indication shall be red for "off", green for "on" and amber for monitoring circuit integrity. In addition, visual indication shall be provided for positive feedback confirmation of field devices. LED status annunciation shall be real time and actual, derived from a monitored auxiliary contact on the fan contactor, sail switch or atmospheric pressure switch installed downstream from the fan.
9. Devices shall be listed by U.L. for sensitivity testing by means of the portable programmer/tester or by readout from the control panel. Device address and sensitivity assignments shall be predetermined electronically, devices requiring dip switch settings, rotary switch settings, staples or jumper settings are not acceptable.
10. Smoke detectors shall alarm at their programmed sensitivity settings and shall not revert to a common default setting when their operating system segment is in the default mode.
11. Software and Firmware Control:

a. All software and firmware provided with a fire alarm system shall be listed for use with the fire alarm control unit.
b. A record of installed software and firmware version numbers shall be maintained at the location of the fire alarm control unit.
c. All software and firmware shall be protected from unauthorized changes through the use of "access levels."

12. Conductors
a. Each conductor shall be identified as shown on the drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.
b. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer wiring guides.
c. Wiring for analog loop circuits, conventional detection circuits, speaker circuits and telephone circuits shall based on the fire alarm manufactures wiring guidelines, but shall not be smaller then #16 AWG.
d. Plenum rated cable, if used, shall be rated for 150§ degrees Celsius with an insulation of Teflon or its equivalent.
e. Splices shall be made with UL listed mechanical connectors or shall be soldered and taped to assure reliable service.
f. Crimp-on type spade lugs shall be used for termination's of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.
g. Wire nuts or other solderless splicing devices shall not be used.
h. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.
i. A consistent color code for fire alarm system conductors throughout the installation shall be provided. The installation Contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.
j. All nominal voltage branch circuit power feeds (120/220 Vac) shall be identified "labeled" at both ends of the circuit to indicate it's source and purpose.
k. Wiring within system control panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance and to isolate nominal voltage wiring from system low voltage wiring.
l. Splices in electrical conductors in vertical risers are prohibited except when the length of conductors exceeds 150 feet in vertical risers, an approved terminal cabinet shall be used.

2.2 WIRE

A. Wire: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install system according to NFPA standards referenced in Parts 1 and 2 of this Section.

3.2 EQUIPMENT INSTALLATION

A. Smoke detection devices which are mounted in ducts shall be supplied with remote "triggered" indication pilot wired in parallel, in an approved manner, with the similar pilots included integrally with detection units. The pilots for duct detectors shall each be flush or surface mounted within 15 feet circuiting distance of its associated detector. Mounting and location to be as directed by the Architect. Duct smoke detectors shall be low-flow type, and to be suitable to be installed in ducts with air velocity ranging between 100 feet per minute and 4,000 feet per minute.

B. Smoke detectors indicated as being located in floor or ceiling cavities of the air handling type shall be equipped with "air shields" where air velocities are such as to require these appurtenances for the proper detection of smoke.

C. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems". Conceal raceway except in unfinished spaces and as indicated.

B. Wiring within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and a different color code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visual alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

E. The minimum temperature rating of the cables shall be 150 Deg. Celsius.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification for Electrical Systems.

3.5 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements of Division 26 Section "Grounding and Bonding for Electrical Systems".

D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

3.7 FIELD TESTING

A. Each addressable analog smoke detector shall be individually field tested prior to installing the device at its designated location to ensure reliability after shipment and storage conditions. A dated log indicating correct address, type of device, sensitivity and initials of the technician performing test - using test equipment specifically designed for that purpose - shall be prepared and kept for final acceptance documentation. After testing, the detection devices and base shall be labeled with the system address, date and initials of the installing technician. Labeling shall not be visible after installation is complete.

B. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
1. A systematic record shall be maintained of all readings using schedules or charts of tests and measurements. Areas shall be provided on the logging form for readings, dates and witnesses.
2. The acceptance inspector shall be notified before the start of any required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector, shall be corrected.
3. Test reports shall be delivered to the acceptance inspector as completed.

C. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing Contractor. The following equipment shall be a minimum for conducting the tests:
1. Ladders and scaffolds as required to access all installed equipment.
2. Multimeter for reading voltage. current and resistance.
3. Intelligent device programmer-tester.
4. Laptop computer with programming software for any required program revisions.
5. Two way radios, flashlights, smoke generation devices and supplies.
6. Spare printer paper.
7. An approved device for measuring air flow through air duct smoke detector sampling assemblies.
8. Decibel meter.
9. Testing documentation.

D. In addition to the testing specified to be performed by the installing Contractor, the installation shall be subject to test by the acceptance inspector.

3.8 FINAL ACCEPTANCE TESTING

A. A written “Acceptance Test Procedure” (ATP) for testing the fire alarm system components and installation will be prepared by the Engineer in accordance with NFPA 72 and this Specification. The Contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits and programming.

B. A final Asbuilt Function Matrix shall be prepared by the installing Contractor referencing each alarm input to every output function affected as a result of an alarm, trouble or supervisory condition on that input. In the case of outputs programmed using more complex logic functions involving "any", "or", "not", "count", "time", and "timer" statements; the complete output equation shall be referenced in the matrix.

C. A complete listing of all device labels for alpha-numeric annunciator displays and logging printers shall be prepared by the installing Contractor prior to the ATP.

D. The acceptance inspector shall use the system record drawings in combination with the documents specified. During the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request a demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
   1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
      a. Open, shorted and grounded intelligent analog signaling circuit.
      b. Open, shorted and grounded network signaling circuit.
      c. Open, shorted and grounded conventional zone circuits.
      d. Open, shorted and grounded speaker, telephone circuits.
      e. Intelligent device removal.
      f. Primary power or battery disconnected.
      g. Incorrect device at address.
      h. Printer trouble, off line or out of paper.
      i. Loss of data communications between system control panels.
      j. Loss of data communications between system annunciators.
   2. System evacuation alarm indicating appliances shall be demonstrated as follows:
      a. All alarm notification appliances actuate as programmed.
      b. Audibility and visibility at required levels.
   3. System indications shall be demonstrated as follows:
      a. Correct message display for each alarm input at the control panel, each remote alpha-numeric LCD display.
      b. Correct annunciator light for each alarm input, at each annunciator and color graphic terminal.
      c. Correct printer logging for all system activity.
   4. System on-site and/or off-site reporting functions shall be demonstrated as follows:
      a. Correct alarm custom message display, address, device type, date and time transmitted for each alarm input.
      b. Correct trouble custom message display, address, device type, date and time transmitted for each alarm input.
      c. Trouble signals received for disconnect.
   5. Secondary power capabilities shall be demonstrated as follows:
      a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
      b. System primary power shall be restored for forty eight hours and system charging current shall be normal trickle charge for a fully charged battery bank.
      c. System battery voltages and charging currents shall be checked at the fire alarm control panel using the test codes and displayed on the LCD display.

E. In the event of system failure to perform as specified and programmed during the ATP procedure, at the discretion of the acceptance inspector, the test shall be terminated.
   1. The installing Contractor shall retest the system, correcting all deficiencies and providing test documentation to the acceptance inspector.

2. In the event that software changes are required during the ATP, a utility program shall be furnished by the system manufacturer to compare the edited program with the original. This utility shall yield a printed list of the changes and all system functions, inputs and outputs affected by the changes. The items listed by this program shall be the minimum acceptable to be retested before calling for resumption of the ATP. The printed list and the printer log of the retesting shall be submitted before scheduling of the ATP.
3. The acceptance inspector may elect to require the complete ATP to be performed again if, in his opinion, modifications to the system hardware or software warrant complete retesting.

3.9 DOCUMENTATION

A. System documentation shall be furnished to the Owner and shall include but not be limited to the following:
   1. System record drawings and wiring details including one set of reproducible masters and drawings on 3 ½ inch floppy disks in a DXF format suitable for use in a CAD drafting program.
   2. System operation, installation and maintenance manuals.
   3. Written documentation for all logic modules as programmed for system operation with a matrix showing interaction of all input signals with output commands.
   4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
   5. System program “hard copy” showing system functions, controls and labeling of equipment and devices.
   6. All specified documentation as required.

3.10 TEST EQUIPMENT

A. The Contractor shall furnish to the Owner all test equipment as required to program the field analog devices, specifically an intelligent device programmer-tester or a calibrated smoke generator with power source.

3.11 WARRANTY/SERVICES

A. The Contractor shall warrant the entire system against system hardware and electrical defects including programming software defects for a period described in the contract general conditions, but not less than one year. This period shall begin upon satisfactory completion and certification of final acceptance testing of the system and sign acceptance of consulting Engineer. Contractor shall provide to Owner a letter stating the start-date and end-date of warranty period. In addition, the Contractor shall also provide an updated list of name(s) and phone number(s) for normal and off hours contacts necessary to respond to warranty issues. Response to warranty notification shall require a reply within 24 hours of initial contact.

3.12 TRAINING

A. The fire alarm Contractor shall furnish training as follows for a minimum of four employees of the system user:
   1. Training in the receipt, handling and acknowledgment of alarms.
   2. Training on system operation including manual control of output functions from the FCS.
   3. Training in the testing of the system including logging of detector sensitivity, field test of devices and response to common troubles.
   4. The total training requirement shall be a minimum of 8 hours but shall be sufficient to cover all items specified.
   5. The manufacture shall provide a written schedule of training dates for factory training of owners representatives. Include all fee’s, dates, times, phone numbers and contact individual.

END OF SECTION

EXHIBIT D: DRAWINGS

ABBREVIATIONS

NOTE: CONTACT ARCHITECT FOR EXPLANATIONS OF ANY ABBREVIATIONS NOT SHOWN BELOW.

A.F.F.	ABOVE FINISHED FLOOR
ACOUST.	ACOUSTIC / ACOUSTICAL
ADJ.	ADJUSTABLE / ADJACENT
A.C.	AIR CONDITIONING
AL.	ALIGN
ALUM.	ALUMINUM
ANOD.	ANODIZED
APPROX.	APPROXIMATE
ARCH.	ARCHITECT (URAL)
AD	AREA DRAIN
@	AT
BSMT.	BASEMENT
BM.	BEAM
BLKG.	BLOCKING
BD.	BOARD
BOT.	BOTTOM
B.O.	BOTTOM OF
BRK.	BRICK
BLDG.	BUILDING
B.U.R.	BUILT UP ROOF
CAB.	CABINET
C.I.	CAST IRON
C.H.	CABINET HEATER
CER.	CERAMIC
C.J.	CONTROL JOINT
CLG.	CEILING
CEM.	CEMENT (ITUOUS)
C.L.	CENTERLINE
C.D.	CEILING DIFFUSER
C.R.	CEILING REGISTER
C.B.	CATCH BASIN
C.O.	CLEAN OUT
CLOS., CL.	CLOSET
CLR.	CLEAR
C.W.	COLD WATER
CONC.	CONCRETE
COL.	COLUMN
CONST.	CONSTRUCTION
C.M.U.	CONCRETE MASONRY UNIT
CONT.	CONTINUOUS
CONTR.	CONTRACTOR
CORR.	CORRIDOR
C.	CONDUIT
CRS.	COURSE
D	DOWN
DET.	DETAIL
D.P.	DAMPPROOFING
DIAG.	DIAGONAL
DIA.	DIAMETER
DIM.	DIMENSION
DISP.	DISPENSER
DN.	DOWN
DWG.	DRAWING
D.F.	DRINKING FOUNTAIN
E	EAST
EC.	EMPTY CONDUIT
ELEC.	ELECTRIC (AL)
EWC.	ELECTRIC WATER COOLER
EL.	ELEVATION
ELEV.	ELEVATOR
EQ.	EQUAL
EQUIP.	EQUIPMENT
EXH.	EXHAUST
E.J., EXP. JT	EXPANSION JOINT
EXISTG., EXIST.	EXISTING
EXT.	EXTERIOR
F.O.B.	FACE OF BLOCK/BRICK
FIN.	FINISH (ED)
F.T.	FIN TUBE
F.A.P.	FIRE ANNUNCIATOR PANEL
F.E.C.	FIRE EXTINGUISHER CABINET
F.H.C.	FIRE HOSE CABINET
F.P.	FIRE PROOF (ING)
F.R.	FIRE RATED
FIX.	FIXTURE
FLSHG.	FLASHING
FL.	FLOOR
FD	FLOOR DRAIN
FLUOR.	FLUORESCENT
FDN.	FOUNDATION
FTG.	FOOTING
F.H.	FULL HEIGHT
GALV.	GALVANIZED
GA.	GAUGE
GL.	GLASS
GR.	GRADE
GRAN.	GRANITE
G.L.	GRID LINE
G.W.B., GYP. BD	GYPSUM WALL BOARD
H.C.	HANDICAPPED
H.D. GALV.	HOT DIPPED GALVANIZED
H.R.	HAND RAIL
HDWR.	HARDWARE
HDWD.	HARDWOOD
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
HT	HEIGHT
H.M.	HOLLOW METAL
HOR.	HORIZONTAL
H.W.	HOT WATER
INCL.	INCLUDING
I.D.	INSIDE DIAMETER
INS., INSUL.	INSULATION
INT.	INTERIOR
JAN. CL.	JANITOR CLOSET
JT.	JOINT
LAM.	LAMINATE / LAMINATED
LAV.	LAVATORY
LDR.	LEADER
LT. FIX.	LIGHT FIXTURE
LW.	LIGHTWEIGHT
LMS.	LIMESTONE
LTL.	LINTEL
LBS.	POUNDS
M.O.	MASONRY OPENING
MAT'L.	MATERIAL
MAX.	MAXIMUM
MECH.	MECHANICAL
MEMB.	MEMBRANE
MTL.	METAL
MIN.	MINIMUM
M.M., MISC. MTL.	MISCELLANEOUS METAL
NOM.	NOMINAL
N.I.C.	NOT IN CONTRACT
N.T.S.	NOT TO SCALE
N.	NORTH
No., #	NUMBER
O.C.	ON CENTER
OPNG.	OPENING
OPP. HND.	OPPOSITE HAND
OPP. SIM.	OPPOSITE SIDE SIMILAR
O.D.	OUTSIDE DIAMETER
O/	OVER
O.P.	OVERFLOW PIPE
O.H.	OVERHEAD
PTD.	PAINTED
PNL.	PANEL
PLAS.	PLASTIC
PL. LAM.	PLASTIC LAMINATE
PLYWD.	PLYWOOD
P.P.	POLISHED PLATE
P.S.I.	POUNDS PER SQUARE INCH
P.S.F.	POUNDS PER SQUARE FOOT
P.M.F.	PRE MOLDED FILLER
P.L.	PROPERTY LINE
PS	PROJECTION SCREEN
RAD.	RADIUS, RADIATOR
REC.	RECESSED
REG.	REGISTER
REINF.	REINFORCED, REINFORCING
RES.	RESILIENT
RET.	RETURN
REF.	REFER (ENCE)
REFL.	REFLECTED
REV.	REVISED, REVISION
R.	RISER
R.D.	ROOF DRAIN
R.S.	ROOF SCUPPER
RM.	ROOM
R.O.	ROOF OPENING
SAN. SEW.	SANITARY SEWER
SCH., SCHED.	SCHEDULE
S.D.	SCUPPER DRAIN
SEC.	SECTION
SEP.	SEPARATE
SIM.	SIMILAR TO
S.	SOUTH
SPEC.	SPECIFICATIONS
SPR, SPKLR.	SPRINKLER
SQ.	SQUARE
SMD	SEE MECHANICAL DRAWINGS
SSD	SEE STRUCTURAL DRAWINGS
S.S., ST/STL.	STAINLESS STEEL
STL.	STEEL
STOR.	STORAGE
ST. SEW.	STORM SEWER
STR., STRUC.	STRUCTURE
SP	SUMP PUMP
SW	SWITCH
THERM, T'STAT.	THERMOSTAT
TB.	TACKBOARD
TEL.	TELEPHONE
T.G.	TEMPERED GLASS
T.C.	TERRA COTTA
	THERMOSTAT
T.O.	TOP OF
TRANS.	TRANSFORMER
T.	TREAD
T.D.	TRENCH DRAIN
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
U.	UP
V.C.	VALVE CABINET
V.B.	VAPOR BARRIER
V/D	VOICE/DATA
VEN.	VENEER
V.F.D.	VARIABLE FREQUENCY DRIVE
V.I.F.	VERIFY IN FIELD
VERT.	VERTICAL
VEST.	VESTIBULE
V.C.T.	VINYL COMPOSITION TILE
VT.	VINYL TILE
W.	WEST, WATER, WASTE
W.C.	WATER CLOSET
W.P.	WATER PROOFING
W.R.	WATER RESISTANT
W.W.M.	WELDED WIRE MESH
WDW.	WINDOW
WKSP.	WORKSPACE
W/	WITH
W/O	WITHOUT
WD.	WOOD

GENERAL NOTES

1. SCOPE OF WORK: INTERIOR RENOVATION OF SELECT PORTIONS OF THE THIRD FLOOR, INCLUDING RELATED MECHANICAL, STRUCTURAL, ELECTRICAL, FIRE SUPPRESSION AND FIRE ALARM WORK. PORTIONS OF WORK INCLUDE ADDITIONAL MECHANICAL AND STRUCTURAL SCOPE FROM THIRD FLOOR TO THE ROOF.
   NO CHANGE IN USE, *EGRESS* OR OCCUPANCY PROPOSED UNDER THIS APPLICATION.
2. WORK SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT CODE OF THE NYC BUILDING DEPARTMENT AND ALL SUBSEQUENT AMENDMENTS, REGULATIONS OF NEW YORK CITY AND NEW YORK STATE, AND THE REGULATIONS OF THE AMERICANS WITH DISABILITIES ACT (ADA), 1968 CODE, 2022 MEP STRUCTURAL CODE, 2025 ENERGY CODE.
3. BEFORE COMMENCING WORK, THE CONTRACTOR SHALL FILE ALL REQUIRED CERTIFICATES OF INSURANCE WITH THE DOB, OBTAIN ALL REQUIRED PERMITS, AND PAY ALL FEES REQUIRED BY GOVERNING NYC AGENCIES.
4. REFER TO PROJECT SPECIFICATIONS FOR GENERAL MATERIAL, WORKMANSHIP, SHOP DRAWING REQUIREMENTS, WORK RULES AND DELIVERY & REMOVAL REQUIREMENTS.
5. ALL DIMENSIONS SHALL BE FIELD VERIFIED AND COORDINATED BY THE CONTRACTOR WITH ALL TRADES. INCONSISTENCIES SHALL BE REPORTED TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.
6. CONTRACTOR SHALL VERIFY ALL PROPOSED AND EXISTING DIMENSIONS AND ELEVATIONS IN THE FIELD. NOTIFY THE ARCHITECT IMMEDIATELY- AND BEFORE PROCEEDING WITH RELEVANT ASPECTS OF THE WORK- OF ANY LAYOUT CONDITION THAT IS NOT CONSISTENT WITH PLANS OR THAT WILL IMPAIR LAYOUT, ATTACHMENTS, OR FINISHES.
7. DO NOT SCALE FROM DRAWINGS. USE INDICATED DIMENSIONS AND ELEVATIONS. NOTIFY ARCHITECT-IMMEDIATELY AND BEFORE PROCEEDING- OF ANY LAYOUT CONDITION THAT IS NOT CONSISTENT WITH THE DRAWING OR THAT WILL IMPAIR LAYOUT OF ANY TRADE.
8. DIMENSIONING FORMAT FOR THE ARCHITECTURAL DRAWINGS IS THAT DIMENSIONS ARE TO FINISH FACE UNLESS NOTED OTHERWISE.
9. MINOR DETAILS NOT USUALLY SHOWN OR SPECIFIED, BUT NECESSARY FOR PROPER CONSTRUCTION OF ANY PART OF THE WORK SHALL BE INCLUDED AS IF THEY WERE INDICATED IN THE DRAWINGS.
10. THE CONTRACTOR SHALL COORDINATE ALL WORK PROCEDURES WITH REQUIREMENTS OF LOCAL AUTHORITIES AND BUILDING OWNER.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL CONDITIONS AND MATERIALS WITHIN THE PROPOSED CONSTRUCTION AREA. THE CONTRACTOR SHALL DESIGN AND INSTALL ADEQUATE SHORING AND BRACING FOR ALL STRUCTURAL OR REMOVAL TASKS. THE CONTRACTOR SHALL HAVE SOLE RESPONSIBILITY FOR ANY DAMAGE OR INJURIES CAUSED BY OR DURING THE EXECUTION OF THE WORK.
12. PLUMBING, SPRINKLER AND ELECTRICAL WORK SHALL BE PREFORMED BY PERSONS LICENSED IN THEIR TRADES WHO SHALL ARRANGE FOR AND OBTAIN INSPECTIONS AND REQUIRED SIGN-OFFS.
13. THE CONTRACTOR SHALL DO ALL CUTTING, PATCHING AND REPAIRING AS REQUIRED TO PERFORM ALL OF THE WORK INDICATED ON THE DRAWINGS, AND ALL OTHER WORK THAT MAY BE REQUIRED TO COMPLETE THE JOB.
14. ALL PIPING AND WIRING SHALL BE REMOVED TO A POINT OF CONCEALMENT AND SHALL BE PROPERLY CAPPED OR PLUGGED.
15. THE CONTRACTOR, UPON COMPLETION OF THE WORK, SHALL ARRANGE FOR DEPARTMENT OF BUILDINGS INSPECTIONS AND SIGN-OFFS AS REQUIRED.
16. THE CONTRACTOR SHALL CONFIRM AND MAINTAIN ALL PAPERWORK RELEVANT TO THE PROJECT.

LOCAL LAW 58/87 NOTES

1. PROPOSED WORK TO COMPLY WITH APPLICABLE REQUIREMENTS OF LOCAL LAW #58/87 FOR HANDICAPPED ACCESS.
2. CONTROLS AND OPERATING MECHANISMS SHALL BE OPERABLE WITH ONE HAND AND SHALL NOT REQUIRE TIGHT GRASPING, PINCHING OR TWISTING OFTHE WRIST, AS PER 4-6, 4.25.4.
3. ACCESSIBLE ROUTES TO BE PROVIDED BETWEEN NEW FACILITIES, PROVIDING A MINIMUM OF 36 INCHES OF WIDTH ALONG THE ACCESSIBLE ROUTE AS PER RS 4-6, 4.3.1, AND A MINIMUM OF 32 INCHES OF WIDTH AT DOORWAYS, AS PER RS 4-6, 4.13.5ALL NEW AND RELOCATED DOORS TO BE MIN 2'-10" WIDE WITH HANDICAPPED USABLE HARDWARE AND PROPER CLEARANCES AND/ OR AUTOMATIC DOOR OPENERS.

PLUMBING & DRAINAGE NOTES

1. ALL PLUMBING AND GAS PIPING WORK SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF 2022 NEW YORK CITY PLUMBING CODE.
2. PLUMBING FIXTURES SHALL BE OF TYPE AND MANUFACTURE APPROVED FOR USE IN NEW YORK CITY AND SHALL BEAR BS&A APPROVAL.
3. PLUMBING CONTRACTOR TO EXAMINE PROPOSED LAYOUT WITH REGARD TO EXISTING FIELD CONDITIONS AND SHALL NOTIFY ARCHITECT OF ANY DISCREPANCIES BETWEEN ASSUMED FIELD CONDITIONS AND THOSE ENCOUNTERED DURING CONSTRUCTION. PLUMBING CONTRACTOR SHALL INFORM ARCHITECT OF ANY REVISIONS TO PLAN WHICH SHALL BE NECESSARY BASED ON CONDITIONS UNCOVERED IN THE FIELD, IN ORDER TO INSTALL ALL FIXTURES, EQUIPMENT AND PIPING IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE NYC BUILDING CODE.
4. PLUMBING CONTRACTOR SHALL ARRANGE AND OBTAIN INSPECTIONS AND REQUIRED SIGN-OFFS.

SPECIAL INSPECTIONS

FIRE-RESISTANT PENETRATIONS AND JOINTS - BC 1705.17
FIRE RESISTANT RATED CONSTRUCTION - BC 110.3.4
FINAL INSPECTIONS - UNDER DIRECTIVE 14
POST-INSTALLED ANCHORS PER 2022 NYCBC 1705.37.
ENERGY CODE COMPLIANCE INSPECTION PER 2022 110.3.5.
SPRINKLER SYSTEMS INSPECTION PER 2022 NYCBC 1705.29.
MECHANICAL SYSTEMS - BC 1705.21
STRUCTURAL STEEL - WELDING (BC 1705.2.1)
STRUCTURAL STEEL - DETAILS (BC 1705.2.2)
STRUCTURAL STEEL - HIGH STRENGTH BOLTING (BC 1705.2.3)

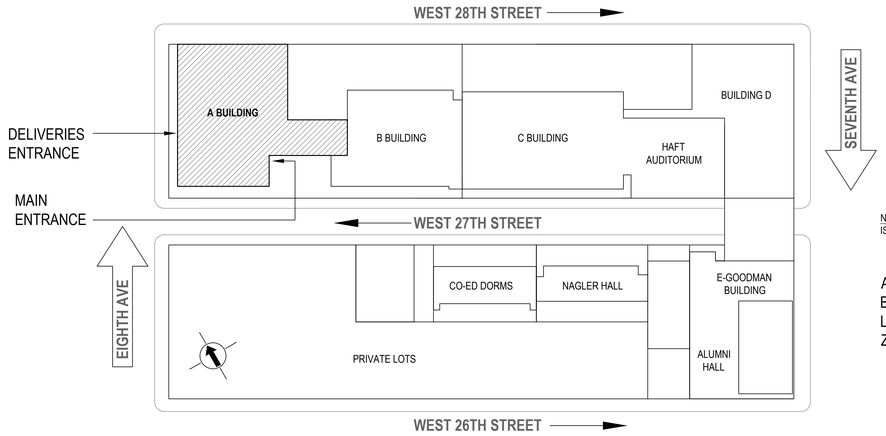
PROGRESS INSPECTIONS

1. FIRE RESISTANT RATED CONSTRUCTION - BC 110.3.4
2. ENERGY CODE COMPLIANCE INSPECTIONS - BC 110.3.5
3. FINAL INSPECTION, PER DIRECTIVE 14
4. NYC ENERGY CONSERVATION CODE INSPECTIONS:
   - 4.1. VENTILATION AND AIR DISTRIBUTION SYSTEMS (IB2)
   - 4.2. HVAC-R AND SERVICE WATER HEATING EQUIPMENT - (IB3), (IIB3)
   - 4.3. HVAC-R AND SERVICE WATER HEATING SYSTEM CONTROLS - (IB4), (IIB4)
   - 4.4. HVAC-R AND SERVICE WATER PIPING DESIGN AND INSULATION - (IB5), (IIB5)
   - 4.5. DUCT LEAKAGE TESTING, INSULATION AND DESIGN - (IB6), (IIB6)
   - 4.6. MAINTENANCE INFORMATION - (ID1), (IID1)
   - 4.7. SHUTOFF DAMPERS - (IIB2)
   - 4.8. ELECTRICAL MOTORS - (IIC6)

SCIENCE LAB RENOVATION
FASHION INSTITUTE OF TECHNOLOGY

340 8TH AVENUE AND 27TH STREET, NEW YORK, NY 10001

100% BID DOCUMENT SET



NOTE: ACCESS TO 27TH STREET IS LIMITED

ADDRESS: 340 8TH AVENUE NY, NY 10001
BLOCK: 777
LOT: 1
ZONING MAP: C6-2

1 SITE PLAN
NOT TO SCALE

DRAWING INDEX

ARCHITECTURAL

G-001 COVER SHEET
G-002 OCCUPANCY & EGRESS PLAN
D-001 DEMOLITION PLAN 3RD FLOOR
D-002 DEMOLITION REFLECTED CEILING PLAN 3RD FLOOR
D-003 DEMOLITION & CONSTRUCTION RCP 2ND FLOOR
A-001 PROPOSED FLOOR PLAN 3RD FLOOR
A-002 PROPOSED ENLARGED FLOOR PLAN 3RD FLOOR
A-011 PROPOSED REFLECTED CEILING PLAN 3RD FLOOR
A-012 PROPOSED EQUIPMENT PLAN
A-013 ENLARGED DUCT PATHWAY PLANS
A-014 ENLARGED DUCT PATHWAY PLANS
A-021 INTERIOR ELEVATIONS & SECTIONS
A-022 INTERIOR ELEVATIONS & SECTIONS
A-041 PLAN AND SECTION DETAILS
A-051 PARTITIONS TYPES & FINISH SCHEDULE
A-061 EQUIPMENT SCHEDULE
A-062 MILLWORK SCHEDULE
A-063 FURNITURE & PLUMBING SCHEDULE
A-071 DOOR, WINDOW & GLAZING SCHEDULES & DETAILS
A-081 DEVICE PLAN
A-091 MILLWORK DETAILS
A-092 MILLWORK DETAILS
A-093 MILLWORK DETAILS
A-094 MILLWORK DETAILS
A-095 MILLWORK DETAILS
A-096 MILLWORK DETAILS

STRUCTURAL

S-001 GENERAL NOTES AND KEY PLAN
S-100 4TH FLOOR - 6TH FLOOR PART FRAMING PLANS
S-101 7TH FLOOR - ROOF PART FRAMING PLANS
S-200 TYPICAL DETAILS

MECHANICAL

M-001.00 SYMBOL LIST, ABBREVIATIONS AND NOTES
M-011.00 3RD FLOOR DEMOLITION PLAN
M-101.00 3RD FLOOR PLAN
M-102.00 4TH, 5TH, 6TH FLOOR AND ROOF PART PLANS
M-103.00 7TH FLOOR PLAN
M-104.00 8TH FLOOR PLAN
M-501.00 DETAILS 1
M-502.00 DETAILS 2
M-701.00 SCHEDULES # 1
M-702.00 SCHEDULES # 2
M-801.00 CONTROL DIAGRAMS

ELECTRICAL

E-001.00 ELECTRICAL SYMBOLS ABBREVIATION AND DRAWING LIST
E-002.00 ELECTRICAL NOTES
E-011.00 3RD FLOOR ELECTRICAL DEMOLITION PLAN
E-101.00 3RD FLOOR ELECTRICAL LIGHTING PLAN
E-200.00 CELLAR ELECTRICAL POWER PLAN
E-201.00 3RD FLOOR ELECTRICAL POWER PLAN
E-202.00 ROOF ELECTRICAL PLAN
E-501.00 ELECTRICAL DETAILS
E-601.00 ELECTRICAL PARTIAL RISER DIAGRAM & PANEL SCHEDULES
EN-001.00 ENERGY COMPLIANCE SHEET #1
EN-002.00 ENERGY COMPLIANCE SHEET #2

PLUMBING

P-001.00 PLUMBING NOTES, SYMBOLS ABBREVIATIONS,& DRAWING LIST
P-012.00 2ND FLOOR PLUMBING DEMOLITION PLAN
P-013.00 3RD FLOOR PLUMBING DEMOLITION PLAN
P-102.00 2ND FLOOR PLUMBING PLAN
P-103.00 3RD FLOOR PLUMBING PLAN
P-601.00 PLUMBING RISER DIAGRAMS
P-701.00 PLUMBING DETAILS & SCHEDULES

FIRE ALARM

FA-001.00 FIRE ALARM NOTES, SYMBOLS LIST, AND RISER DIAGRAM
FA-011.00 3RD FLOOR FIRE ALARM DEMOLITION PLAN
FA-101.00 3RD FLOOR FIRE ALARM PLAN

FIRE PROTECTION

SP-001.00 SPRINKLER NOTES, SYMBOLS, & DRAWING LIST
SP-011.00 3RD FLOOR SPRINKLER DEMOLITION PLAN
SP-101.00 3RD FLOOR SPRINKLER PLAN
SP-601.00 SPRINKLER RISER DIAGRAM

BID SET NOTES :

AN ELECTRICAL ADDENDUM WILL BE ISSUES FOR ROUGH IN AND POWER FOR OWNER'S AV SCOPE. (AV EQUIPMENT WILL BE FURNISHED AND INSTALLED BY OWNER'S CONTRACTOR)

DRAWING SYMBOLS

INTERIOR ELEVATION — 1 / 2 / A.24
BUILDING SECTION — # / A.21
DETAIL SECTION — # / A.41
DETAIL BUBBLE — # / A.31
KEYED NOTE — #
PARTITION TYPE — #
DRAWING NUMBERS, TITLES — # DETAIL / SCALE
ELEVATION MARK/ DATUM — 2'-10" A.F.F. / T.O. SILL
AREA NOT IN SCOPE - NO WORK
WINDOW NUMBER — X
DOOR NUMBER — XXX
EQUIPMENT NUMBER — E-XX
CABINET NUMBER — E-XX
PLUMBING FIXTURE NUMBER — PL-X
ROOM NAME/NUMBER — ROOM NAME / 00X

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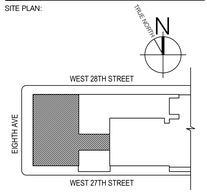
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SITE PLAN:



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04	100% BID DOCUMENT	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:

SHEET TITLE:
COVER SHEET

SHEET NUMBER:
G-001



BUILDING A

BUILDING B

SUMMARY

FIT THIRD FLOOR OCCUPANT LOAD :
810 OCCUPANTS

REQUIRED # OF EXITS FROM THIRD FLOOR:
1 EXITS

PROPOSED # OF EXITS FROM THIRD FLOOR:
4 EXITS

KEY

- MECH. ROOM — ROOM NAME
- X.XX — ROOM NUMBER
- 6389 — AREA OF SPACE IN NET SF
- 300 — OCCUPANT LOAD FACTOR
- 22 — OCCUPANCY
- PROJECT LIMIT LINE
- EXIT LIGHT FIXTURE, CEILING OR WALL MOUNTED WITH DIRECTIONAL ARROW AS NOTED.
- 314 / 360 — NUMBER OF OCCUPANTS EXITING AT LAST POINT OF EGRESS / FULL CAPACITY OF EGRESS DOOR
- 40 OF 130 — ASSUMED NUMBER OF OCCUPANTS EXITING AT INTERMEDIATE POINTS/JUNCTURE ALONG EGRESS PATH
- C.P.T. = 70 / DIST. (NORTH EXIT) = 150 / DIST. (SOUTH EXIT) = 225 — COMMON PATH OF TRAVEL/EXIT ACCESS TRAVEL DISTANCE; Maximum Common Path of Travel: 100 feet; Maximum Exit Access Travel Distance: 150 feet; DISTANCE TO (NORTH EXIT); DISTANCE TO (SOUTH EXIT)

TRAVEL DISTANCE

PATH FROM	TOTAL TR. DISTANCE	MAX. TR. DISTANCE
OFFICE	103'-0"	150'-0" (UNSPRINKLERED)
BIOMATERIALS RESEARCH	121'-0"	150'-0" (UNSPRINKLERED)
WET TEACHING LAB	149'-0"	150'-0" (UNSPRINKLERED)
DRY TEACHING LAB	136'-0"	150'-0" (UNSPRINKLERED)
ANALYTICS LAB	90'-0"	150'-0" (UNSPRINKLERED)

DOOR EGRESS CALCULATIONS

LOCATION	DOOR #	WIDTH	UNITS OF WIDTH	CAPACITY	MAXIMUM ALLOWABLE CAPACITY	PROPOSED CAPACITY
BUILDING A	1	(3)3'-0"	4.5	80	360	168
BUILDING A	2	(1)3'-0"	1.5	80	120	110
BUILDING A	3	(1)3'-0"	1.5	80	120	104
BUILDING A	4	(1)3'-0"	1.5	80	120	35
BUILDING B	5	(1)3'-0"	1.5	80	120	119
BUILDING B	6	(1)3'-0"	1.5	80	120	110
BUILDING B	7	(2)3'-0"	3	80	240	159
BUILDING B	8	(2)3'-0"	3	80	240	159

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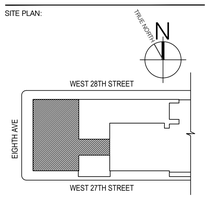
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SITE PLAN:



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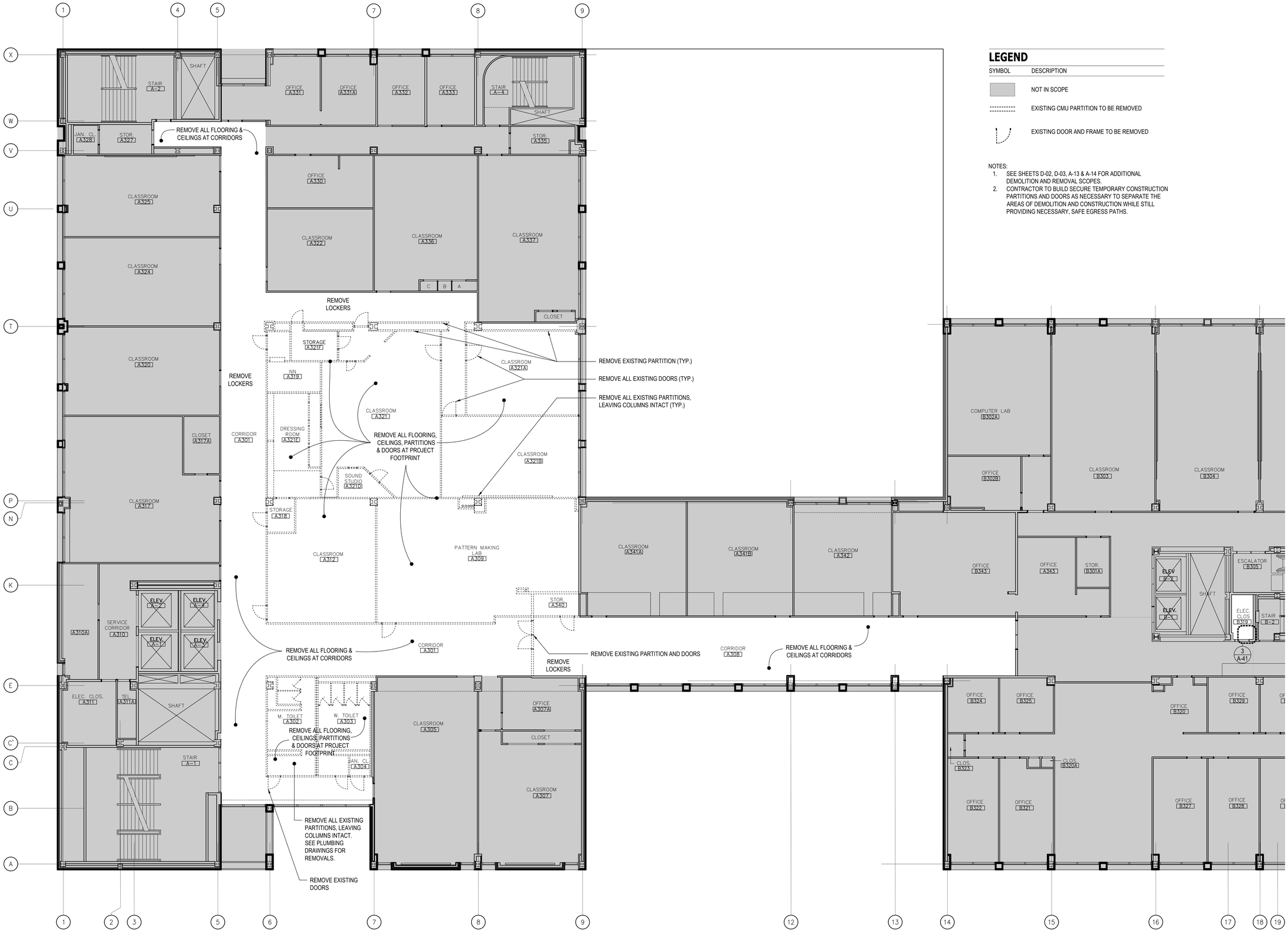
SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
3/32" = 1'-0"

SHEET TITLE:
OCCUPANCY & EGRESS PLAN

SHEET NUMBER:
G-002



LEGEND

SYMBOL	DESCRIPTION
	NOT IN SCOPE
	EXISTING CMU PARTITION TO BE REMOVED
	EXISTING DOOR AND FRAME TO BE REMOVED

NOTES:
1. SEE SHEETS D-02, D-03, A-13 & A-14 FOR ADDITIONAL DEMOLITION AND REMOVAL SCOPES.
2. CONTRACTOR TO BUILD SECURE TEMPORARY CONSTRUCTION PARTITIONS AND DOORS AS NECESSARY TO SEPARATE THE AREAS OF DEMOLITION AND CONSTRUCTION WHILE STILL PROVIDING NECESSARY, SAFE EGRESS PATHS.

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SITE PLAN:



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SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
1/8" = 1'-0"

SHEET TITLE:
DEMOLITION PLAN 3RD FLOOR

SHEET NUMBER:
D-001



LEGEND

SYMBOL	DESCRIPTION
	NOT IN SCOPE
	CEILING REMOVALS
	EXISTING CMU PARTITION / DOOR TO BE REMOVED
	EXISTING DOOR TO BE REMOVED

NOTES:

1. SEE SHEETS D-02, D-03, A-13 & A-14 FOR ADDITIONAL DEMOLITION AND REMOVAL SCOPES.
2. CONTRACTOR TO BUILD SECURE TEMPORARY CONSTRUCTION PARTITIONS AND DOORS AS NECESSARY TO SEPARATE THE AREA OF CONSTRUCTION WHILE STILL PROVIDING NECESSARY, SAFE EGRESS PATHS.

NOT FOR CONSTRUCTION

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SITE PLAN:



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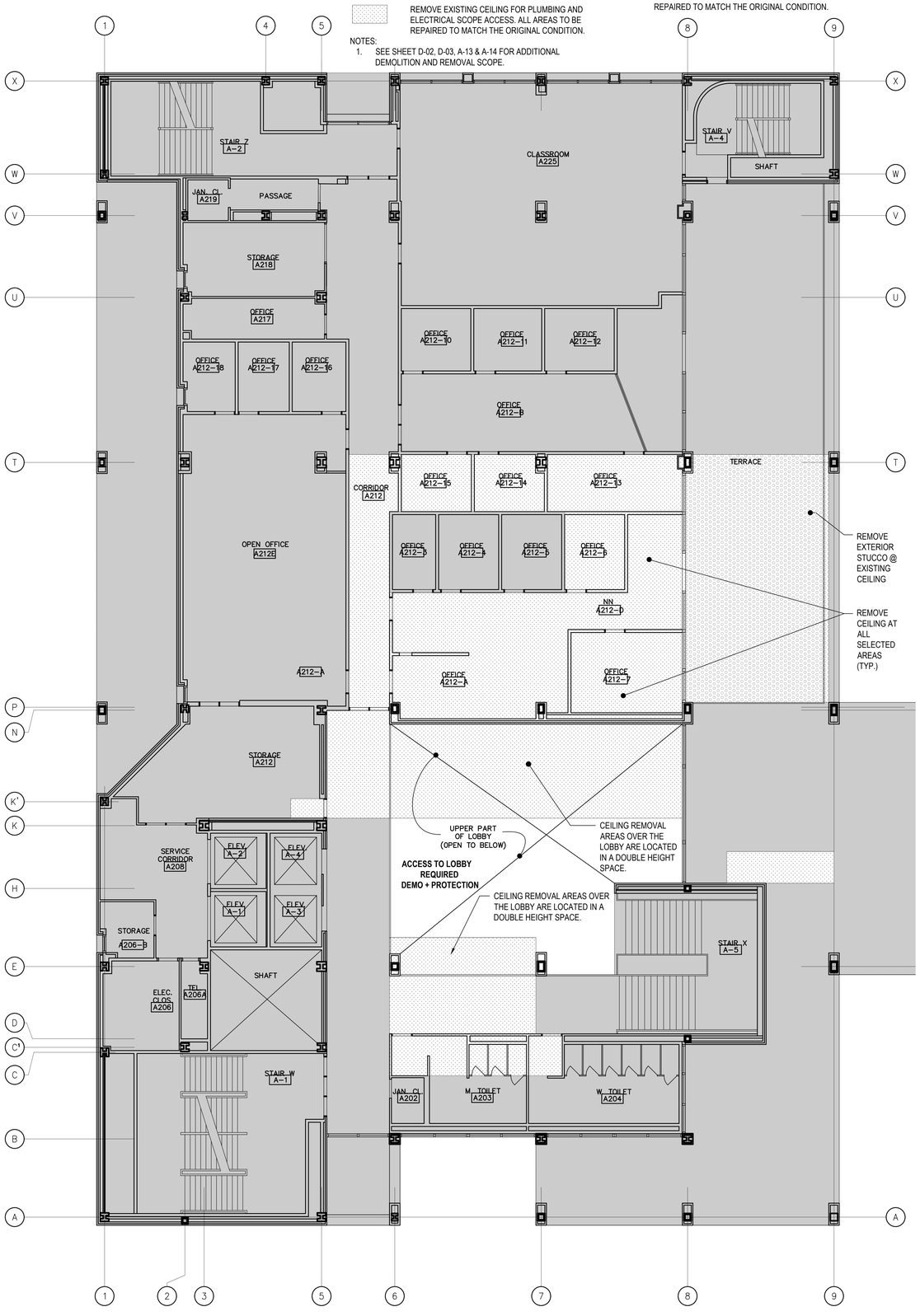
SHEET TITLE:
DEMOLITION RCP
3RD FLOOR

SHEET NUMBER:
D-002

LEGEND

SYMBOL	DESCRIPTION
	NOT IN SCOPE
	REMOVE EXISTING CEILING FOR PLUMBING AND ELECTRICAL SCOPE ACCESS. ALL AREAS TO BE REPAIRED TO MATCH THE ORIGINAL CONDITION.
	REMOVE EXISTING EXTERIOR CEILING FOR PLUMBING AND ELECTRICAL SCOPE ACCESS. ALL AREAS TO BE REPAIRED TO MATCH THE ORIGINAL CONDITION.

NOTES:
1. SEE SHEET D-02, D-03, A-13 & A-14 FOR ADDITIONAL DEMOLITION AND REMOVAL SCOPE.

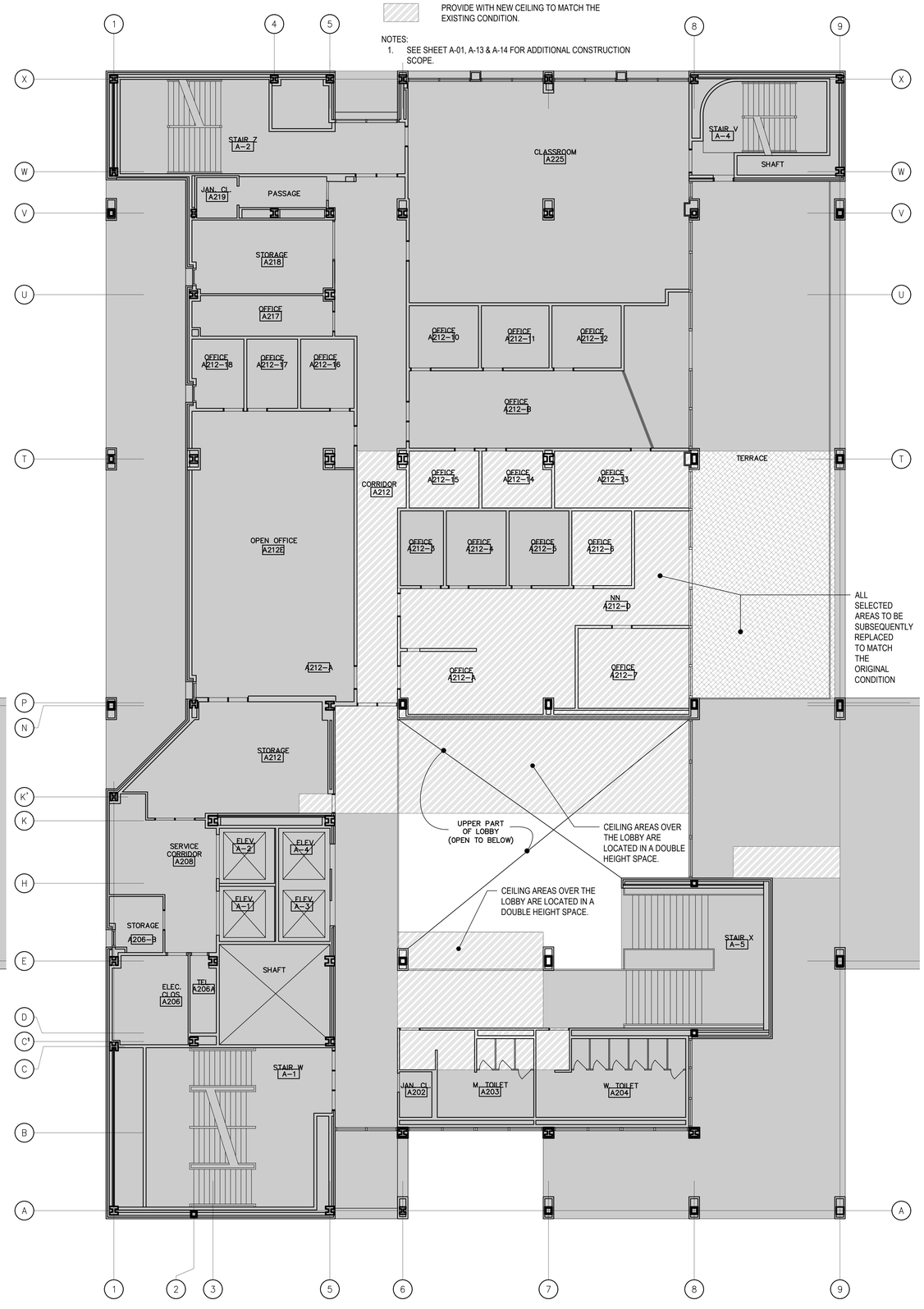


1 DEMOLITION REFLECTED CEILING PLAN 2ND FLOOR
1/8" = 1'-0"

LEGEND

SYMBOL	DESCRIPTION
	NOT IN SCOPE
	PROVIDE WITH NEW CEILING TO MATCH THE EXISTING CONDITION.
	PROVIDE WITH NEW EXTERIOR CEILING TO MATCH THE EXISTING CONDITION.

NOTES:
1. SEE SHEET A-01, A-13 & A-14 FOR ADDITIONAL CONSTRUCTION SCOPE.



2 PROPOSED REFLECTED CEILING PLAN 2ND FLOOR
1/8" = 1'-0"

NOT FOR CONSTRUCTION

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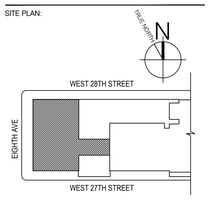
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DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
1/8" = 1'-0"

SHEET TITLE:
DEMOLITION & CONSTRUCTION RCP 2ND FLOOR

SHEET NUMBER:
D-003



LEGEND

SYMBOL	DESCRIPTION
	TEMPORARY CEILING AND TEMPORARY LIGHTING FOR PUBLIC CORRIDORS TO BE MAINTAINED
	TEMPORARY PARTITION
	NOT IN SCOPE (EGRESS FROM ALL SPACES SHALL BE MAINTAINED)

SHEET NOTES

1. CONTRACTOR TO ENSURE THAT CODE REQUIRED EMERGENCY EGRESS FROM ALL SPACES IS MAINTAINED ON THIS FLOOR.

NOT FOR CONSTRUCTION

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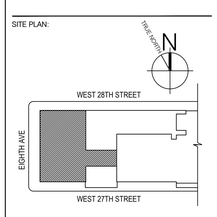
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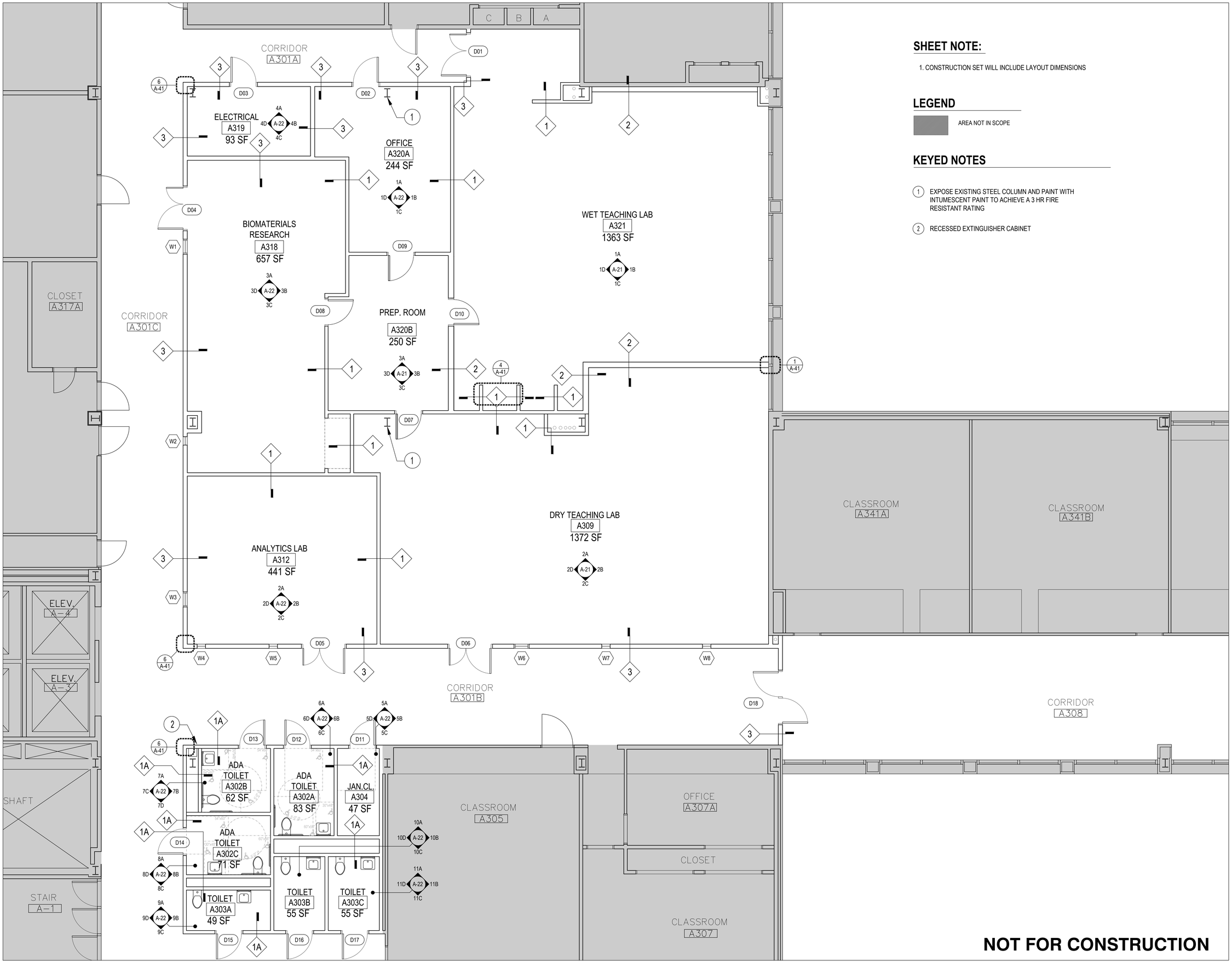
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SCALE:
1/8" = 1'-0"

SHEET TITLE:
PROPOSED OCCUPANT PROTECTION PLAN

SHEET NUMBER:
A-001



SHEET NOTE:

1. CONSTRUCTION SET WILL INCLUDE LAYOUT DIMENSIONS

LEGEND

AREA NOT IN SCOPE

KEYED NOTES

1. EXPOSE EXISTING STEEL COLUMN AND PAINT WITH INTUMESCENT PAINT TO ACHIEVE A 3 HR FIRE RESISTANT RATING
2. RECESSED EXTINGUISHER CABINET

NOT FOR CONSTRUCTION

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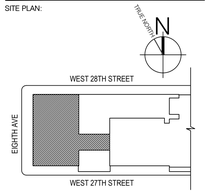
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03	100% DESIGN DEVELOPMENT	2026.03.31
04	100% BID DOCUMENT	2026.10.28

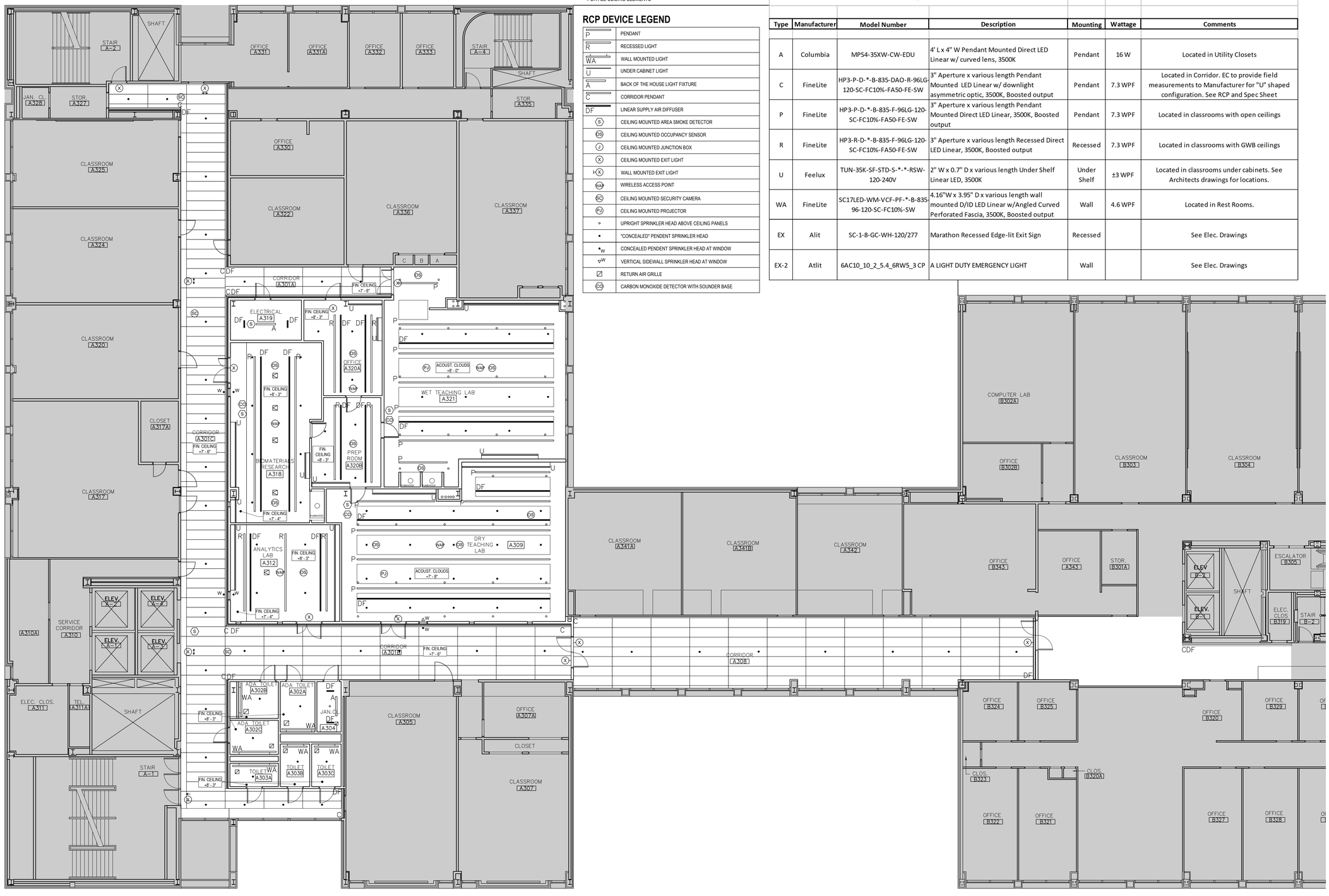
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DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
1/4" = 1'-0"

SHEET TITLE:
PROPOSED PLAN ENLARGED 3RD FLOOR

SHEET NUMBER:
A-002



SHEET NOTE:

1. CONSTRUCTION SET WILL INCLUDE LAYOUT DIMENSIONS FOR ALL CEILING ELEMENTS

RCP DEVICE LEGEND

P	PENDANT
R	RECESSED LIGHT
WA	WALL MOUNTED LIGHT
U	UNDER CABINET LIGHT
A	BACK OF THE HOUSE LIGHT FIXTURE
C	CORRIDOR PENDANT
DF	LINEAR SUPPLY AIR DIFFUSER
S	CEILING MOUNTED AREA SMOKE DETECTOR
OS	CEILING MOUNTED OCCUPANCY SENSOR
J	CEILING MOUNTED JUNCTION BOX
X	CEILING MOUNTED EXIT LIGHT
X	WALL MOUNTED EXIT LIGHT
WAP	WIRELESS ACCESS POINT
SC	CEILING MOUNTED SECURITY CAMERA
PJ	CEILING MOUNTED PROJECTOR
	UPRIGHT SPRINKLER HEAD ABOVE CEILING PANELS
	"CONCEALED" PENDENT SPRINKLER HEAD
W	CONCEALED PENDENT SPRINKLER HEAD AT WINDOW
W	VERTICAL SIDEWALL SPRINKLER HEAD AT WINDOW
	RETURN AIR GRILLE
CO	CARBON MONOXIDE DETECTOR WITH SOUNDER BASE

FIT Science Lab Renovation -Light Fixture Schedule - CD

Type	Manufacturer	Model Number	Description	Mounting	Wattage	Comments
A	Columbia	MPS4-35XW-CW-EDU	4' L x 4" W Pendant Mounted Direct LED Linear w/ curved lens, 3500K	Pendant	16 W	Located in Utility Closets
C	FineLite	HP3-P-D-*-B-835-DAO-R-96LG-120-SC-FC10%-FA50-FE-SW	3" Aperture x various length Pendant Mounted LED Linear w/ downlight asymmetric optic, 3500K, Boosted output	Pendant	7.3 WPF	Located in Corridor. EC to provide field measurements to Manufacturer for "U" shaped configuration. See RCP and Spec Sheet
P	FineLite	HP3-P-D-*-B-835-F-96LG-120-SC-FC10%-FA50-FE-SW	3" Aperture x various length Pendant Mounted Direct LED Linear, 3500K, Boosted output	Pendant	7.3 WPF	Located in classrooms with open ceilings
R	FineLite	HP3-R-D-*-B-835-F-96LG-120-SC-FC10%-FA50-FE-SW	3" Aperture x various length Recessed Direct LED Linear, 3500K, Boosted output	Recessed	7.3 WPF	Located in classrooms with GWB ceilings
U	Feelux	TUN-35K-SF-STD-S-*-*-RSW-120-240V	2" W x 0.7" D x various length Under Shelf Linear LED, 3500K	Under Shelf	±3 WPF	Located in classrooms under cabinets. See Architects drawings for locations.
WA	FineLite	SC17LED-WM-VCF-PF-*-B-835-96-120-SC-FC10%-SW	4.16"W x 3.95" D x various length wall mounted D/ID LED Linear w/Angled Curved Perforated Fascia, 3500K, Boosted output	Wall	4.6 WPF	Located in Rest Rooms.
EX	Alit	SC-1-8-GC-WH-120/277	Marathon Recessed Edge-lit Exit Sign	Recessed		See Elec. Drawings
EX-2	Atlit	6AC10_10_2_5.4_6RW5_3 CP	A LIGHT DUTY EMERGENCY LIGHT	Wall		See Elec. Drawings

NOT FOR CONSTRUCTION

FIT Science Lab Renovation

Project No. 2449

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212.217.7999

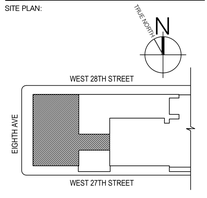
ARCHITECT
SAMUEL ANDERSON ARCHITECTS
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SAMUELANDERSON.COM

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LIGHTING DESIGNER
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212.206.8356

SITE PLAN:



SUBMITTAL:
100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% SCHEMATIC DESIGN	2025.02.06
02	10% DESIGN DEVELOPMENT	2026.11.12
03	100% DESIGN DEVELOPMENT	2026.03.31
04	100% BID DOCUMENT	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
1/8" = 1'-0"

SHEET TITLE:
PROPOSED RCP
3RD FLOOR

SHEET NUMBER:
A-011



SHEET NOTE:

1. SEE SHEET A-61 FOR EQUIPMENT SCHEDULE
2. SEE SHEET A-62 FOR MILLWORK SCHEDULE
3. SEE SHEET A-63 FOR FURNITURE AND PLUMBING SCHEDULES

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FIT Science Lab Renovation

Project No. 2449

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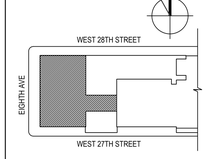
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SITE PLAN:



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04	100% BID DOCUMENT	2026.10.28

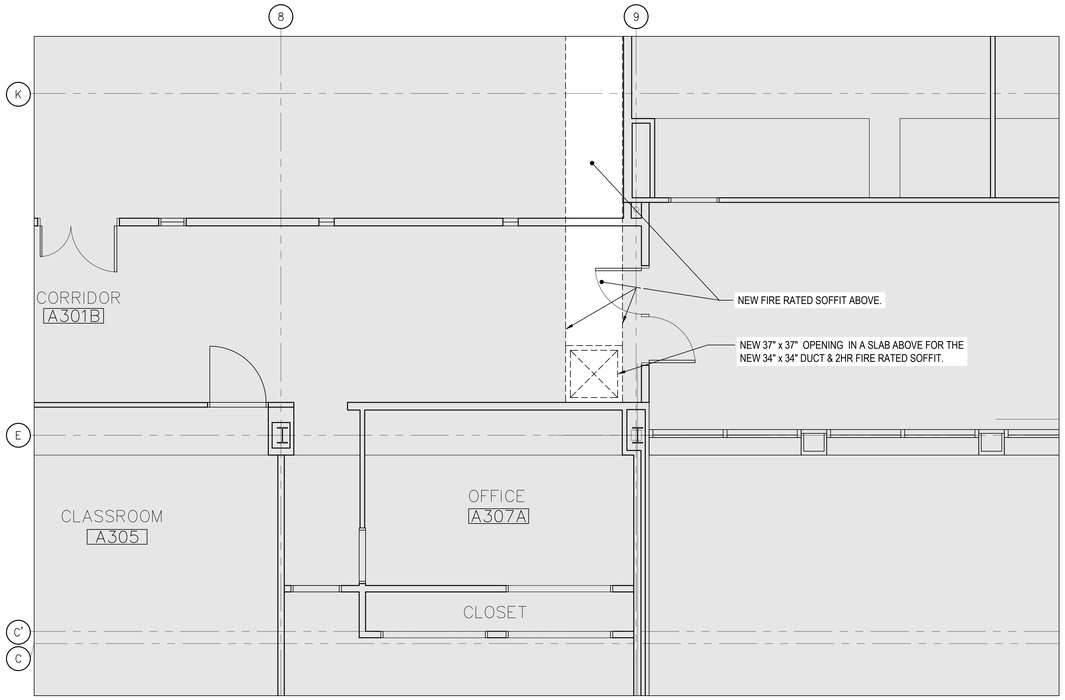
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DRAWN BY: KC, AS CHECKED BY: KB, SA

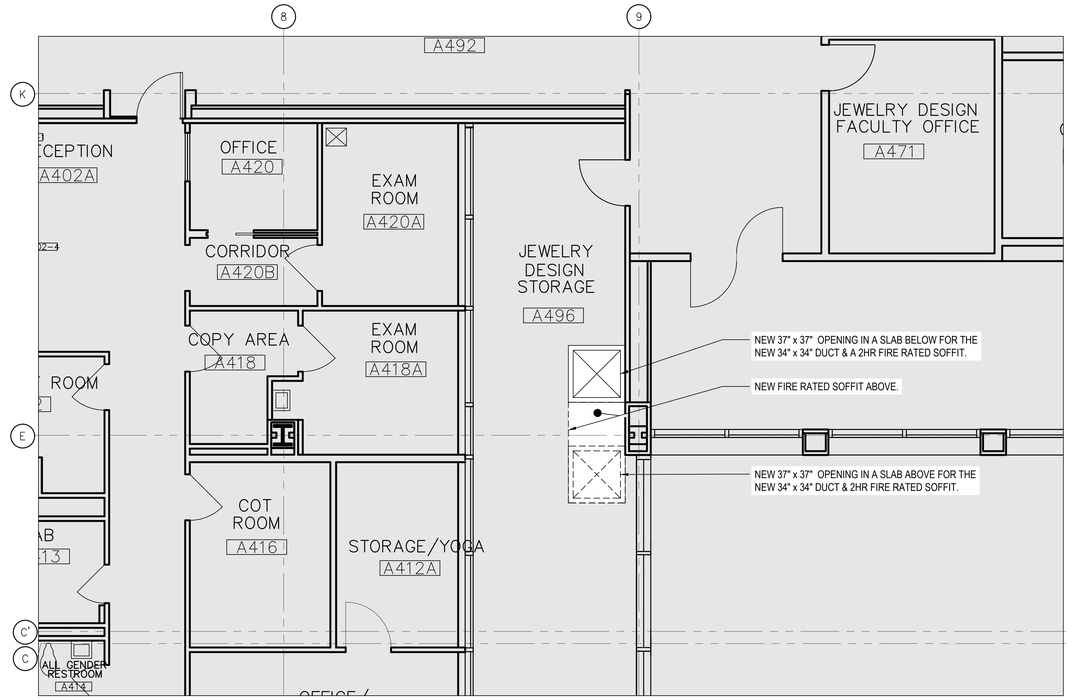
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SHEET TITLE:
PROPOSED EQUIPMENT PLAN 3RD FLOOR

SHEET NUMBER:
A-012



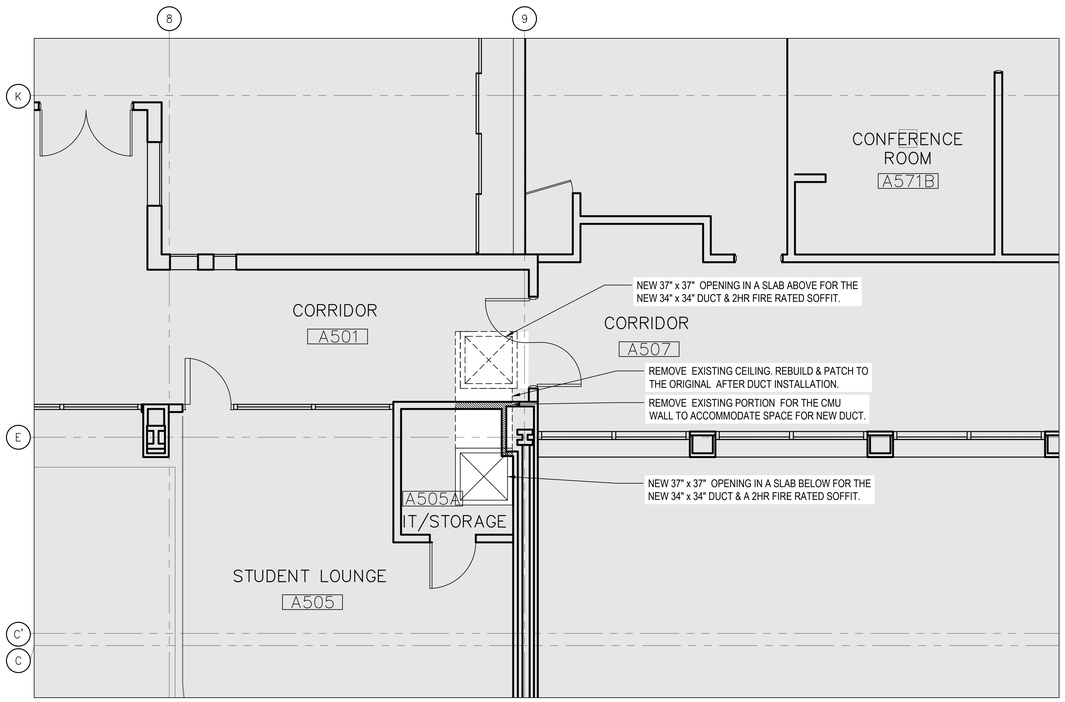
1 **DUCT PATH PLAN 3rd FLOOR**
1/4" = 1'-0"



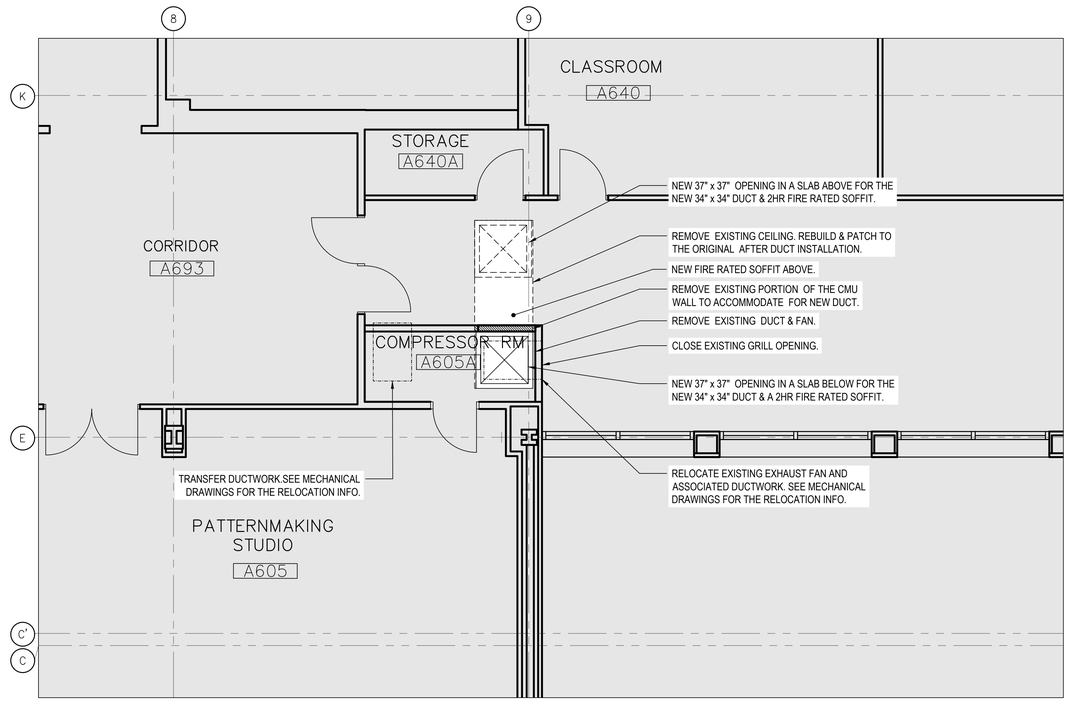
2 **DUCT PATH PLAN 4th FLOOR**
1/4" = 1'-0"

NOTE: ALL DIMENSIONS FOR LAYOUTS WILL BE INCLUDED ON THE ISSUED FOR CONSTRUCTION DRAWINGS.

SEE PARTITION TYPE 4 FOR SHAFT & SOFFIT ASSEMBLIES.
SEE STRUCTURAL & MECHANICAL DRAWINGS AS WELL.



3 **DUCT PATH PLAN 5th FLOOR**
1/4" = 1'-0"



4 **DUCT PATH PLAN 6th FLOOR**
1/4" = 1'-0"

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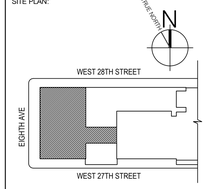
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SITE PLAN:



SUBMITTAL:
100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
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03	100% DESIGN DEVELOPMENT	2026.03.31
04	100% BID DOCUMENT	2026.10.28

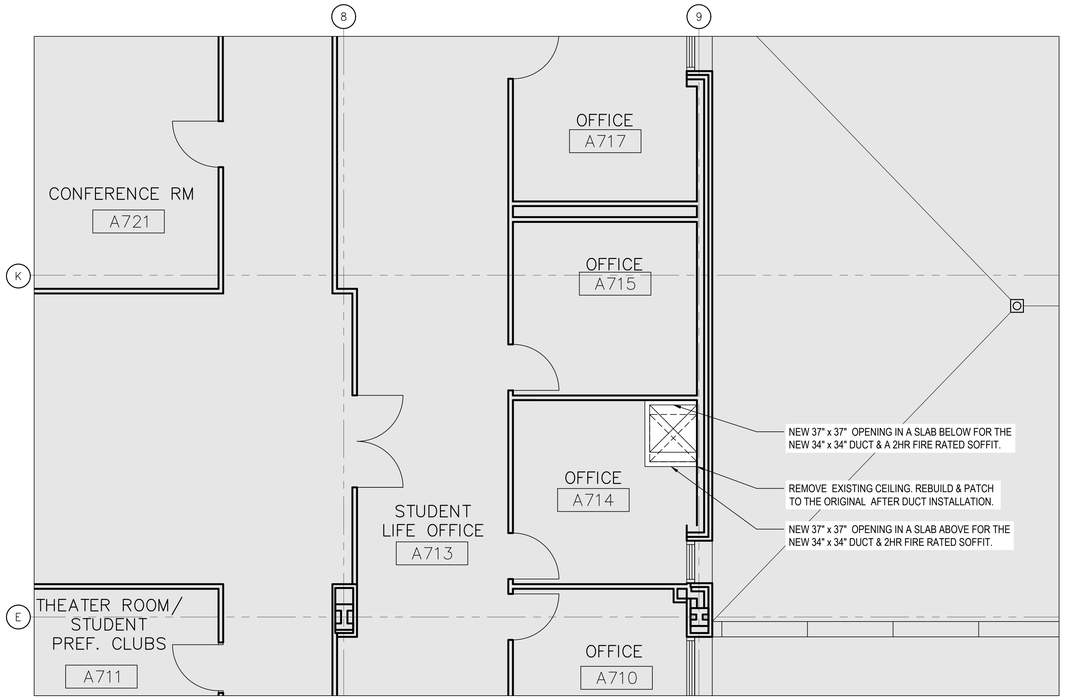
SEAL & SIGNATURE:

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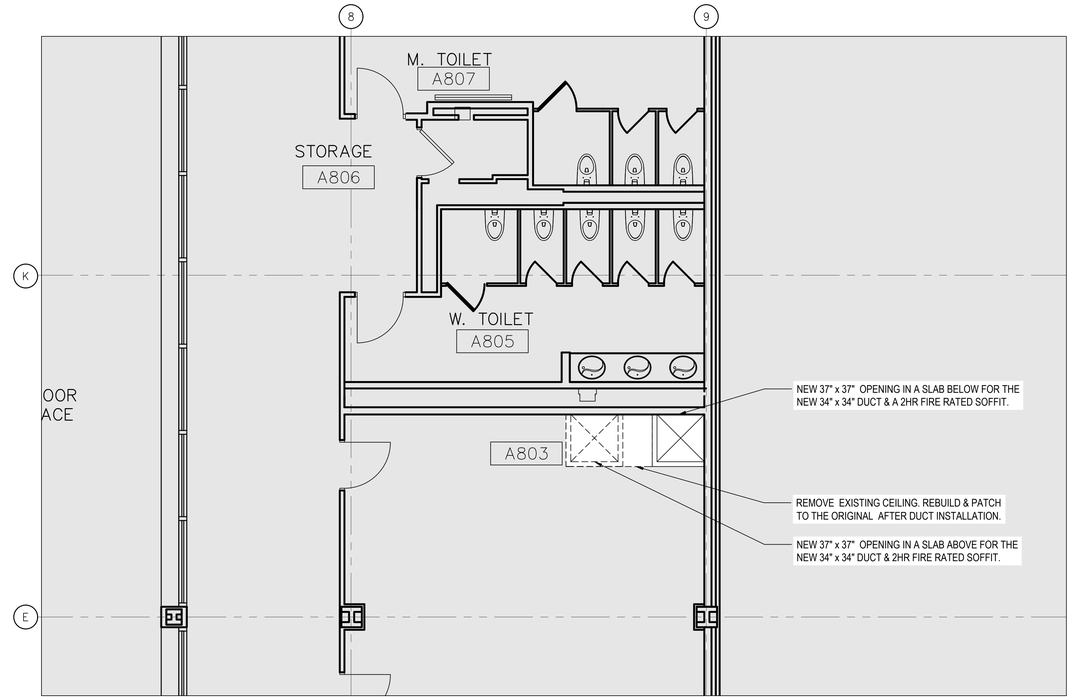
SCALE:
AS NOTED

SHEET TITLE:
ENLARGED DUCT PATHWAY PLAN

SHEET NUMBER:
A-013



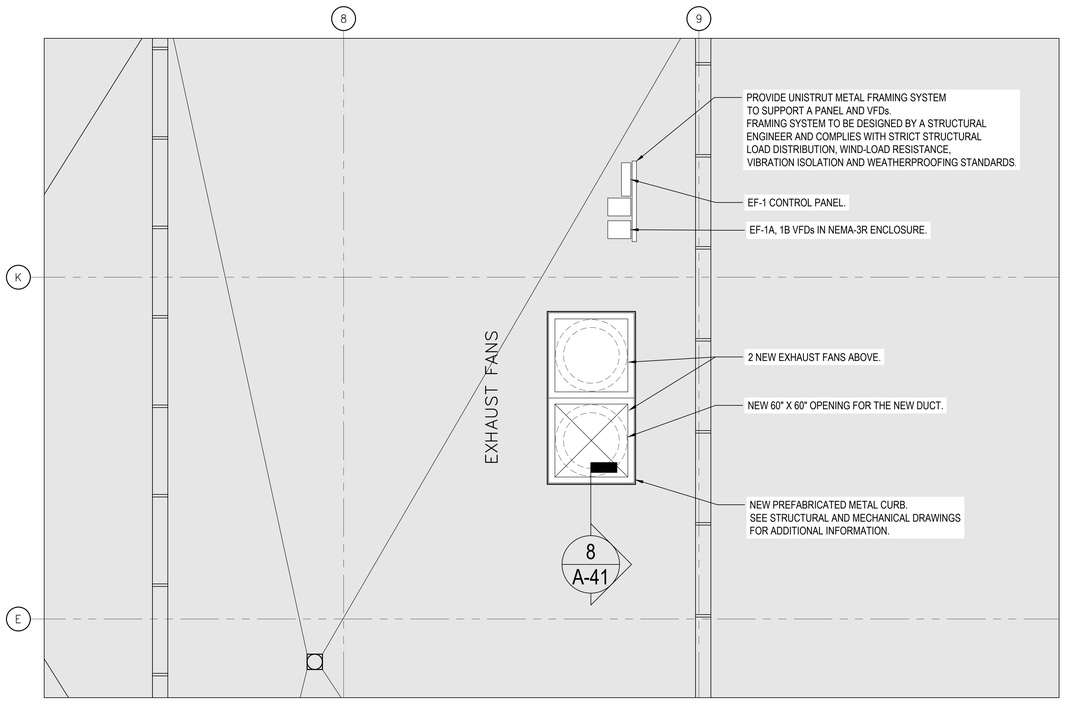
1 **DUCT PATH PLAN 7th FLOOR**
1/4" = 1'-0"



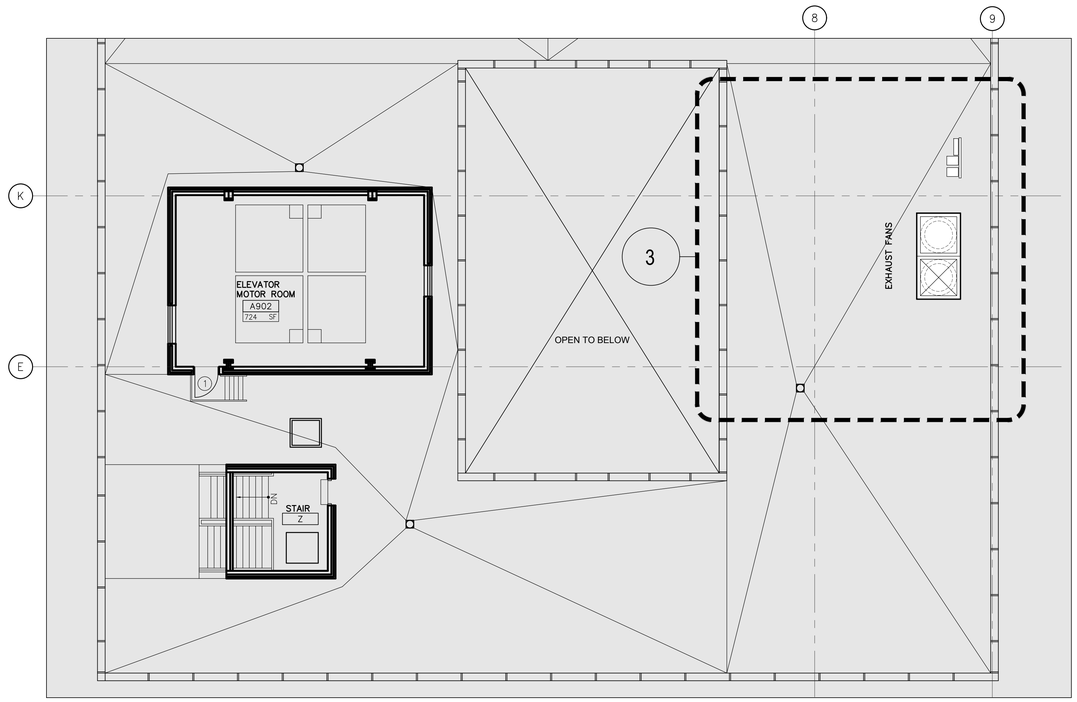
2 **DUCT PATH PLAN 8th FLOOR**
1/4" = 1'-0"

NOTE: ALL DIMENSIONS FOR LAYOUTS WILL BE INCLUDED ON THE ISSUED FOR CONSTRUCTION DRAWINGS.

SEE PARTITION TYPE 4 FOR SHAFT & SOFFIT ASSEMBLIES.
SEE STRUCTURAL & MECHANICAL DRAWINGS AS WELL.



3 **EQUIPMENT PLAN AT ROOF**
1/4" = 1'-0"



4 **ROOF APPROACH DIAGRAM**
1/8" = 1'-0"

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Project No. 2449

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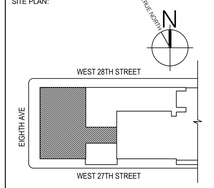
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SITE PLAN:



SUBMITTAL:
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04	100% BID DOCUMENT	2026.10.28

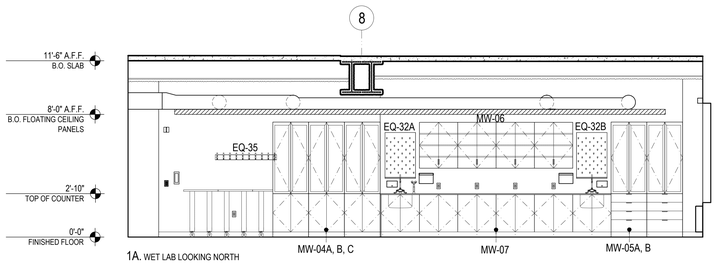
SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

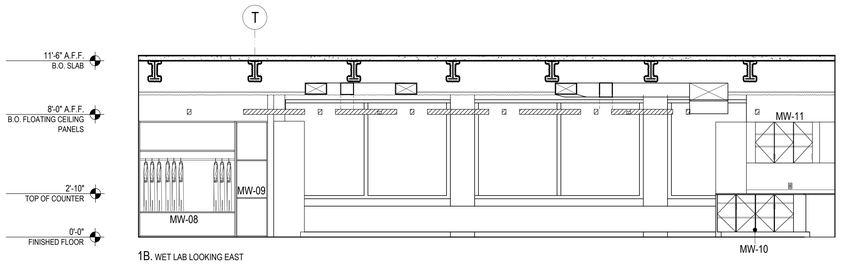
SCALE:
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SHEET TITLE:
ENLARGED DUCT PATHWAY PLAN

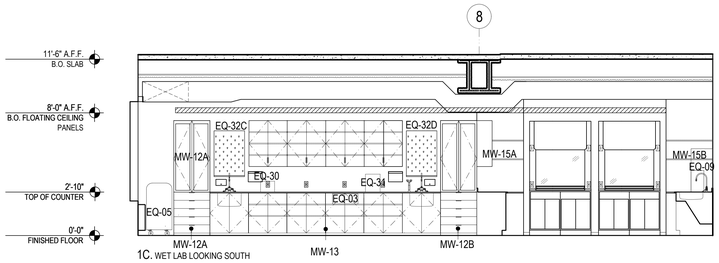
SHEET NUMBER:
A-014



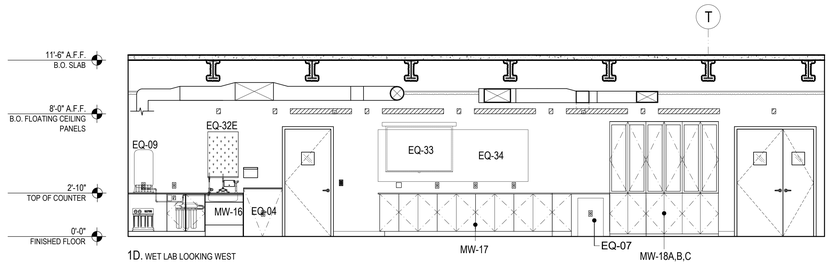
1A. WET LAB LOOKING NORTH



1B. WET LAB LOOKING EAST

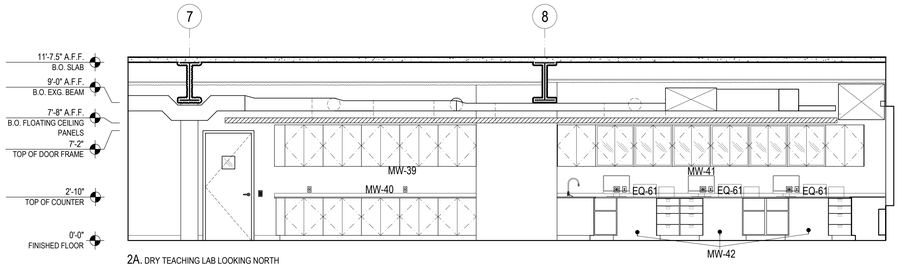


1C. WET LAB LOOKING SOUTH

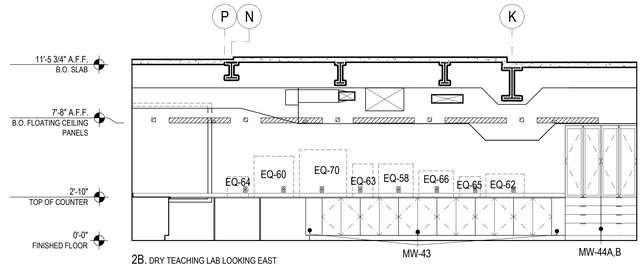


1D. WET LAB LOOKING WEST

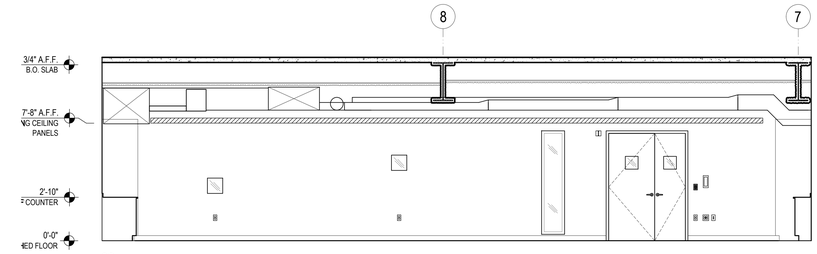
1 A321 WET LAB



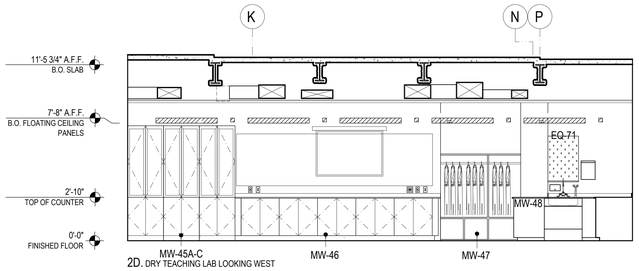
2A. DRY TEACHING LAB LOOKING NORTH



2B. DRY TEACHING LAB LOOKING EAST

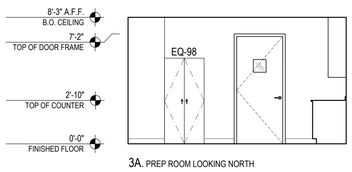


2C. DRY TEACHING LAB LOOKING SOUTH

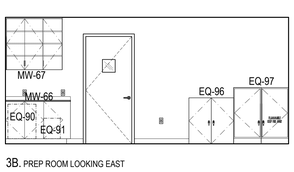


2D. DRY TEACHING LAB LOOKING WEST

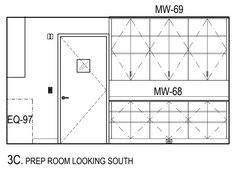
2 A309 DRY TEACHING LAB



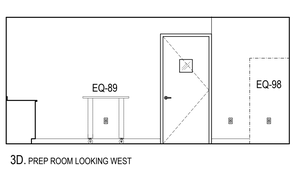
3A. PREP ROOM LOOKING NORTH



3B. PREP ROOM LOOKING EAST



3C. PREP ROOM LOOKING SOUTH



3D. PREP ROOM LOOKING WEST

3 A320B PREP ROOM

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FIT Science Lab Renovation

Project No. 2449

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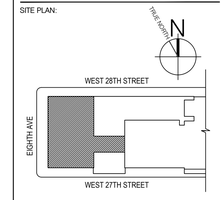
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LIGHTING DESIGNER
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NEW YORK, NY 10001
212.206.8356

SITE PLAN:



SUBMITTAL:
100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% SCHEMATIC DESIGN	2025.02.06
02	10% DESIGN DEVELOPMENT	2026.11.12
03	100% DESIGN DEVELOPMENT	2026.03.31
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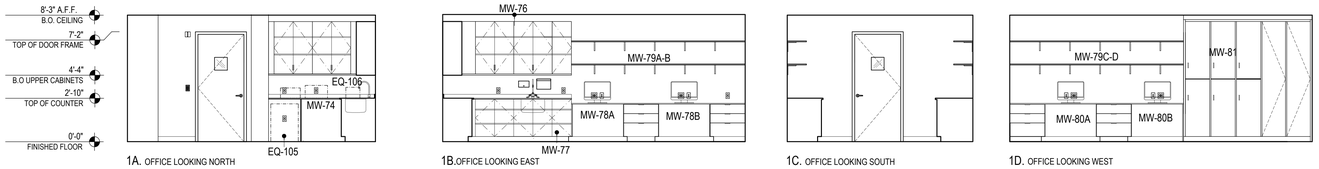
SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
1/4" = 1'-0"

SHEET TITLE:
INTERIOR ELEVATIONS AND SECTIONS

SHEET NUMBER:
A-021



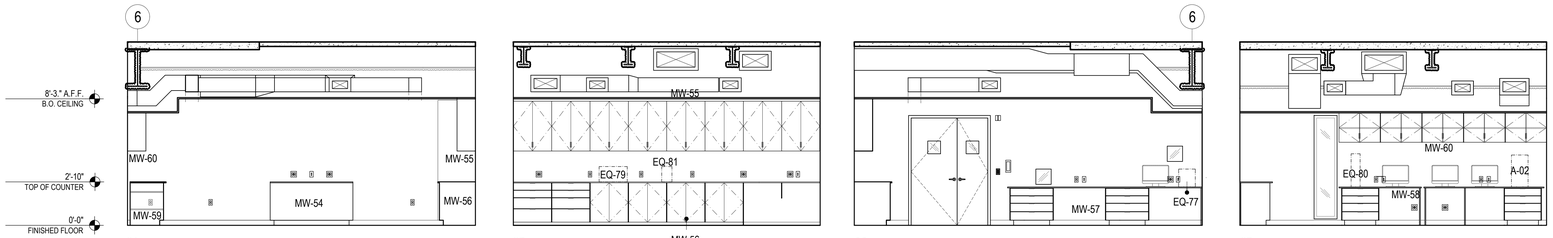
1A. OFFICE LOOKING NORTH

1B. OFFICE LOOKING EAST

1C. OFFICE LOOKING SOUTH

1D. OFFICE LOOKING WEST

1 A320A OFFICE



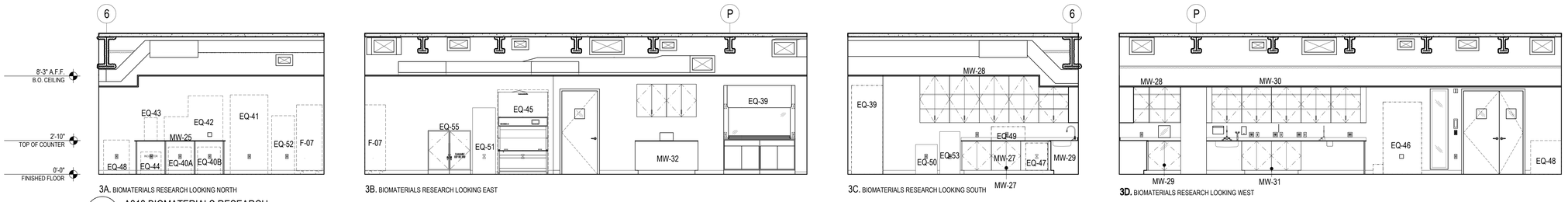
2A. ANALYTICS LAB LOOKING NORTH

2B. ANALYTICS LAB LOOKING EAST

2C. ANALYTICS LAB LOOKING SOUTH

2D. ANALYTICS LAB LOOKING WEST

2 A312 ANALYTICS LAB



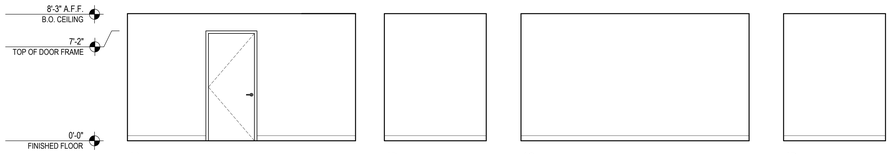
3A. BIOMATERIALS RESEARCH LOOKING NORTH

3B. BIOMATERIALS RESEARCH LOOKING EAST

3C. BIOMATERIALS RESEARCH LOOKING SOUTH

3D. BIOMATERIALS RESEARCH LOOKING WEST

3 A318 BIOMATERIALS RESEARCH



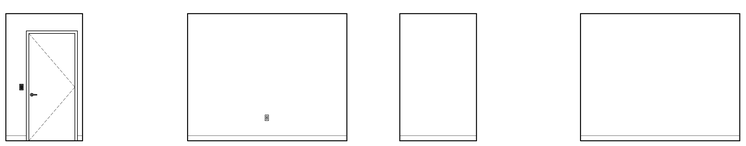
4A. ELEC RM LOOKING NORTH

4B. ELEC RM LOOKING EAST

4C. ELEC RM LOOKING SOUTH

4D. ELEC RM LOOKING EAST

4 A319 ELECTRICAL ROOM



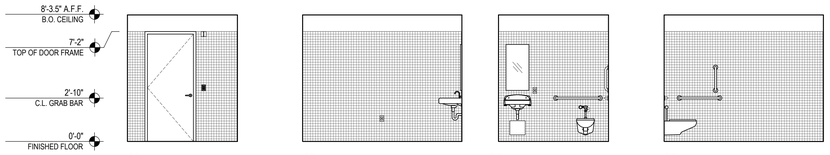
5A. JANITORS CLOSET LOOKING NORTH

5B. JANITORS CLOSET LOOKING EAST

5C. JANITORS CLOSET LOOKING SOUTH

5D. JANITORS CLOSET LOOKING WEST

5 A304 JANITOR'S CLOSET



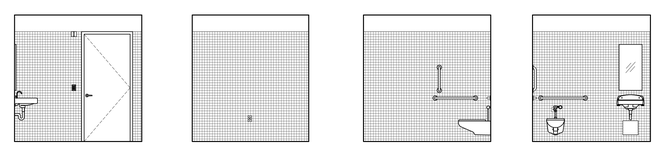
6A. ADA TOILET LOOKING NORTH

6B. ADA TOILET LOOKING EAST

6C. ADA TOILET LOOKING SOUTH

6D. ADA TOILET LOOKING WEST

6 A302A ADA W.C



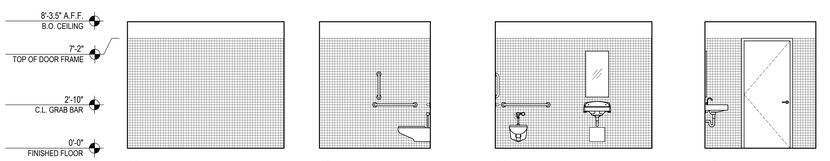
7A. ADA TOILET LOOKING NORTH

7B. ADA TOILET LOOKING EAST

7C. ADA TOILET LOOKING SOUTH

7D. ADA TOILET LOOKING WEST

7 A302B ADA W.C.



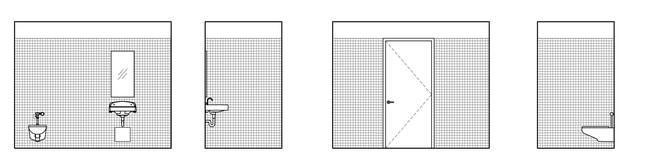
8A. ADA TOILET LOOKING NORTH

8B. ADA TOILET LOOKING EAST

8C. ADA TOILET LOOKING SOUTH

8D. ADA TOILET LOOKING WEST

8 A302C ADA W.C.



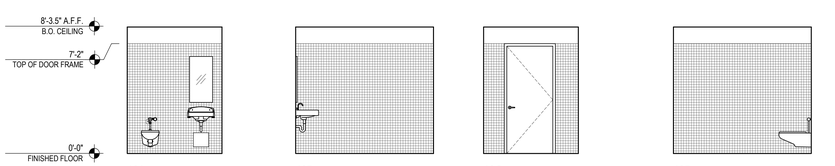
9A. W.C. LOOKING NORTH

9B. W.C. LOOKING EAST

9C. W.C. LOOKING SOUTH

9D. W.C. LOOKING WEST

9 A303A W.C.



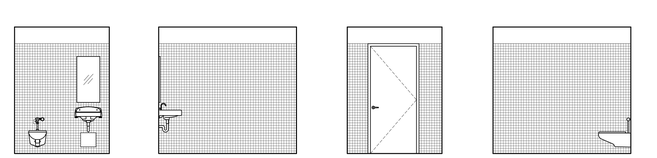
10A. W.C. LOOKING LOOKING NORTH

10B. W.C. LOOKING EAST

10C. W.C. LOOKING SOUTH

10D. W.C. LOOKING WEST

10 A303B W.C



11A. W.C. LOOKING NORTH

11B. W.C. LOOKING EAST

11C. W.C. LOOKING SOUTH

11D. W.C. LOOKING WEST

11 A303C W.C

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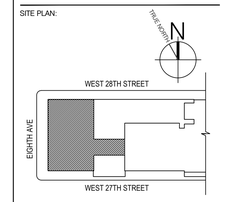
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SITE PLAN:



SUBMITTAL:
100% CONSTRUCTION DOCUMENT - BID SET

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03	100% DESIGN DEVELOPMENT	2026.03.31
04	100% BID DOCUMENT	2026.10.28

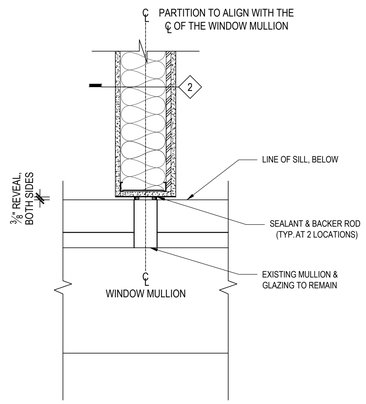
SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

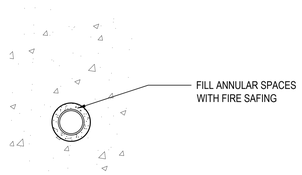
SCALE:
1/4" = 1'-0"

SHEET TITLE:
INTERIOR ELEVATIONS AND SECTIONS

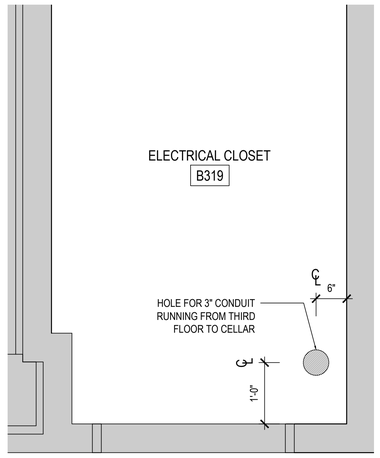
SHEET NUMBER:
A-022



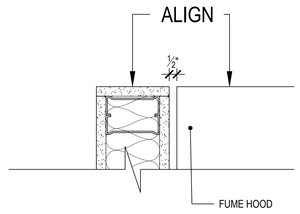
1 PLAN DETAIL AT PARTITION AND WINDOW MULLION
1 1/2"=1'-0"



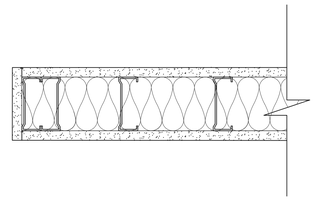
2 CORE DRILL DETAIL
1-1/2"=1'-0"



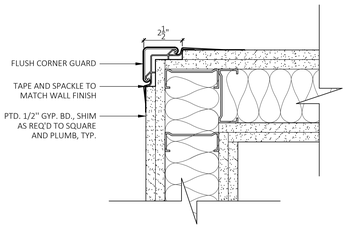
3 CORE DRILL DETAIL
1"=1'-0"



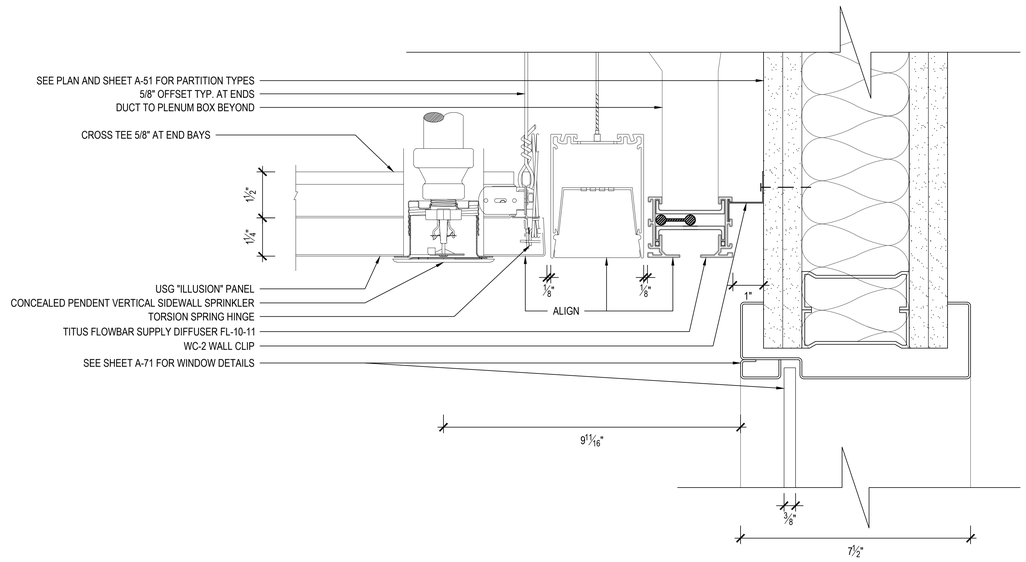
4 PLAN DETAIL AT FUME HOOD
3" =1'-0"



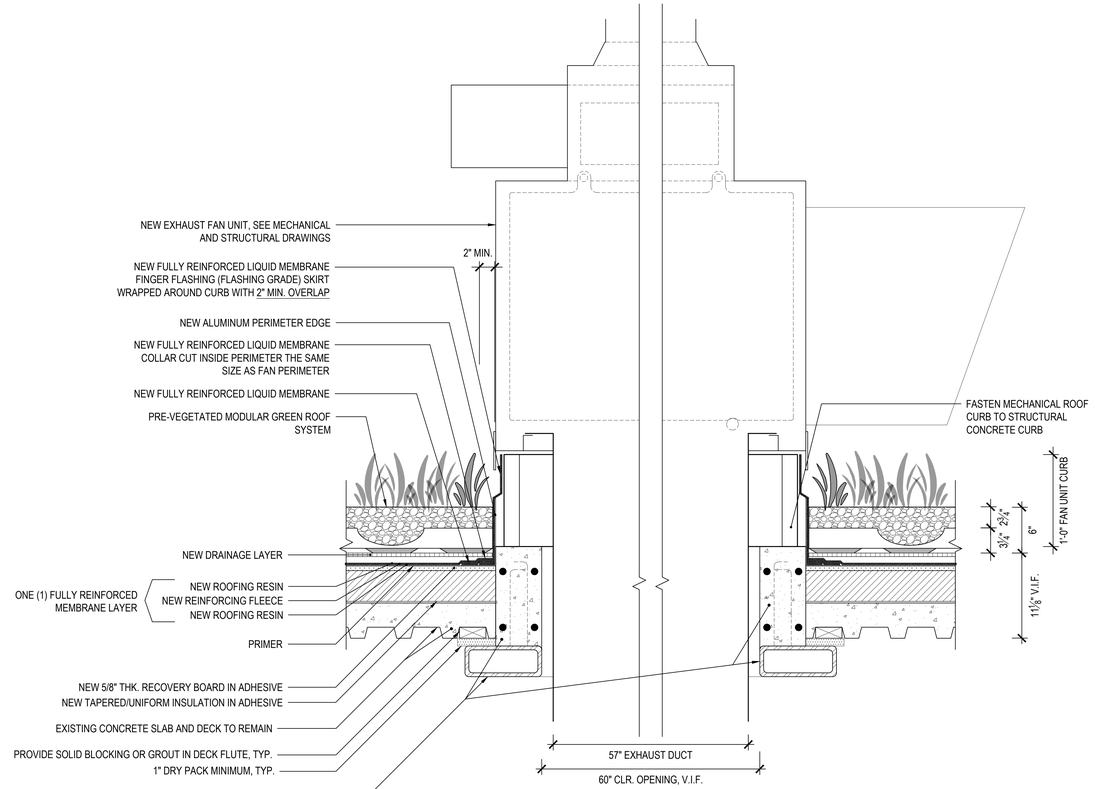
5 PLAN DETAIL AT MILLWORK SUPPORT PARTITION
3" =1'-0"



6 PLAN DETAIL AT CORRIDOR CORNER WITH FLUSH CORNER GAURD
3" =1'-0"



7 CORRIDOR CEILING SECTION DETAIL AT WINDOWS
6" =1'-0"



8 ROOF SECTION DETAIL AT CURB
1 1/2" =1'-0"

NOTE: ALL NEW WORK AT ROOF TO MATCH EXISTING ROOFING ASSEMBLY IN TYPE AND DIMENSION. ALL CONDITIONS TO BE V.I.F.

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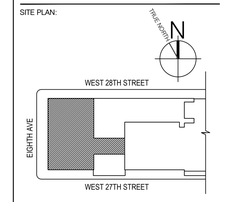
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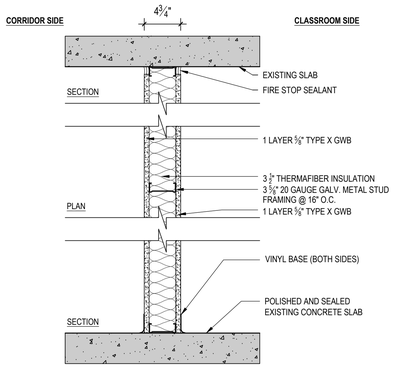
SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
AS NOTED

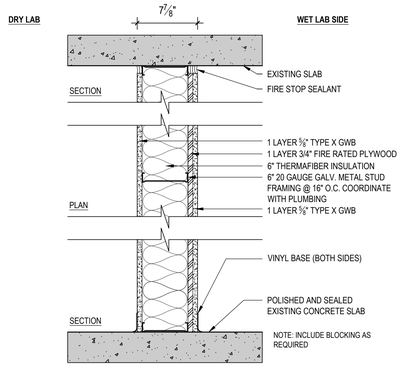
SHEET TITLE:
PLAN AND SECTION DETAILS

SHEET NUMBER:
A-041

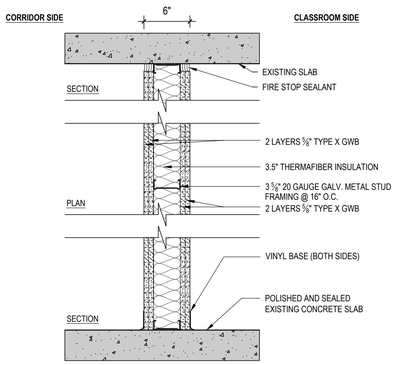


1A 1 — 1 - HR RATED PARTITION
1 1/2" = 1'-0"
1-HR RATED ASSEMBLY SHALL COMPLY WITH UL RATING #U419.

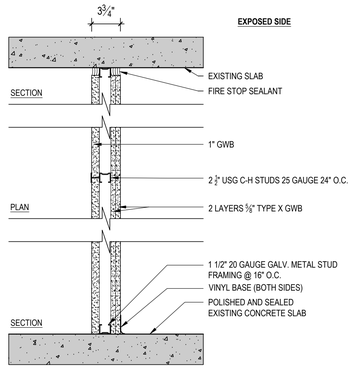
GREEN BOARD AT 1A.



2 — 1 - HR RATED PARTITION
1 1/2" = 1'-0"
1-HR RATED ASSEMBLY SHALL COMPLY WITH UL RATING #U419.



3 — 2 - HR RATED PARTITION
1 1/2" = 1'-0"
2-HR RATED ASSEMBLY SHALL COMPLY WITH UL RATING #U419.



4 — 2 - HR RATED PARTITION AT SHAFT WALL
1 1/2" = 1'-0"
2-HR RATED ASSEMBLY SHALL COMPLY WITH UL RATING #U419.

1 — PARTITION TYPES
1 1/2" =1'-0"

FINISH SCHEDULE

ROOM NUMBER	ROOM NAME	FLOOR	BASE	PARTITIONS	CEILING	COMMENTS
A301A	CORRIDOR NORTH	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINYL	GWB, PAINTED	PERFORATED METAL PANEL CELING	
A301B	CORRIDOR SOUTH	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	PERFORATED METAL PANEL CELING	
A301C	CORRIDOR WEST	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	PERFORATED METAL PANEL CELING	
A304	JANITORS CLOSET	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	GWB PAINTED	
A302 A	ADA W.C	TILE	COVE TILE BASE	TILE AND GWB, PAINTED	GWB PAINTED	2"x2" MOSAIC TILE WITH COLORED GROUT
A302 B	ADA W.C	TILE	COVE TILE BASE	TILE AND GWB, PAINTED	GWB PAINTED	"
A302 C	ADA W.C	TILE	COVE TILE BASE	TILE AND GWB, PAINTED	GWB PAINTED	"
A303 A	W.C	TILE	COVE TILE BASE	TILE AND GWB, PAINTED	GWB PAINTED	"
A303 B	W.C	TILE	COVE TILE BASE	TILE AND GWB, PAINTED	GWB PAINTED	"
A303 C	W.C	TILE	COVE TILE BASE	TILE AND GWB, PAINTED	GWB PAINTED	"
A309	DRY TEACHING LAB	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	FLOATING ACOUSTIC PANELS	
A312	ANALYTICS LAB	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	GWB PAINTED	
A318	BIOMATERIALS RESEARCH	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	GWB PAINTED	
A319	ELECTRICAL	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	GWB PAINTED	
A320 A	OFFICE	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	GWB PAINTED	
A320 B	PREP. ROOM	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	GWB PAINTED	
A321	WET LAB	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	FLOATING ACOUSTIC PANELS	BLACK PAINT ABOVE PANELS
A340	STORAGE	POLISH, PATCH, AND SEAL EXIST. CONCRETE SLAB	VINL	GWB, PAINTED	FLOATING ACOUSTIC PANELS	BLACK PAINT ABOVE PANELS

2 FINISH SCHEDULE
N.T.S

MATERIAL	MANUFACTURER	MODEL	SIZE	COLOR	COMMENTS
FLOORING					
POLISH EXIST. CONCRETE SLAB					SEE SPECS
TILE	DALTILE		2"x2"	MANGO, ICEBURG, KIWI, DAISY	W.Cs
VINYL WALL BASE					
VINYL	TARKETT	JOHNSONITE	4"	IRON MOUNTAIN CG	
WALLS					
TILE	DALTILE		2"x2"	MANGO, ICEBURG, KIWI, DAISY	W.Cs
PAINT 1	BENJAMIN MOORE			WHITE WISP 2137-70	
CEILINGS					
PERFORATED METAL PANEL CEILING	USG CEILINGS SOLUTIONS	USG CEILILNGS PLUS ILLUSIONS	2'X8', AND CUSTOM SIZES	SILVER SATIN 002	
FLOATING ACOUSTICAL PANELS	ARMSTRONG	ACOUSTIBUILT		WHITE	
PAINT 2	BENJAMIN MOORE			WHITE	LEVEL 4 FINISH
PAINT 3	BENJAMIN MOORE			BLACK 2132-10	FLAT FINISH, WET AND DRY LAB
DOORS AND DOOR FRAMES					
PAINT 4	BENJAMIN MOORE			TBD	
MILLWORK					
P-LAM CABINETS	WILSONART	STANDARD LAMINATE		DESIGNER WHITE	
RICHLITE					
SILSTONE					
RADIATOR COVER					
	MESTEK, INC			P-1 WHITE	
ROLLER SHADES					
SHADE FABRIC	MECHO	MECHO 7 SYSTEM		TBD	WET AND DRY LAB WINDOWS

3 FINISH SPEC SCHEDULE
N.T.S

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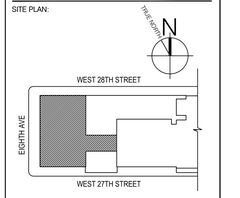
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SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
AS NOTED

SHEET TITLE:
PARTITIONS TYPES AND FINISH SCHEDULES

SHEET NUMBER:
A-051

EQUIPMENT SCHEDULE

FIT SCIENCE LAB RENOVATION 08.19.26

OLD NO.	NEW NO.	QTY	LOCATION	NAME	MODEL/MANUFACTURER	STATUS	DESCRIPTION	SIZE (WxDxH)	VOLTAGE	PLUG TYPE	W/A	REL. TRDS.	COMMENTS/DETAILS
A-321	**WET LAB**												
W.01.A	**EQ-01**	1	WET LAB	fume hood with acid storage	Kewaunee Venturi 48" wide with 48" acid storage	C-C	with acid storage	48"Wx36.5"x96"				E, M, PL	fixed, must be vented to outdoors. Spec with gas
W.01.B	**EQ-02**	1	WET LAB	ada fume hood with acid storage	Kewaunee Venturi 48" wide with 18" acid storage	C-C	with acid storage	48"Wx36.5"x96"				E, M, PL	fixed, must be vented to outdoors. Spec with gas.
W-06	**EQ-03**	1	WET LAB	microwave	Galanz / GLCMKA07RDR-07	E-O		20"x17"Dx8"H	120V	NEMA 5-15P	1100W	E	stored away in cabinets
W-07	**EQ-04**	1	WET LAB	dishwasher	SP Industries/Hot Pack	E-O		25"Wx27"D x39"H	120V	NEMA 5-15P	5A	E, PL	
W-13	**EQ-05**	1	WET LAB	liquid nitrogen tank	Taylor-Wharton/50 LD	E-O	rolling on wheels	26"Wx25"Dx45"H					stand alone, on the wheels
	EQ-06		NOT IN USE										
W-14.B	**EQ-07**	1	WET LAB	oven (small)	Quincy Lab, Inc./ Model 40 oven	E-O	built in	20"Wx16"D x30"H	120V		1500W	E	built in under counter
W-15.A,B	**EQ-08A-B**	2	WET LAB	spill supplies	Gorilla on Wheels bin	C-C	plastic box	36"Wx18"Dx14"H					needs to be accessable in a hurry / next to health and safety items / open shelving
W-16	**EQ-09**	1	WET LAB	water purification system	I/S Water Raptor 118 LPH Lab Water System Parts: Flexwave FWRO 20, Pulsar Ultraviolet, BL	E-O		Tank: 17"Dx34"H RO system: 17"x12"x17"	120V	(4) NEMA 5-15P	600 W	E, PL, MW	fixed / water intake / next to the sink / cold only. Coordinate with plumbing and millwork
W-17.A	**EQ-10**	3	WET LAB	hot+stir plates L	sizes for L and M plates are the same...	E-O		11.5"Wx15"Dx5.5"H	120V	NEMA 5-15P	13A	E	stored away in tall storage MW-05B
W-17.B	**EQ-11**	13	WET LAB	hot+stir plates M		E-O		8.5"Wx15"Dx5"H	120V	NEMA 5-15P	11.2A	E	stored away in tall storage MW-05B
W-17.C	**EQ-12**	4	WET LAB	hot+stir plates S		E-O		5.5"Wx11"Dx4.5"H	120V	NEMA 5-15P	460W	E	stored away in tall storage MW-05B
W-19	**EQ-13**	1	WET LAB	dehydrator	Excalibur Economy	E-O		17"Wx20"Dx12.5"H					stored away in cabinets
W-20	**EQ-14**	1	WET LAB	sonic bath cleaner	Cole Parmer	E-O		10"Wx12"Hx11.5"D	120V	NEMA 5-15 P	560W	E	stored away in cabinets
W-21	**EQ-15**	1	WET LAB	analytical balance (digital)	Ohaus Adventurer Pro / AV2101	E-O		17"Wx11"Dx7.5"H	120V	NEMA 5-15P	15W	E	stored away in cabinets
W-22	**EQ-16**	1	WET LAB	water bath	GCA Precision Scientific Thelco 184	E-O		16"Wx19"Dx18"H	120V	NEMA 5-15P	560W	E	stored away in cabinets
W-23	**EQ-17**	1	WET LAB	autoclave	Benchmark Scientific/Bioclave	E-O		15"Wx22"Dx15"H	120V	NEMA 5-15P	13.3A	E	stored away in cabinets
W-24.A,B	**EQ-18A-B**	2	WET LAB	vacuum distiller (bell jar)		E-O		15" H x 12" DIA					stored away in cabinets
W-25.A,B	**EQ-19A-B**	2	WET LAB	vacuum pump		E-O	Used w bell jar	6"Wx11"Dx8"H	120V	NEMA 5-15P	7A	E	stored away in cabinets
W-26	**EQ-20**	5	WET LAB	electric kettles		E-O		9"Wx10"Hx7"D	120V	NEMA 5-15P	1500W	E	stored away in cabinets
W-27	**EQ-21**	1	WET LAB	incubator (small)	Honyta	E-O	12V DC	13W X 17D X 18.5H	12 0 V		50W	E	stored away in cabinets
W-28	**EQ-22**	1	WET LAB	electrophoresis device (PCR)	Applied Biosystems by Thermo Scientific/Verit Thermalcycler 96 well	E-O		10"Wx20"Dx10"H	120V	NEMA 5-15P	10A	E	stored away in cabinets
W-29	**EQ-23**	1	WET LAB	electrophoresis device (w/camera)	Invitrogen/e-gel powersnap	E-O		5"Wx7.5"Hx10"D	120V	NEMA 5-15P	10A	E	stored away in cabinets
W-31	**EQ-24**	1	WET LAB	heating mantle	Apeta/DSHM-3000	E-O	requires 220v outlet	12"Wx6.5"Hx14"D	220V			E	stored away in cabinets
W-32	**EQ-25**	1	WET LAB	shaker	Fisher Digital Vortex / 02215418	E-O		5"Wx6.5"Hx9"D	120V	NEMA 5-15P	100W	E	stored away in cabinets
W-33	**EQ-26**	8	WET LAB	stir plates	Will Scientific Inc/Dynastir (1) CorningPC 320 (1) - heating function broken Fisher Sci/1152049SH (3) - heating function broken Fisher Sci/11-600-7R (2)	E-O		9"Wx5"Hx8.5"D	120V	NEMA 5-15P	800W	E	stored away in cabinets
W-34	**EQ-27**	5	WET LAB	hand blenders	1 each of: Braun/1469 Peach Street/PE-302 Chefman/R319-RBR-S-Black Procter-Silex/HB89 120V-60Hz-150W Bella/HB1908KB-ET	E-O		small	120V	NEMA 5-15P	800W	E	stored away in cabinets
W-35	**EQ-28**	22	WET LAB	electronic balances		E-O		small (notebook size)				E	stored away in cabinets
W-36	**EQ-29**	24	WET LAB	bioreactors		E-O	large plastic 20L bins	17.5L" x 22.5d" x 8.5h"					stored away in cabinets
W-37	**EQ-30**	1	WET LAB	centrifuge (old)	International Micro Centrifuge / 11036 M	E-O		11"Dx11"Wx8.5"H	120V	NEMA 5-15P	400W	E	located on countertop
W-38	**EQ-31**	1	WET LAB	centrifuge (new)		E-O		11.5"Wx10"Hx14"D	120V	NEMA 5-15P	2.1A	E	located on countertop
	EQ-32A-E	5	WET LAB	drying racks	Inter Dyne Systems Victoria V2436	C-C	Stainless Steel Pegboard	24"W x 36"H x 0.75"D					one above each sink; wall mounted
	EQ-33	1	WET LAB	pull down projector screen (not electric)		O-C							fixed location-- located behind instructor's bench
	EQ-34	1	WET LAB	blackboard		O-C							fixed location-- located behind instructor's bench
	EQ-35	1	WET LAB	coat hooks	SCR-3604 Stainless	O-C	Wall mounted coat hooks						
	EQ-36	5	WET LAB	paper towel dispenser	Interdyne #0215	O-C	Wall mounted						
	EQ-37A-E	5	WET LAB	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-38		NOT IN USE										
A-319	**BIOMATERIALS RESEARCH**												
B-01	**EQ-39**	1	BIOMATERIALS RESEARCH	ADA fume hood with chemical base storage	Kewaunee Venturi 72" wide with 42" chemical base storage	C-C		72"W x 36.5"D x 96"H	120V	NEMA 5-15P	1200W	E, M, P	will have cupsink-- coordinate with plumbing
B-02.A,B	**EQ-40A-B**	2	BIOMATERIALS RESEARCH	biolab fridge hotpoint		E-O		19"Wx17.7"Dx27.8"H	115V	3-pronged plug	15A	E	fixed location
B-03	**EQ-41**	1	BIOMATERIALS RESEARCH	environmental chamber	Thermo Scientific/Model 3960 - EXST	E-O	dedicated 120v circuit, 3" clearance on either side for ventilation, 6" on the back. Must be next to Favimat.	38"W x 80"H x 33"D	120V	NEMA 5-20P	20A	E	fixed location
B-04	**EQ-42**	1	BIOMATERIALS RESEARCH	favimat + (single fiber testing)	EXISTING	E-O	dedicated 220V circuit 1.5 amp + transformer 10 (provide cut sheets and photo of electric plug)	FAVIMAT+ x 24"W x 22"D x 24"H ROBOT2: x 35"W x 24"D x45"H - these are side by side	208V	CEE 7/7 Schuko		E	fixed location
B-05	**EQ-43**	1	BIOMATERIALS RESEARCH	air compressor (for favimat)	newly added	E-O	needs to be next to favimat	13W x 26W x 23"H	120V	3-pronged plug	13A	E	fixed location
B-06	**EQ-44**	1	BIOMATERIALS RESEARCH	incubator	Avantor VWR Gravity Convection Incubator	E-O		20.5W x 21.5D x 22.5H	120V	NEMA 5-15P	800W	E	fixed location
B-07	**EQ-45**	1	BIOMATERIALS RESEARCH	biological safety cabinet	1500 Series A2 Biological Safety Cabinet, Thermofisher	E-O	model number: 1595A2 to be confirmed with FIT	51.2"Wx61.8"Hx31.5"D	120V	NEMA 5-15P	1080W	E	fixed location
B-08	**EQ-46**	1	BIOMATERIALS RESEARCH	MSE PRO 300L Climate Incubator type C	MSE SUPLIES	E-O		33"Wx39"Dx73H" HAS A PIECE THAT ATTACHES 10WX 10D X 20H	220V	TBD	1500W	E	fixed location
B-09	**EQ-47**	1	BIOMATERIALS RESEARCH	lab oven	Quality Lab, Inc. Model 40 - EXST	E-O	fixed	21.5"W x 18.5"D x 23"H	120V	NEMA 5-15P	290W	E	fixed under the counter MW-27
B-10	**EQ-48**	1	BIOMATERIALS RESEARCH	incubator (large)	Thermo Scientific Heracell 150i	E-O		26W X 31D X 34.5 H	120V	NEMA 5-15P		E	fixed location
B-11	**EQ-49**	1	BIOMATERIALS RESEARCH	e-spinner	CeCe Wool	E-O	spinning yarn 12V DC	17"Dx34Wx14"H	120V	2-pronged plug	2.0 A, 70W motor	E	stored away in cabinets
W-11	**EQ-50**	1	BIOMATERIALS RESEARCH	boiling vessel (large)	Digibolt	E-O		22"Wx 20"Dx20"H	220V	NEMA 6-15P	14.6A	E	220V, on 18"H cart
W-04	**EQ-51**	1	BIOMATERIALS RESEARCH	chemical storage cabinet - waste	22 Gallon Flammable Storage Cabinet	C-C	custom color	67"H x 23.25"W x 18"D				E	fixed location, must be grounded
W-12	**EQ-52**	1	BIOMATERIALS RESEARCH	chemical fridge	isotemp	E-O	requires its own uninteruptable power source	23"Wx23.5"Dx69"H	120V	NEMA 5-15P	575W	E	fixed location
W-14.A	**EQ-53**	1	BIOMATERIALS RESEARCH	oven (large)		E-O	rolling on wheels/ could be built in	20.5"Wx18"Dx31.5"H	120V	NEMA 5-15P	1500W	E	
	EQ-54	1	BIOMATERIALS RESEARCH	drying rack	Inter Dyne Systems Victoria V2436	C-C	Stainless Steel Pegboard	24"W x 36"H x 0.75"D					
	EQ-55	1	BIOMATERIALS RESEARCH	chemical storage cabinet - flammable	A130SS SECURALL 30 GALLON FLAMMABLE CABINET	E-O	limits to quantities per room of these materials, custom color; (existing cabinet, to be reused)	43W X 20D X 44.25H				E	
	EQ-56	1	BIOMATERIALS RESEARCH	paper towel dispenser	Interdyne #0215								
	EQ-57	1	BIOMATERIALS RESEARCH	soap dispenser	Interdyne #0342	O-C	Wall mounted						
A-309	**DRY TEACHING LAB**												
D-02	**EQ-58**	1	DRY LAB	color matcher box	GTI Graphic Technology Light Guard	E-O		30.5"Wx20.5"Dx26"H	120V	NEMA 5-15A	1.43 W	E	fixed location MW-43
D-03	**EQ-59**	1	DRY LAB	color matching booth	GTI Graphic Technology Light Guard	E-O		31"Wx25"Dx32"H	120V	NEMA 5-15A	1.43 W	E	fixed location MW-43
D-04	**EQ-61**	3	DRY LAB	UV/visible spectrometer w/printer & PC	X-Rite CI7800 (2x), Color i5	E-O	printers are 14x15x18 and 15x18x10 & 16x19x10, each unit requires a PC	8"Wx7"Dx12"H	120V	NEMA 5-15A	1.1 A	E, IT	fixed location MW-42
D-05	**EQ-62**	1	DRY LAB	Color Rendition Demonstrator	GTI Technology CRD-1	E-O		30"Wx7"Dx18"H	120V	NEMA 5-15A	81 W	E	fixed location MW-43
D-06	**EQ-63**	1	DRY LAB	Filtergraph	Sargent-Welch	E-O		16"Wx13"Dx26"H					fixed location MW-43
D-07	**EQ-64**	1	DRY LAB	color mixing box	Welch Scientific	E-O		16.5"Wx13"Dx16"H				E	fixed location MW-46
E	**EQ-65**	1	DRY LAB	color booth	Judge QC	E-O		16.5"Wx13"Dx16"H				E	fixed location MW-43
D-09	**EQ-66**	1	DRY LAB	color viewing system box	Porta Trace True	E-O		27Wx16Dx20.5H	120V	NEMA 5-15A		E	fixed location MW-43
D-11	**EQ-67**	10	DRY LAB	spec 20s for liquids	Spectronic 200	E-O	non stackable / closed storage	15.5Wx12Dx7"H	100V	3-pronged plug	1.67A	E	to be placed in MW-46 stored away in cabinets
D-12	**EQ-68**	1	DRY LAB	supplies	(Munsell chips, books, gels, scissors, etc.)	E-O		29"Wx30"Dx11"H (total: 50196 in3)					stored away in cabinets
D-13	**EQ-69**	2	DRY LAB	irradiance spectrometer	custom home-built (no brand)	E-O	Hooks up to any computer	10"Wx10"Dx2"H				E	stored away in cabinets
D-14	**EQ-70**	1	DRY LAB	light booth	GretagMacbeth Spectralight III	E-O		37"Wx25"Dx37"H	120V	NEMA 5-15A	1500 W	E	fixed location MW-43
	EQ-71	1	DRY LAB	drying rack	Inter Dyne Systems Victoria V2436	C-C	Stainless Steel Pegboard	24"W x 36"H x 0.75"D					fixed location mounted above sink PL-29A
	EQ-72	1	DRY LAB	pull down projector screen (not electric)		O-C							fixed location-- located behind instructor's bench
	EQ-73	1	DRY LAB	blackboard		O-C							fixed location-- located behind instructor's bench
	EQ-74	1	DRY LAB	paper towel dispenser	Interdyne #0215								
	EQ-75	1	DRY LAB	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-76		NOT IN USE										

1 EQUIPMENT SCHEDULE

EQUIPMENT SCHEDULE

FIT SCIENCE LAB RENOVATION 08.19.26

OLD NO.	NEW NO.	QTY	LOCATION	NAME	MODEL/MANUFACTURER	STATUS	DESCRIPTION	SIZE (WxDxH)	VOLTAGE	PLUG TYPE	W/A	REL. TRDS.	COMMENTS/DETAILS
A-312	**ANALYTICS LAB**												
A-01	**EQ-77**	1	ANALYTICS LAB	IR spectrometer (FTIR)	Thermo Scientific Nicolet iS5	E-O	needs PC/monitor+seat	13"Wx 10"D x 14"H	12V DC		4.16 A	E, IT	fixed location / seating station
A-02	**EQ-78**	1	ANALYTICS LAB	SEM (Scanning Electro Microscope)	Phenom XL	E-O	2 micro PCs and 2 monitors+seat	13"Wx 25"D x 25"H	120V	NEMA 5-15A	300W	E, IT	fixed location. Requires 2 computer monitors and clearance for peripherals (power supplies, pump, bakcup power, keyboards). SEM PUMP: 7"W X 9"D X 9"H (must go on floor under the counter) SEM backup 4"W x 18"d x 10"h
A-03	**EQ-79**	1	ANALYTICS LAB	Sputter coater	Cressington 108	E-O	dimensions include pump and tubes; required for prepping SEM samples	17"W x 22"D X 12"H	120V	NEMA 5-15A	500W	E	
A-04	**EQ-80**	1	ANALYTICS LAB	Contact Angle Goniometer + Computer	MSE PRO MA2113	E-O	needs PC/monitor+seat+textile characterization - hydrophobicty	21Wx8Dx26H	120V	NEMA 5-15A		E, IT	
A-05	**EQ-81**	1	ANALYTICS LAB	X-Rite iCi7800	X-Rite iCi7800	E-O		8"Wx7"Dx12"H	125V	3-pronged plug	10A	E	fixed location heavy can share station w/ contact angle or IR
A-06	**EQ-82**	1	ANALYTICS LAB	equipment supplies	37"Wx30.5"Dx36"H (overall volume)	E-O	needs a prep bench w drawer w SEM stubs	loose items					needs prep station
	EQ-83		NOT IN USE										
	EQ-84		NOT IN USE										
	EQ-85		NOT IN USE										
	EQ-86		NOT IN USE										
A-321B	**PREP ROOM**												
P-01	**EQ-87**	1	PREP ROOM	vinyl cutter (cricut)		E-O		25"Wx8"Dx7"H				E	stored away in cabinets
P-02	**EQ-88**	1	PREP ROOM	manual paper press machine	INTBUYING	E-O		14.5Wx9Dx13.5"H					stored away in cabinets
P-03	**EQ-89**	1	PREP ROOM	prep table		E-O		95.5"Wx37"Hx36"D					fixed location
P-04	**EQ-90**	1	PREP ROOM	shop vacuum	VacMaster Professional/Beast Series	E-O	on wheels	23" x 22" x 27"	120V	NEMA 5-15P	12A	E	stored away in cabinets, MW-66
P-05	**EQ-91**	1	PREP ROOM	vacuum chamber (round)		E-O		16"H x 13"DIA				E	stored away in cabinets- MW-66
P-06	**EQ-92**	1	PREP ROOM	heavy-duty grinder	Al Marwani/150	E-O		10"Wx13"Hx5"D	120V	NEMA 5-15P	900W	E	stored away in cabinets
P-07	**EQ-93**	3	PREP ROOM	spice grinders	Kaffe Blade Coffee Grinder / KF2040	E-O		4"Wx5.5"Dx7"H	120V	NEMA 5-15P	150W	E	stored away in cabinets
P-08	**EQ-94**	1	PREP ROOM	vise		E-O		small					stored away in cabinets
P-09	**EQ-95**	1	PREP ROOM	paper cutter		E-O		16"Wx16"Dx6"H	120V	NEMA 5-15P	25W		stored away in cabinets
P-10	**EQ-96**	1	PREP ROOM	chemical storage cabinet - oxidizers	24 gallon acid/corrosive storage cabinet	C-C	custom color	35"Wx22"D x 36"H				E	CM: must be grounded
P-11	**EQ-97**	1	PREP ROOM	chemical storage cabinet - flammable	A130SS SECURALL 30 GALLON FLAMMABLE CABINET	E-O	limits to quantities per room of these materials, custom color; (existing cabinet, to be reused)	43W X 20D X 44.25H				E	CM: must be grounded
P-12	**EQ-98**	1	PREP ROOM	chemical storage cabinet - reagents	60 gallon acid/ corrosive storage cabinet	C-C	custom color	67"H x 31"W x 31"D				E	GM: must be grounded
	EQ-99		NOT IN USE										
	EQ-100		NOT IN USE										
	EQ-101		NOT IN USE										
	EQ-102		NOT IN USE										
A-321A	**OFFICE**												
O-03	**EQ-103**	1	OFFICE	food microwave	Galanz / GLCMKA07RDR-07	E-O		17.5"Wx10"Hx14"D	120V	NEMA 5-15P	1000W	E	
O-04	**EQ-104**	1	OFFICE	food toaster oven	Comfee/CFO-BB102	E-O		15.5"Wx8"Hx11"D				E	
O-05	**EQ-105**	1	OFFICE	food fridge	Frigidaire/FFPE 4533UM	O-O	for food only	21.5"Wx33.5"Hx23"D	120V	NEMA 5-15P	200W	E	
O-06	**EQ-106**	1	OFFICE	tea kettle	NPET/EK6100	E-O		7"Wx6.5"Hx11"D	120V	NEMA 5-15P	30W	E	
	EQ-107	1	OFFICE	paper towel dispenser	Interdyne #0215			22"Wx21"Dx29.5"H					
	EQ-108	1	DRY LAB	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-109		NOT IN USE										
	EQ-110		NOT IN USE										
	EQ-111		NOT IN USE										
	EQ-112		NOT IN USE										
	EQ-113		NOT IN USE										
A302A	**ADA TOILET**												
	EQ-114	1	A302A	Air Dryer		C-C	Commercial electric hand dryer; automatic, touch-free infrared activation						
	EQ-115	1	A302A	Mirror		C-C							
	EQ-116	1	A302A	Trashcan		C-C							
	EQ-117	1	A302A	ADA Grab bars		C-C							
	EQ-118	1	A302A	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-119		NOT IN USE										
A302B	**ADA TOILET**												
	EQ-120	1	A302B	Air Dryer		C-C	Commercial electric hand dryer; automatic, touch-free infrared activation						
	EQ-121	1	A302B	Mirror		C-C							
	EQ-122	1	A302B	Trashcan		C-C							
	EQ-123	1	A302B	ADA Grab bars		C-C							
	EQ-124	1	A302B	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-125		NOT IN USE										
A302C	**ADA TOILET**												
	EQ-126	1	A302C	Air Dryer		C-C	Commercial electric hand dryer; automatic, touch-free infrared activation						
	EQ-127	1	A302C	Mirror		C-C							
	EQ-128	1	A302C	Trashcan		C-C							
	EQ-129	1	A302C	ADA Grab bars		C-C							
	EQ-130	1	A302C	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-131		NOT IN USE										
A303A	**TOILET**												
	EQ-132	1	A303A	Air Dryer		C-C	Commercial electric hand dryer; automatic, touch-free infrared activation						
	EQ-133	1	A303A	Mirror		C-C							
	EQ-134	1	A303A	Trashcan		C-C							
	EQ-135	1	A303A	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-136		NOT IN USE										
A303B	**TOILET**												
	EQ-137	1	A303B	Air Dryer		C-C	Commercial electric hand dryer; automatic, touch-free infrared activation						
	EQ-138	1	A303B	Mirror		C-C							
	EQ-139	1	A303B	Trashcan		C-C							
	EQ-140	1	A303B	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-141		NOT IN USE										
	EQ-142		NOT IN USE										
A303C	**TOILET**												
	EQ-143	1	A303B	Air Dryer		C-C	Commercial electric hand dryer; automatic, touch-free infrared activation						
	EQ-144	1	A303B	Mirror		C-C							
	EQ-145	1	A303B	Trashcan		C-C							
	EQ-146	1	A303B	soap dispenser	Interdyne #0342	O-C	Wall mounted						
	EQ-147		NOT IN USE										

STATUS KEY/ BALL IN COURT	
E-O	EXISTING, OWNER INSTALLED
O-O	OWNER FURNISHED, OWNER INSTALLED
C-C	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
O-C	OWNER FURNISHED, CONTRACTOR INSTALLED

TRADE KEY, CM TO COORDINATE	
M	MECHANICAL
E	ELECTRICAL
P	PLUMBING
IT	INFORMATION TECHNOLOGY
MW	MILLWORK

NOT FOR CONSTRUCTION

FIT Science Lab Renovation

Project No. 2449

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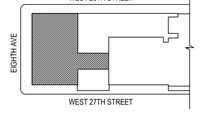
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SITE PLAN:



SUBMITTAL:
100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% SCHEMATIC DESIGN	2025.02.06
02	10% DESIGN DEVELOPMENT	2026.11.12
03	100% DESIGN DEVELOPMENT	2026.03.31
04	100% BID DOCUMENT	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
AS NOTED

SHEET TITLE:
EQUIPMENT SCHEDULE

SHEET NUMBER:
A-061

MILLWORK SCHEDULE

FIT SCIENCE LAB RENOVATION

OLD NO.	NEW NO.	QTY	LOCATION	NAME	MODEL/MANUFACTUR	STATUS	DESCRIPTION	SIZE (WxDxH)	REL. TRDS.	COMMENTS/DETAILS
A-321	**WET LAB**									
W-09 A-B	**MW- 01**	1	WET LAB	student lab bench	Custom Millwork	C-C	Lab bench for students with knee and storage space below. Each pair of students has 4 duplex outlets, a cupsink, a faucet, and a gas turret.	21'-0" L X 5'-2" W X 3'-4.5" H	P, E, C	pumbing (faucets and cup sinks) acid neutralization tanks, gas outlets, electrical outlets
W-09 A-B	**MW- 02**	1	WET LAB	student lab bench	Custom Millwork	C-C	Lab bench for students with knee and storage space below. Each pair of students has 4 duplex outlets, a cupsink, a faucet, and a gas turret.	26'-0" L X 5'-2" W X 3'-4.5" H	P, E, C	pumbing (faucets and cup sinks) acid neutralization tanks, gas outlets, electrical outlets
W-10	**MW-03**	1	WET LAB	teacher lab bench	Custom Millwork	C-C		10'-0" X 2'-6" X 2'-10" H	P, E, C, IT	pumbing (faucet and sink) acid neutralization tanks, gas turrets, electrical outlets + data
	MW-04A-C	3	WET LAB	tall storage cabinets	Custom Millwork	C-C	Tall storage cabinets	see drawings	C	See elevations for cabinet types, sizes & quantities. Provide blocking as needed.
	MW-05A-B	2	WET LAB	tall storage cabinets	Custom Millwork	C-C	Tall storage cabinets	see drawings	C	See elevations for cabinet/drawer types, sizes & quantities. Provide blocking as needed.
	MW-06	1	WET LAB	upper cabinets	Custom Millwork	C-C	Wall mounted upper storage cabinets above MW-07	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate with countertop and plumbing fixtures below.
	MW-07	1	WET LAB	lower cabinets	Custom Millwork	C-C	countertop w/ storage cabinets below	see drawings	P, C	Coordinate for sinks and emergency eyewash/drench hose.
	MW-08	1	WET LAB	coat storage	Custom Millwork	C-C	coat storage w/ shelf above & bag storage below	see drawings	C	See elevations for shelf/rod/storage types, sizes & quantities. Provide blocking as needed.
	MW-09	1	WET LAB	open shelving	Custom Millwork	C-C	Open shelving adjacent to coat storage	see drawings	C	See elevations for shelf types, sizes & quantities. Provide blocking as needed.
	MW-10	1	WET LAB	lower cabinets	Custom Millwork	C-C	countertop w/ storage cabinets below	see drawings	C	See elevations for cabinet types, sizes & quantities.
	MW-11	1	WET LAB	upper cabinets	Custom Millwork	C-C	wall mounted upper storage cabinets above MW-10	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate with storage cabinets below.
	MW-12A-B	2	WET LAB	tall storage cabinets	Custom Millwork	C-C	Tall storage cabinets w/ lower drawer storage	see drawings	C	See elevations for cabinet/drawer types, sizes & quantities. Provide blocking as needed.
	MW-13	1	WET LAB	lower cabinets	Custom Millwork	C-C	Countertop with base storage cabinets below.	see drawings	P, C	See elevations for cabinet types, sizes & quantities. Coordinate for sinks. Coordinate electrical access for a microwave.
	MW-14	1	WET LAB	upper cabinets	Custom Millwork	C-C	Wall-mounted upper storage cabinets above MW-13	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate clearances with countertop and equipment below.
	MW-15A-B	2	WET LAB	shelves	Custom Millwork	C-C	Wall-mounted open shelves	see drawings	C	See elevations for shelf types, sizes & quantities. Provide blocking as needed. Coordinate clearances with adjacent equipment.
	MW-16	1	WET LAB	lower cabinets	Custom Millwork	C-C	Countertop with ADA sink & water purifcaiton station	see drawings	P, E, C	See elevations for cabinet types, sizes & quantities. Coordinate closely w/ water purification system, ADA sink, plumbing clearances, knee/toe clearances, pipe protection, water intake, cold-water connection, filtration components, tank/RO system clearanc
	MW-17	1	WET LAB	lower cabinets	Custom Millwork	C-C	Countertop with base storage cabinets below. Narrow.	see drawings	C	See elevations for cabinet types, sizes & quantities.
	MW-18A-C	3	WET LAB	tall storage cabinets	Custom Millwork	C-C	Tall storage cabinets.	see drawings	C	See elevations for cabinet types, sizes & quantities. Provide blocking as needed.
	MW-19		NOT IN USE							
	MW-20		NOT IN USE							
	MW-21		NOT IN USE							
	MW-22		NOT IN USE							
	MW-23		NOT IN USE							
	MW-24		NOT IN USE							
A-319	**BIOMATERIALS RESEARCH**									
	MW-25	1	BIOMATERIALS RESEARCH	open lower cabinet	custom millwork	C-C	Custom equipment counter with dedicated below-counter equipment bays.	see drawings	E, C	See elevations. Coordinate countertop support layout and below-counter equipment openings with chemical fridges, Favimat, air compressor, and incubator as required. Coordinate electrical access for equipment. Provide required clearances & ventilation/air
	MW-26	1	BIOMATERIALS RESEARCH	work bench	custom millwork	C-C				
	MW-27	1	BIOMATERIALS RESEARCH	lower cabinets	custom millwork	C-C	Countertop with base storage cabinets and below-counter equipment opening for lab equipment	see drawings	E, C	See elevations for cabinet types, sizes & quantities. Coordinate equipment clearances, ventilation/airflow, and service access for lab oven. Coordinate countertop/electrical access for e-spinner.Coordinate with adjacent equipment clearances.
	MW-28	1	BIOMATERIALS RESEARCH	upper cabinets	custom millwork	C-C	Wall-mounted upper storage cabinets above MW-29	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate clearances with adjacent equipment.
	MW-29	1	BIOMATERIALS RESEARCH	lower cabinets	custom millwork	C-C	Base storage cabinet	see drawings		See elevations for cabinet types, sizes & quantities. Coordinate clearances with adjacent oven.
	MW-30	1	BIOMATERIALS RESEARCH	upper cabinets	custom millwork	C-C	Wall-mounted upper storage cabinet above MW-31	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate clearances with countertop and equipment below.
	MW-31	1	BIOMATERIALS RESEARCH	lower cabinets	custom millwork	C-C	Countertop with base storage cabinets below.	see drawings	C	See elevations for cabinet types, sizes & quantities. Coordinate for sink/plumbing if shown within this counter run. Coordinate clearances with adjacent oven and incubator.
	MW-32	1	BIOMATERIALS RESEARCH	student lab bench	custsom milwork	C-C	Lab bench for students with knee and storage space below. Each pair of students has 4 duplex outlets, a cupsink, a faucet, and a gas turret.	8'-1/2" L X 5'-2" W X 3'-4.5" H	P, E, C	pumbing (faucets and cup sinks) acid neutralization tanks, gas outlets, electrical outlets
	MW-33		NOT IN USE							
	MW-34		NOT IN USE							
	MW-35		NOT IN USE							
	MW-36		NOT IN USE							
A-309	**DRY TEACHING LAB**									
D-01 A-B	**MW-37**	1	DRY LAB	student lab bench	Custom Millwork	C-C	Lab bench for students with knee and storage space below. Each pair of students has two duplex outlets and a gas turret.	see drawings	P, E, C	
D-01 A-B	**MW-38**	1	DRY LAB	student lab bench	Custom Millwork	C-C	Lab bench for students with knee and storage space below. Each pair of students has two duplex outlets and a gas turret.	see drawings	P, E, C	
	MW-39	1	DRY LAB	upper cabinets	Custom Millwork	C-C	Upper Cabinets Above MW-40	see drawings	C	See elevations. Provide blocking as needed.
	MW-40	1	DRY LAB	lower cabinets	Custom Millwork	C-C		see drawings	C	See elevations for cabinet types, sizes & quantities
	MW-41	1	DRY LAB	upper cabinets	Custom Millwork	C-C	Upper cabinets above MW-42	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate clearances with equipment at countertop below
	MW-42	1	DRY LAB	lower cabinets	Custom Millwork	C-C	Lower cabinets w/ knee space below	see drawings	E, IT, C	See elevations for cabinet/drawer types, sizes & quantities. Coordinate for sink. Coordinate with D-04 equipment at countertop; provide power/data access for PC/monitor/printer equipment as required. Provide grommets as needed to access low voltage device
	MW-43	1	DRY LAB	lower cabinets	Custom Millwork	C-C	Countertop with base storage cabinets and seated knee space below for dry lab equipment.	see drawings	E, C	See elevations for cabinet types, sizes & quantities. Coordinate electrical access for equipment as required. Coordinate knee space/seated workstation; radiator below knee space. Coordinate equipment depths, clearances, and service access.
	MW-44 A-B	2	DRY LAB	tall storage cabinets	Custom Millwork	C-C	Tall storage cabinet assembly.	see drawings	C	See elevations for cabinet types, sizes & quantities. Provide blocking as needed. Coordinate clearances with adjacent equipment/countertop.
	MW-45A-C	3	DRY LAB	tall storage cabinets	Custom Millwork	C-C	Tall storage cabinet assembly.	see drawings	C	See elevations for cabinet types, sizes & quantities. Provide blocking as needed. Coordinate clearances with adjacent equipment/countertop.
	MW-46	1	DRY LAB	lower cabinets	Custom Millwork	C-C	Narrow countertop with base storage cabinets below.	see drawings	C	See elevations for cabinet types, sizes & quantities. Coordinate with wall-mounted board/display above.
	MW-47	1	DRY LAB	coat storage	Custom Millwork	C-C	Coat storage with divided hanging storage and open bag storage below.	see drawings	C	See elevations for shelf/rod/storage types, sizes & quantities. Provide separate hanging areas for lab coats and outside jackets. Provide open storage below for bags. Provide blocking as needed.
	MW-48	1	DRY LAB	lower cabinets	Custom Millwork	C-C	Lower cabinet with ADA sink	see drawings	P, E, C	See elevations for cabinet types, sizes & quantities. Coordinate closely w / ADA sink, plumbing clearances, knee/toe clearances. Coordinate penetrations through countertop/casework as required.
	MW-49	1	DRY LAB	teacher lab bench	Custom Millwork	C-C		12'-0" L X 2'-6" W X 2'-10" H	P, E, C, IT	pumbing (faucet and sink) acid neutralization tanks, gas turrets, electrical outlets + data
	MW-50		NOT IN USE							
	MW-51		NOT IN USE							
	MW-52		NOT IN USE							
	MW-53		NOT IN USE							

1 MILLWORK SCHEDULE

MILLWORK SCHEDULE

FIT SCIENCE LAB RENOVATION

OLD NO.	NEW NO.	QTY	LOCATION	NAME	MODEL/MANUFACTUR	STATUS	DESCRIPTION	SIZE (WxDxH)	REL. TRDS.	COMMENTS/DETAILS
A-312	**ANALYTICS LAB**									
	MW-54	1	ANALYTICS LAB	work table	Custom Millwork	C-C	Custom freestanding work table with tabletop outlet boxes.	see drawings	E	See plans. Coordinate any required floor penetrations. Conduit, or wire management as required.
	MW-55	1	ANALYTICS LAB	upper cabinets	Custom Millwork	C-C	Wall-mounted upper storage cabinets above MW-56	see drawings	E,C	See elevations. Provide blocking as needed. Coordinate clearances with equipment at countertop below.
	MW-56	1	ANALYTICS LAB	lower cabinets	Custom Millwork	C-C	Countertop with base storage cabinets below for analytics equipment and supplies.	see drawings	E, C	See elevations for cabinet types, sizes & quantities. Coordinate countertop layout and clearances with sputter coater and X-Rite spectrophotometer. Coordinate storage/drawer requirements for supplies & SEM stubs. Coordinate equipment depths, clearances, e
	MW-57	1	ANALYTICS LAB	work stations	Custom Millwork	C-C	Countertop with drawer storage and seated knee space below for analytics equipment.	see drawings	E, IT, C	See elevations for drawer types, sizes & quantities. Coordinate with IR spectrometer / FTIR, PC and monitor. Coordinate power/data access, equipment clearances, seating/knee space, and wire management as required.
	MW-58	1	ANALYTICS LAB	work desk	Custom Millwork	C-C	Custom freestanding desk for goniometer with drawer storage for analytics equipment.	see drawings	E,IT	See elevations. Coordinate with contact angle goniometer, PC and monitor. Desk shall remain freestanding and shall not touch or be fastened to wall to prevent vibration transfer to sensitive equipment. Coordinate power/data routing, wire management, equip
	MW-59	1	ANALYTICS LAB	work desk	Custom Millwork	C-C	Custom freestanding desk for SEM workstation.	see drawings	E,IT	See elevations. Coordinate with SEM, including 2 micro PCs, 2 monitors, peripherals, power supplies, pump, and backup power. Desk shall remain freestanding and shall not touch or be fastened to wall to prevent vibration transfer to sensitive equipment. Co
	MW-60	1	ANALYTICS LAB	upper cabinets	Custom Millwork	C-C	Wall-mounted upper storage cabinets.	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate clearances with equipment, monitors, and freestanding workstations below.
	MW-61		NOT IN USE							
	MW-62		NOT IN USE							
	MW-63		NOT IN USE							
	MW-64		NOT IN USE							
	MW-65		NOT IN USE							
A-321B	**PREP ROOM**									
	MW-66	1	PREP ROOM	lower cabinets	custom millwork	C-C	Countertop with below-counter storage for prep room equipment.	see drawings	E, C	See elevations for cabinets/storage types, sizes & quantities. Coordinate storage clearances with P-04 shop vacuum and P-05 vacuum chamber. Coordinate electrical access for P-04 as required.
	MW-67	1	PREP ROOM	upper cabinets	custom millwork	C-C	Wall-mounted upper storage cabinets.	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate clearances with equipment/storage below.
	MW-68	1	PREP ROOM	lower cabinets	custom millwork	C-C	Countertop with base storage cabinets below for prep room equipment.	see drawings	E, C	Countertop with base storage cabinets below for prep room equipment.
	MW-69	1	PREP ROOM	upper cabinets	custom millwork	C-C	Wall-mounted upper storage cabinets.	see drawings	C	Wall-mounted upper storage cabinets.
	MW-70	1	PREP ROOM	wooden work bench	existing by owner	O-O			E	
	MW-71	1	NOT IN USE							
	MW-72	1	NOT IN USE							
	MW-73	1	NOT IN USE							
A-321A	**OFFICE**									
	MW-74	1	OFFICE	lower cabinets	custom millwork	C-C	Countertop with base storage cabinets below for prep room equipment.	see drawings	C	See elevations for cabinet types, sizes & quantities. Coordinate storage clearances with vinyl cutter. Coordinate electrical access for powered equipment as required.
	MW-75	1	OFFICE	upper cabinets	custom millwork	C-C	Wall-mounted upper storage cabinets.	see drawings	E, C	See elevations. Provide blocking as needed. Coordinate clearances with sink/countertop below.
	MW-76	1	OFFICE	upper cabinets	custom millwork	C-C	Wall-mounted upper storage cabinets.	see drawings	E, C	See elevations for shelf types, sizes & quantities. Provide blocking as needed. Coordinate clearances with freestanding desks and monitors below.
	MW-77	1	OFFICE	lower cabinets	custom millwork	C-C	Countertop with sink and base storage cabinets below.	see drawings	P,C	See elevations for cabinet types, sizes & quantities. Coordinate for O-07 sink/faucet. Coordinate plumbing rough-ins and cabinet clearances below sink.
	MW-78A-B	2	OFFICE	work desks	custom millwork	C-C	Custom freestanding desks with drawer storage and seated knee space.	see drawings	E, IT, C	See elevations. Coordinate power/data access, monitor/computer locations, wire management, seating clearance, and drawer clearances as required.
	MW-79A-B	2	OFFICE	shelves	Rakks shelving system + custom millwork	C-C	Wall Mounted Rakks Shelves above work desks.	see drawings	C	See elevations for shelf types, sizes & quantities. Provide blocking as needed. Coordinate clearances with freestanding desks and monitors below.
	MW-80A-B	2	OFFICE	work desks	custom millwork	C-C	freestanding desks with drawer storage and seated knee space; mirrored condition of MW-78A-B.	see drawings	E, IT,C	See elevations. Desks are freestanding and shall not be attached to one another. Coordinate power/data access, monitor/computer locations, wire management, seating clearance, and drawer clearances as required.
D-09A	**MW-81**	1	OFFICE	lockers w/ broom closet	custom millwork	C-C	Lockable staff lockers with broom closet at side.	see drawings	C	See elevations for locker quantities, door types, sizes & configuration. Provide full-height broom closet at side. Provide blocking/anchorage as needed.

STATUS KEY/ BALL IN COURT	
E-O	EXISTING, OWNER INSTALLED
O-O	OWNER FURNISHED, OWNER INSTALLED
C-C	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
O-C	OWNER FURNISHED, CONTRACTOR INSTALLED
E-C	EXISTING, CONTRACTOR INSTALLED

TRADE KEY	
M	MECHANICAL
E	ELECTRICAL
P	PLUMBING
IT	INFORMATION TECHNOLOGY
C	CARPENTRY
S	STRUCTURAL

NOT FOR CONSTRUCTION

FIT Science Lab Renovation

Project No. 2449

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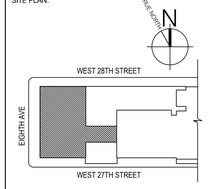
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SITE PLAN:



SUBMITTAL:

100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% SCHEMATIC DESIGN	2025.02.06
02	10% DESIGN DEVELOPMENT	2026.11.12
03	100% DESIGN DEVELOPMENT	2026.03.31
04	100% BID DOCUMENT	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:

AS NOTED

SHEET TITLE:

MILLWORK SCHEDULE

SHEET NUMBER:

A-062

FURNITURE SCHEDULE

FIT SCIENCE LAB RENOVATION

OLD NO.	NEW NO.	QTY	LOCATION	NAME	MODEL/MANUFACTURER	STATUS	DESCRIPTION	SIZE (W x D x H)	REL. TRDS.	COMMENTS/DETAILS
A-321	**WET LAB**									
W-39	**F-01A-F**	6	WET LAB	Utility Carts	ULINE H-5007BLU	E-O	3-Shelf Compact Utility Cart with Flat Shelves	27L x 18W x 34H"		
	F-02	30	WET LAB	chairs	TBD	O-O				located at student and instructor benches
	F-03		NOT IN USE							
	F-04		NOT IN USE							
	F-05		NOT IN USE							
	F-06		NOT IN USE							
A-319	**BIOMATERIALS RESEARCH**									
B-12	**F-07**	1	BIOMATERIALS RESEARCH	mobile tray rack		E-O	on casters, can be moved	21"Wx26"Dx70"H		not fixed
B-13 A-D	**F-08A-D**	4	BIOMATERIALS RESEARCH	Utility Cart	ULINE H-5007BLU	E-O	3-Shelf Compact Utility Cart with Flat Shelves	27L x 18W x 34H"		
	F-09	6	BIOMATERIALS RESEARCH	chairs	TBD	O-O				
	F-10		NOT IN USE							
	F-11		NOT IN USE							
	F-12		NOT IN USE							
A-309	**DRY TEACHING LAB**									
	F-13	34	DRY LAB	chairs	TBD	O-O				located at student and instructor benches
	F-14		NOT IN USE							
	F-15		NOT IN USE							
	F16		NOT IN USE							
A-312	**ANALYTICS LAB**									
	F-17	9	ANALYTICS LAB	chairs	TBD	O-O				
	F-18		NOT IN USE							
	F-19		NOT IN USE							
	F-20		NOT IN USE							
A-321B	**PREP ROOM**									
	F-21		NOT IN USE							
	F-22		NOT IN USE							
	F-23		NOT IN USE							
A-321A	**OFFICE**									
	F-24	4	OFFICE	chairs	TBD	O-O				
	F-25		NOT IN USE							
	F-26		NOT IN USE							
	F-27		NOT IN USE							
A301C	**CORRIDOR**									
A301C	**F-28**	11	A301C	Lockers: 3 columns 2 rows	Hallowell® Model # :WBB661824 MPN #: USS3888-2A	O-O	2-Tier 6 Door Stainless Steel Locker	54"W x 18"D x 78"H		https://www.globalindustrial.com/p/2-tier-6-door-stainless-steel-locker-54-w-x-18-d-x-78-h-gray-assembled?referer=L2Mvc3RvcmFnZS9sb2NrZXJzL3N0YWc5kYXJkX2xvY2tlcnMvc3RhaW5sZXNzX3N0ZWVsX2x0Y2tlcnM%3D#customUrl:::prindex=9&pgkey=21089
	F-29	2	A301C	Lockers: 1 column 2 rows	Hallowell® Model # :WBB661823 MPN #: USS1888-2A	O-O	2-Tier 2 Door Stainless Steel Locker	18" W x 18" D x 78" H		https://www.globalindustrial.com/p/2-tier-6-door-stainless-steel-locker-54-w-x-18-d-x-78-h-gray-assembled?referer=L2Mvc3RvcmFnZS9sb2NrZXJzL3N0YWc5kYXJkX2xvY2tlcnMvc3RhaW5sZXNzX3N0ZWVsX2x0Y2tlcnM%3D#customUrl:::prindex=9&pgkey=21089
	F-30		NOT IN USE							
	F-31		NOT IN USE							

1 FURNITURE SCHEDULE

STATUS KEY/ BALL IN COURT	
E-O	EXISTING, OWNER INSTALLED
O-O	OWNER FURNISHED, OWNER INSTALLED
C-C	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
O-C	INSTALLED
E-C	EXISTING, CONTRACTOR INSTALLED

TRADE KEY	
M	MECHANICAL
E	ELECTRICAL
P	PLUMBING
IT	INFORMATION TECHNOLOGY
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S	STRUCTURAL

PLUMBING SCHEDULE

FIT SCIENCE LAB RENOVATION

NEW NO.	QTY	LOCATION	NAME	MODEL/MANUFACTURER	STATUS	DESCRIPTION	SIZE (W x D x H)	COMMENTS/DETAILS
PL-01	3	WET LAB, BIOMAT, DRY LAB	ADA lab undermounted sink	Just, USADA1824A55-J	C-C	Stainless Steel Single Bowl Undermount ADA Sink	23-1/2" x 18-1/4" x 5-3/8"	https://www.justmfg.com/products/sinks/undermount-sinks/usada1824a55-j
PL-02	7	WET LAB, DRY LAB, OFFICE	lab undermounted sink	Just, USX1618A-J	C-C	Stainless Steel Single Bowl Undermount ADA Sink	18-1/2" x 16" x 10-1/2"	https://www.justmfg.com/products/sinks/undermount-sinks/usx1618a-j
PL-03	17	WET LAB, BIOMAT	cup sink	Just, A28065	C-C	Just Manufacturing A28065 Cup Sink, Round, Self Rimming, 16 Ga Type 316	5 3/4" x 5-3/4" x 4"	https://www.webstaurantstore.com/documents/specsheets/995a28066_specsheet.pdf?srsltid=AfmBOorhK4ls6UA_mBvVx3_04ZcMdAWWQxsMM-nyU1FKE68D6ojratE
PL-04	17	WET LAB, BIOMAT, DRY LAB	acid neutralization tank	MIFAB® M-NEUT-NT-5	C-C	acid neutralization tank manufactured out of heavy duty H.D.P.E. material with internal deep seal trap	11" x 11" x 14"	https://mifab.com/products/mi-neut-nt-5/
PL-05	17	WET LAB, BIOMAT	student lab faucet	Chicago Faucets, 928-369CP	C-C	Deck Mounted Laboratory Faucet with Rigid/Swing Vacuum Breaker Spout and Metal Lever Handle	2" x 5-7/8" x 12 3/4"	https://www.fergusonhome.com/chicago-faucets-928-369/s387467?uid=1071723#overview
PL-06	2	WET LAB, DRY LAB	teacher lab faucet	Chicago Faucets LWM1-B63-E	C-C	Laboratory Water Mixing Faucet, Single Hole, Gooseneck Spout with Vacuum Breaker & Laminar Outlet	10" x 6" x 13-1/8"	https://www.chicagofaucetshoppe.com/Chicago-Faucets-930-K2E29-317CP-p/lwm1-b63-e.htm?srsltid=AfmBOoqk8SS-RTMtM3cvHWuTP26w1Q8_2PJWJBGNkMNlPxAZrHVtdmlu2
PL-07	31	WET LAB, BIOMAT	gas turret w/ 1 outlet	T&S Brass, BL-4200-01	C-C	Lab Turret, Tapered w/One Hose Cock (1 turret per pair of students, 6 at the smaller student bench and 8 at the larger student bench)		https://www.tsbrass.com/products/laboratory-products/hose-cocks-turrets-flanges-stops/BL-4200-01
PL-08	2	WET LAB, BIOMAT	gas turret w/ 2 outlets	T&S Brass, BL-4200-02	C-C	Lab Turret, Tapered w/Two 180 Degree Hose Cocks (located at teacher's island)		https://www.tsbrass.com/products/laboratory-products/hose-cocks-turrets-flanges-stops/BL-4200-02
PL-09	1	WET LAB	DI faucet	Marquest Scientific, LG-DD-R1	C-C	PVC Laboratory Faucet, Deck Mount, Duraline Control Valve, 3/8" Female NPT Inlet, Removable Serrated Barb Tip, Right Handle	3" x 6" 14.8"	https://catalog.marquestscientific.com/item/series-lg-laboratory-faucets/deck-mounted-lab-faucets/lg-dd-r1?srsltid=AfmBOopWh4go8dkj842nC57iewyv148wjPhIfHi6fUbFmuKemcFrL8g
PL-10	4	WET LAB, BIOMAT, DRY LAB	eye wash	Speakman, SE-927	C-C	Combination Eyewash & Drench Hose	5-1/2" x 1-1/2"	https://speakman.com/product/se-927-deck-mounted-drench-hose-eyewash-combination/
PL-11	7	WET LAB, BIOMAT, DRY LAB	lab faucet (hot+cold)	Chicago Faucets LWM1-A23-B	C-C	Deck-mounted, dual-inlet water faucet, single-hole mounting	10" x 8-1/8" x 14-7/8"	https://www.chicagofaucets.com/specific-product/Laboratory-Fittings/LWM1/LWM1-A23-B
PL-12	1	OFFICE	kitchen faucet	Chicago Faucets, 786 Series, Manual Sink Faucets786-ABCP	C-C	Polished Chrome Deck-mounted manual faucet	8"x 5-3/8" x 11-5/8"	https://www.chicagofaucets.com/specific-product/Manual-Sink-Faucets/786/786-ABCP
PL-13	6	ADA TOILET, TOILET	ADA sink	American Standard, DECORUM® WALL-HUNG LAVATORY WITH EVERCLEAN®	C-C	Wall-hung sink For concealed arm (by others) or wall support Faucet holes – center hole only	20" x 18-1/4" x 5"	https://www.americanstandard-us.com/products/decorum-r-wall-hung-everclean-r-sink-with-center-hole-only?variant=43622231343151
PL-14	6	ADA TOILET, TOILET	ADA faucet	Chicago Faucets, 50 Series Manual Sink Faucets 50-317XKABCP	C-C	Deck-mounted manual faucet, single-hole mounting	10" x 5-1/4" x 13-3/8"	https://www.chicagofaucets.com/new-product-page/manual-sink-faucets/50
PL-15	6	ADA TOILET, TOILET	ADA toilet	American Standard, Afwall® Millenium™ FloWise® Elongated Flushometer Toilet with EverClean®	C-C	Wall-hung elongated flushometer bowl, Maximum Performance (MaP) score of 1,000 grams	14" x 26" x 15"	https://www.americanstandard-us.com/products/afwall-r-millennium-r-1-1-1-6-gpf-4-2-6-0-lpf-back-spud-elongated-wall-hung-everclean-r-bowl?variant=43622227345455
PL-16	1	JANITOR CL	janitor sink	Fiat Products, TSB3001 Stockton Terrazzo Mop Basin	C-C	Square mop service basin. Continuous stainless steel caps on all curbs	32" x 32"	https://fiatproducts.com/products/mop-service-basins/tsb3001-32-x-32-stockton-terrazzo-mop-basin/
PL-17	1	JANITOR CL	janitor faucet	Chicago Faucets Manual Sink Faucets 897-CP	C-C	Wall-mounted manual faucet with 8" centers	8-3/8" x 8" x 10-3/4"	https://www.chicagofaucets.com/specific-product/Manual-Sink-Faucets/897/897-CP

2 PLUMBING SCHEDULE

STATUS KEY/ BALL IN COURT	
E-O	EXISTING, OWNER INSTALLED
O-O	OWNER FURNISHED, OWNER INSTALLED
C-C	INSTALLED
O-C	OWNER FURNISHED, CONTRACTOR INSTALLED
E-C	EXISTING, CONTRACTOR INSTALLED

NOT FOR CONSTRUCTION

FIT Science Lab Renovation

Project No. 2449

340 8th AVENUE
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212.217.7999

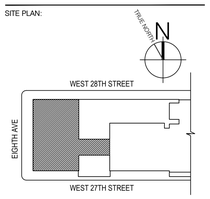
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SITE PLAN:



SUBMITTAL:

100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% SCHEMATIC DESIGN	2025.02.06
02	10% DESIGN DEVELOPMENT	2026.11.12
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04	100% BID DOCUMENT	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
AS NOTED

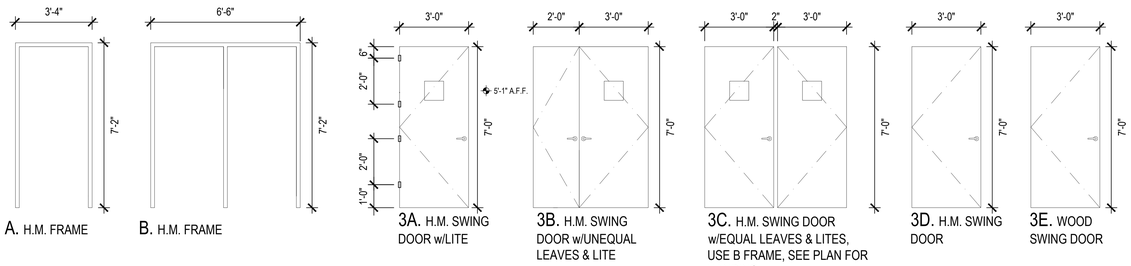
SHEET TITLE:
FURNITURE AND PLUMBING SCHEDULES

SHEET NUMBER:
A-063

DOOR SCHEDULE

DOOR		FRAMES						DOORS									
NO.	LOCATION	MATL.	ELEV.	TYPE	JAMB	HEAD	SILL	MATL.	ELEV.	WIDTH	HEIGHT	LEAVES	THKNS.	UNDRCUT	HDWR	U.L.	COMMENTS
D01	WET LAB A321	HM	A						3B	5'-0"	7'-0"	1 @ 3'-0" 1 @ 2'-0"	1 3/4"	3/8"	4	90	
D02	OFFICE A320A	HM	A						3A	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	5	90	
D03	ELECTRICAL A319	HM	A						3D	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	1	90	
D04	BIOMATERIALS RESEARCH A318	HM	A						3B	5'-0"	7'-0"	1 @ 3'-0" 1 @ 2'-0"	1 3/4"	3/8"	4	90	
D05	ANALYTICS LAB A312	HM	A						3B	5'-0"	7'-0"	1 @ 3'-0" 1 @ 2'-0"	1 3/4"	3/8"	4	90	
D06	DRY TEACHING LAB A309	HM	A						3B	5'-0"	7'-0"	1 @ 3'-0" 1 @ 2'-0"	1 3/4"	3/8"	4	90	
D07	PREP ROOM A320B	HM	A						3A	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	3	45	
D08	PREP ROOM A320B	HM	A						3A	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	3	45	
D09	PREP ROOM A320B	HM	A						3A	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	7	45	
D10	PREP ROOM A320B	HM	A						3A	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	3	45	
D11	JANITORS CLOSET 304	HM	A						3D	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	1	45	
D12	ADA W.C A302A	HM	A						3E	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	2	45	
D13	ADA W.C A302B	HM	A						3E	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	2	45	
D14	ADA W.C A302C	HM	A						3E	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	2	45	
D15	W.C A303A	HM	A						3E	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	2	45	
D16	W.C A303B	HM	A						3E	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	2	45	
D17	W.C A303C	HM	A						3E	3'-0"	7'-0"	1 @ 3'-0"	1 3/4"	3/8"	2	45	
D18	CORRIDOR A301 B	HM	A						3C	6'-2"	7'-0"	2 @ 3'-0"	1 3/4"	3/8"	6	90	

1 DOOR SCHEDULE



A. H.M. FRAME

B. H.M. FRAME

3A. H.M. SWING DOOR w/LITE

3B. H.M. SWING DOOR w/UNEQUAL LEAVES & LITE

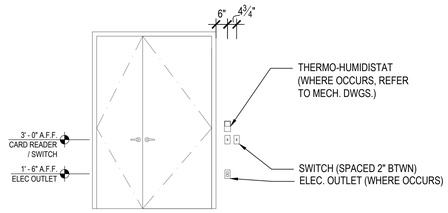
3C. H.M. SWING DOOR w/EQUAL LEAVES & LITES, USE B FRAME, SEE PLAN FOR HANDING

3D. H.M. SWING DOOR

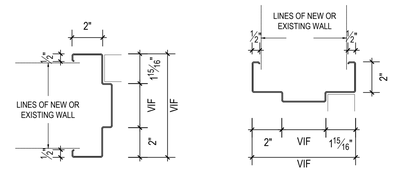
3E. WOOD SWING DOOR

2 FRAME ELEVATION
3/8"=1'-0"

3 DOOR ELEVATIONS
3/8"=1'-0"



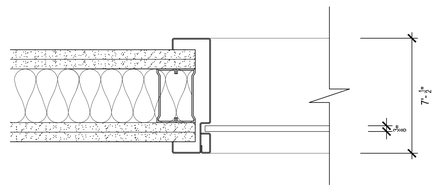
4 TYP. DEVICE DATUMS AT DOOR DIAGRAM
3/8"=1'-0"



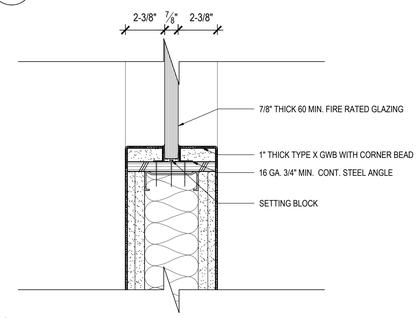
5 METAL DOOR FRAME DETAILS
3"=1'-0"

GLAZING TYPES					
TYPE	USE	DESCRIPTION	EDGES	MANUFACTURER/MODEL	NOTES
GL-1		3/8" THICK CLEAR LAMINATED GLASS			
GL-2		2 HOUR FIRE RATED GLASS			

6 GLAZING TYPES



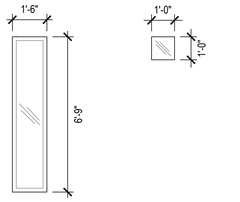
7 METAL WINDOW FRAME DETAIL (SAME FOR SILL, JAMBS, AND HEAD)
3"=1'-0"



8 FRAMELESS WINDOW DETAIL (SAME FOR SILL, JAMBS, AND HEAD)
3"=1'-0"

WINDOW SCHEDULE							
NO.		LOCATION	FRAME MATERIAL	DIMENSIONS (W,H)	FRAME TYPE	GLAZING TYPE	DETAILS	COMMENTS
W-1	W1	BIOMATERIALS RESEARCH A318	FRAMELESS	1'-6", 7'-2"	FRAMELESS	GL-1	10A	WEST WALL, NEAR DOOR D04
W-2	W2	BIOMATERIALS RESEARCH A318	FRAMELESS	1'-0",1'-0"	FRAMELSS	GL-2	10B	WEST WALL
W-3	W3	ANALYTICS LAB A312	FRAMELESS	1'-6", 7'-2"	FRAMELESS	GL-1	10A	WEST WALL
W-4	W4	ANALYTICS LAB A312	FRAMELESS	1'-0",1'-0"	FRAMELSS	GL-2	10B	SOUTH WALL
W-5	W5	ANALYTICS LAB A312	FRAMELESS	1'-0",1'-0"	FAMELESS	GL-2	10B	SOUTH WALL
W-6	W6	DRY TEACHING LAB A309	FRAMELESS	1'-6", 7'-2"	FAMELESS	GL-1	10A	SOUTH WALL
W-7	W7	DRY TEACHING LAB A309	FRAMELESS	1'-0",1'-0"	FAMELESS	GL-2	10B	SOUTH WALL
W-8	W8	DRY TEACHING LAB A309	FRAMLESS	1'-0",1'-0"	FAMLESS	GL-2	10B	SOUTH WALL

9 WINDOW SCHEDULE



10A. INTERIOR HOLLOW METAL FRAME

10B. INTERIOR FRAMELESS SQUARE WINDOW

10 INTERIOR WINDOW ELEVATIONS
3/8"=1'-0"

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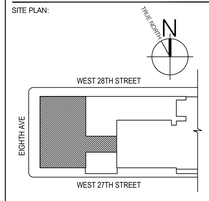
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SITE PLAN:



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SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

SCALE:
AS NOTED

SHEET TITLE:
DOOR, WINDOW, GLAZING DETAILS & SCHEDULES

SHEET NUMBER:
A-071



DEVICE LEGEND

	HARDWIRED CONNECTION
	WALL DUPLEX OUTLET. REF: ELEC.
	WALL DOUBLE DUPLEX OUTLET. REF: ELEC.
	DEDICATED OUTLET
	FLOOR OUTLET, FLUSH MOUNT W/ ELEC, DATA & TEL. REF: ELEC & I.T.
	WALL TEL./DATA OUTLET
S	OVERRIDE LOW VOLTAGE WALL MOUNTED SWITCH
S_D	DIMMING OVERRIDE LOW VOLTAGE WALL MOUNTED SWITCH
S_{OS}	OCCUPANCY SENSOR LOW VOLTAGE WALL MOUNTED SWITCH
CR	CARD READER @ 42" A.F.F. O.C.
P	WALL MOUNTED TELEPHONE @ 42" A.F.F. O.C.
S	WALL MOUNTED COMBINATION SPEAKER/STROBE APPLIANCE
SL	WALL MOUNTED STROBE ONLY APPLIANCE
SPS	STROBE POWER SUPPLY
F	MANUAL PULL STATION
P	RELOCATED & NEW PANEL BOARDS
	FLOORBOX W/ POWER & DATA
	RECEPTACLE, NEMA 6-50R 208V, 50A COORDINATE WITH MANUFACTURER
	CEILING/WALL/FLOOR MOUNTED JUNCTION BOX
	SPECIAL PURPOSE OUTLET. (COORDINATE REQUIREMENTS WITH VENDOR FOR EACH EQUIPMENT)
SV	SOLENOID VALVE
	JUNCTION BOX STUBBED UP FROM CONDUIT STUBBED UP FROM FLOOR
SP	SPEAKER

NOTES

1. THE DEVICE PLAN CAPTURES THE FULL VOLUME OF DEVICES FOR WORK STATIONS AND EQUIPMENT. PLEASE INCLUDE ADDITIONAL CONVENIENCE RECEPTACLES.
2. SUBSCRIPTS INDICATE CENTERLINE HEIGHTS FOR WALL AND CABINET MOUNTED DEVICES AS FOLLOWS.
   H: HIGH HEIGHT MOUNT @ 54" A.F.F. O.C.
   M: MEDIUM HEIGHT MOUNT @ 42" A.F.F. O.C.
   L: LOW HEIGHT MOUNT @ 18" A.F.F. O.C.
   GFI: GROUND FAULT INTERRUPTER
   CAB: MOUNT IN CABINETRY
3. CENTER SINGLE OUTLETS OR SERIES OF OUTLETS & EQUALLY SPACE SERIES OF OUTLETS WITHIN WALLS OR ELEMENTS, UNLESS OTHERWISE NOTED.
4. ALL SWITCHES & OUTLETS TO BE AT LEAST 18" FROM INSIDE CORNERS, FOR ACCESSIBILITY, UNLESS OTHERWISE NOTED.
5. ALL PULL STATIONS TO BE AT 48" A.F.F. O.C. U.O.N. OPERATING HANDLE HEIGHT MUST NOT EXCEED 48".
6. ALL LIGHT SWITCHES & CARD READERS TO BE AT 42" A.F.F. O.C. U.O.N.

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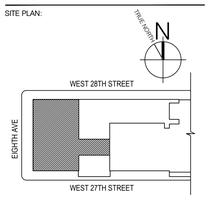
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SITE PLAN:



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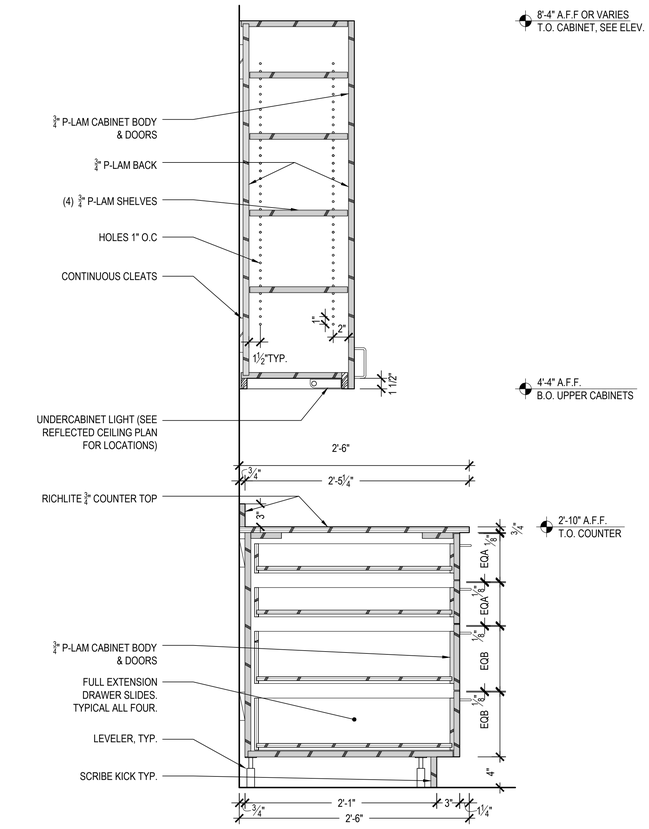
SEAL & SIGNATURE:

DRAWN BY: KC, AS CHECKED BY: KB, SA

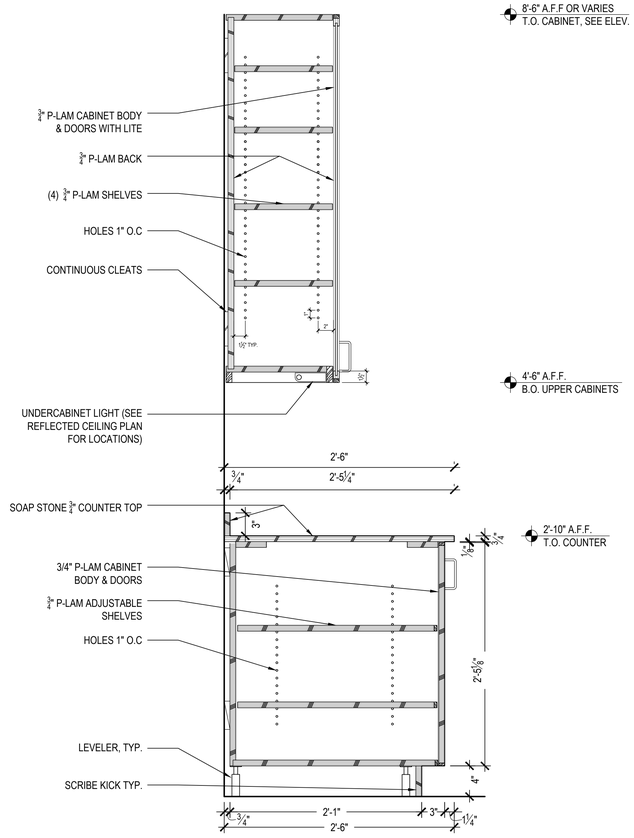
SCALE:
1/8" = 1'-0"

SHEET TITLE:
DEVICE PLAN

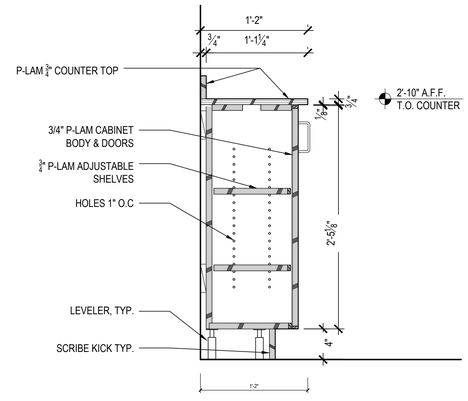
SHEET NUMBER:
A-081



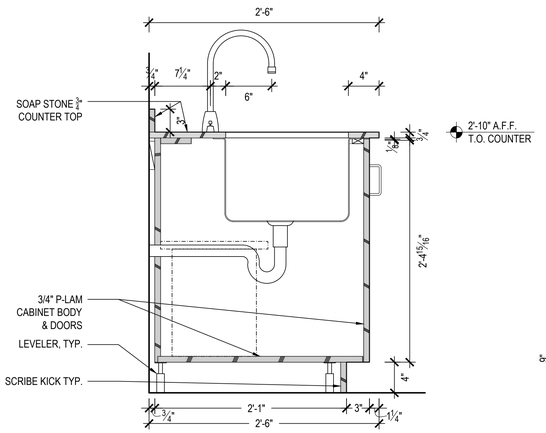
1 TYPICAL BASE CABINET WITH 4 DRAWERS AND GLAZED UPPER CABINET
1 1/2"=1'-0"



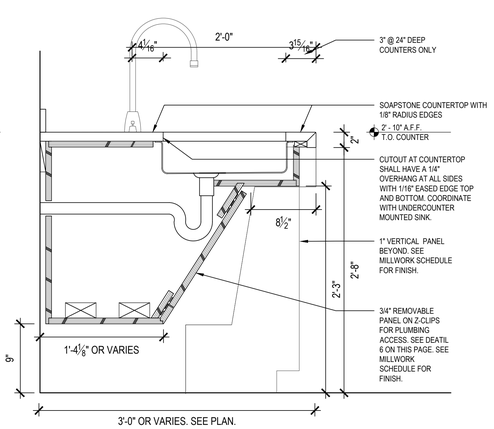
2 BASE CABINET WITH SHELVES AND UPPER CABINET
1 1/2"=1'-0"



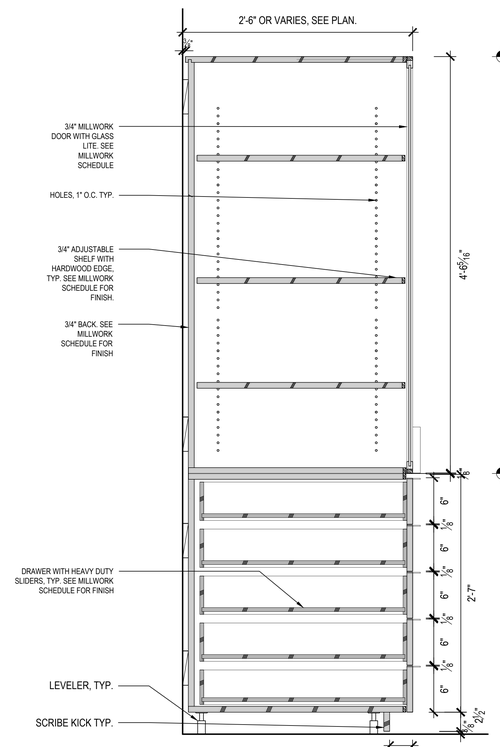
3 BASE CABINET WITH SHELVES
1 1/2"=1'-0"



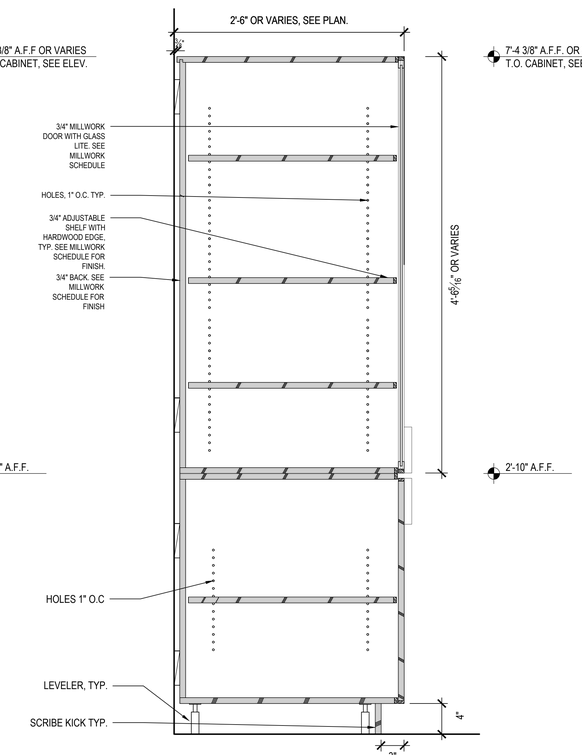
4 BASE CABINET AT SINK
1 1/2"=1'-0"



5 ADA SINK
1 1/2"=1'-0"



6 FULL HEIGHT STORAGE WITH DRAWERS
1-1/2" = 1' - 0"



7 FULL HEIGHT STORAGE WITH SHELVES
1-1/2" = 1' - 0"

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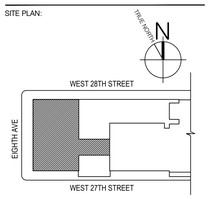
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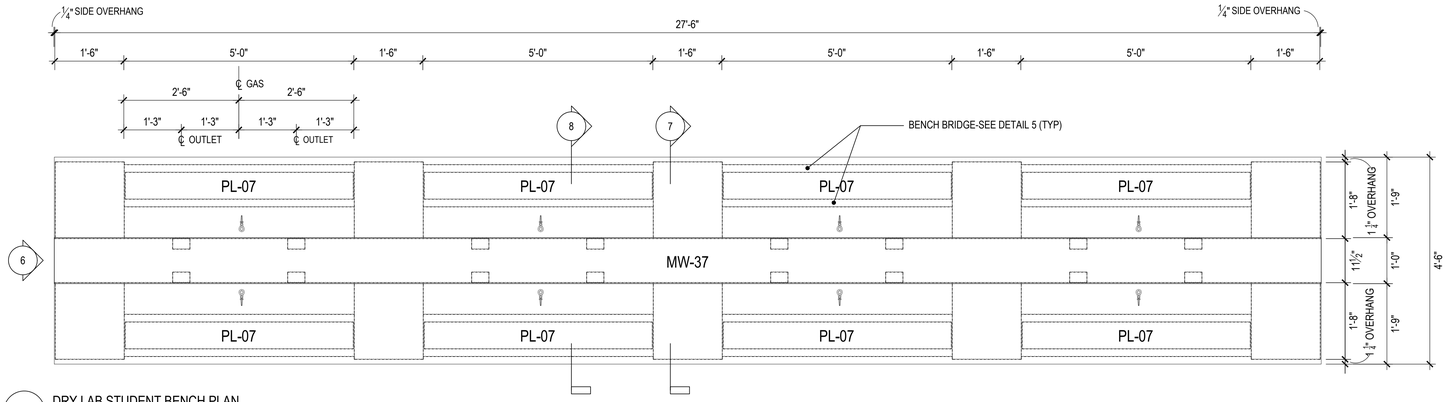
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DRAWN BY: **AS**, AS CHECKED BY: KB, SA

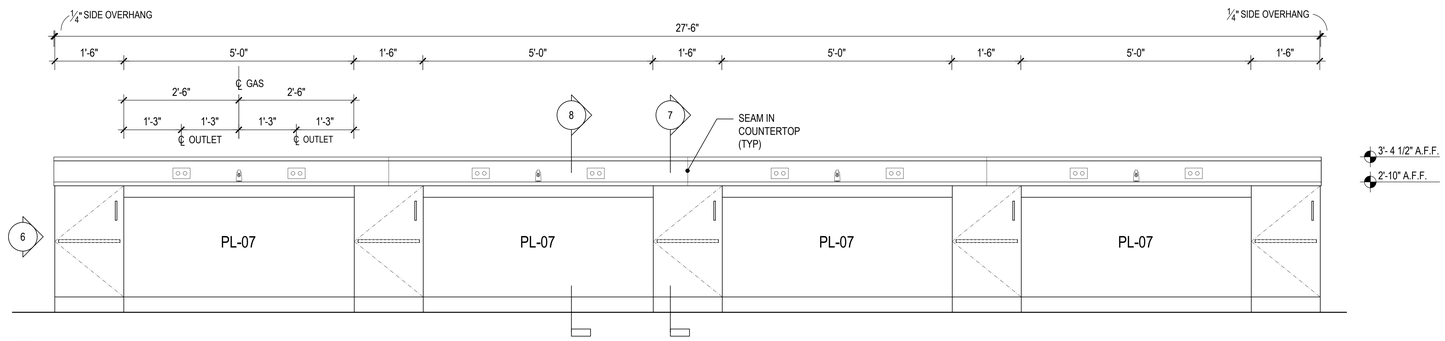
SCALE:
AS NOTED

SHEET TITLE:
MILLWORK DETAILS

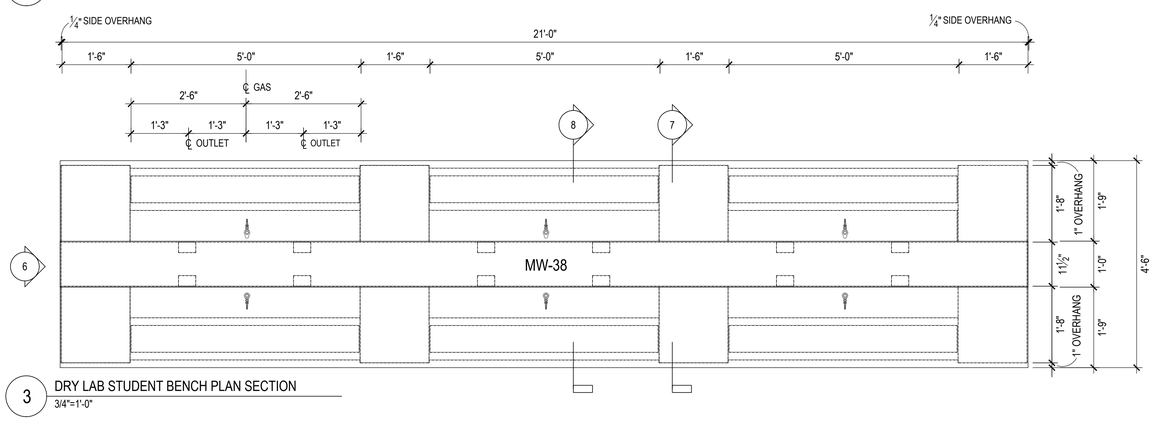
SHEET NUMBER:
A-091



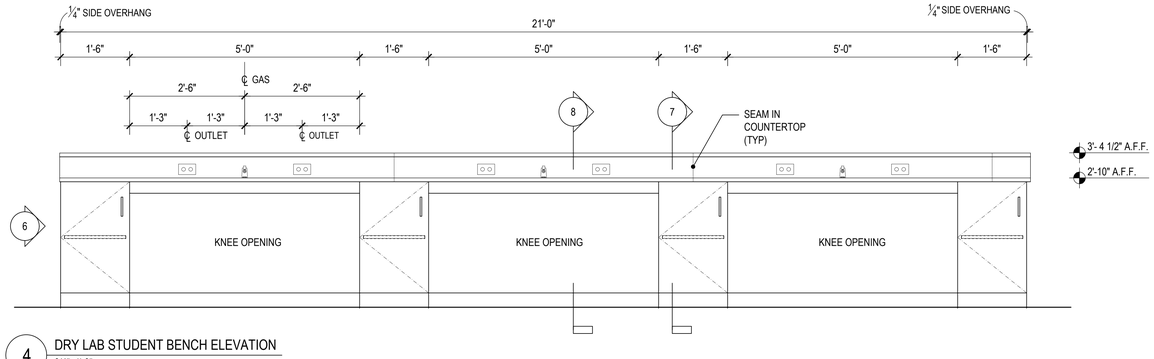
1 DRY LAB STUDENT BENCH PLAN
3/4"=1'-0"



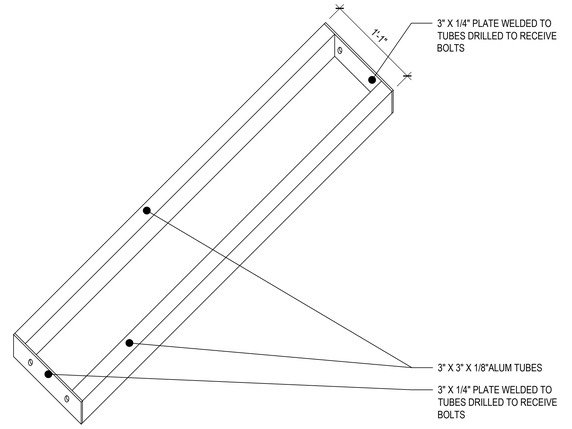
2 DRY LAB STUDENT BENCH ELEVATION
3/4"=1'-0"



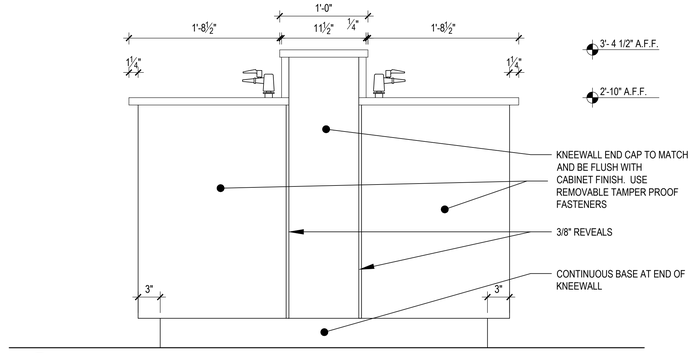
3 DRY LAB STUDENT BENCH PLAN SECTION
3/4"=1'-0"



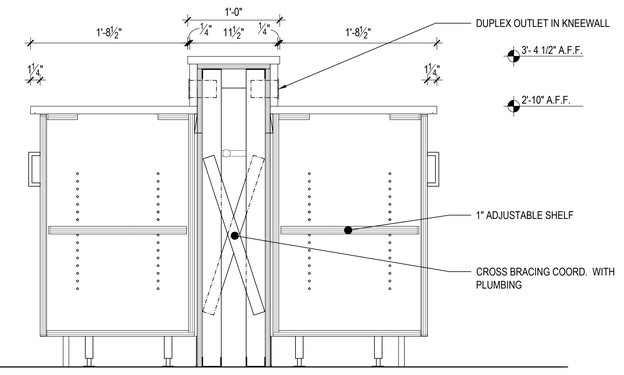
4 DRY LAB STUDENT BENCH ELEVATION
3/4"=1'-0"



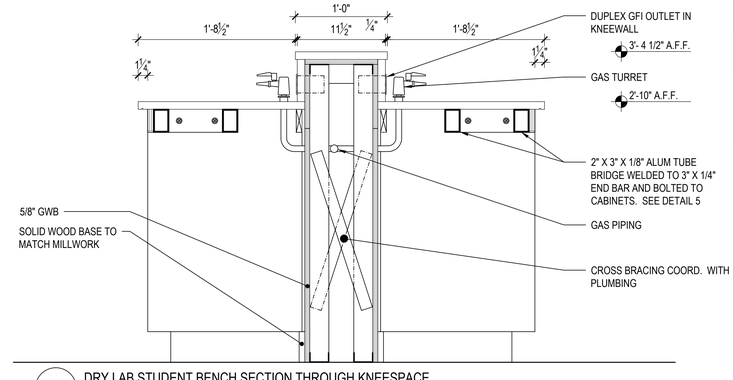
5 BENCH BRIDGE
1 1/2"=1'-0"



6 DRY LAB STUDENT BENCH SIDE ELEVATION
1 1/2"=1'-0"



7 DRY LAB STUDENT BENCH SECTION DETAIL THROUGH CABINET
1 1/2"=1'-0"



8 DRY LAB STUDENT BENCH SECTION THROUGH KNEESPACE
1 1/2"=1'-0"

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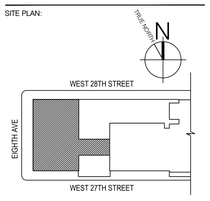
ARCHITECT
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SITE PLAN:



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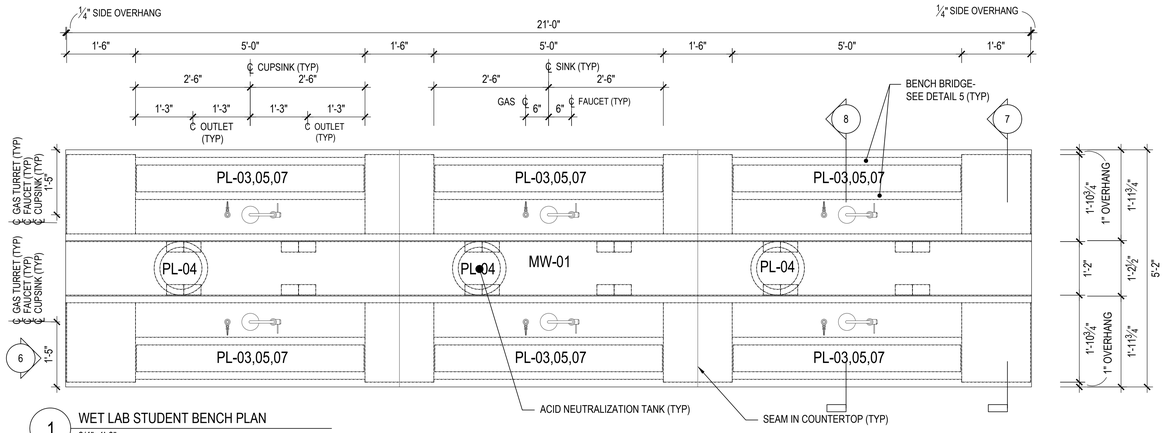
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DRAWN BY: KC, AS CHECKED BY: KB, SA

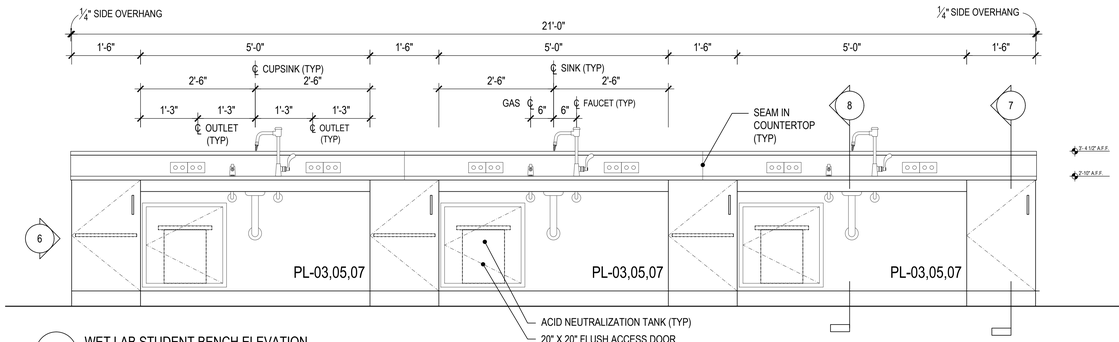
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SHEET TITLE:
MILLWORK DETAILS

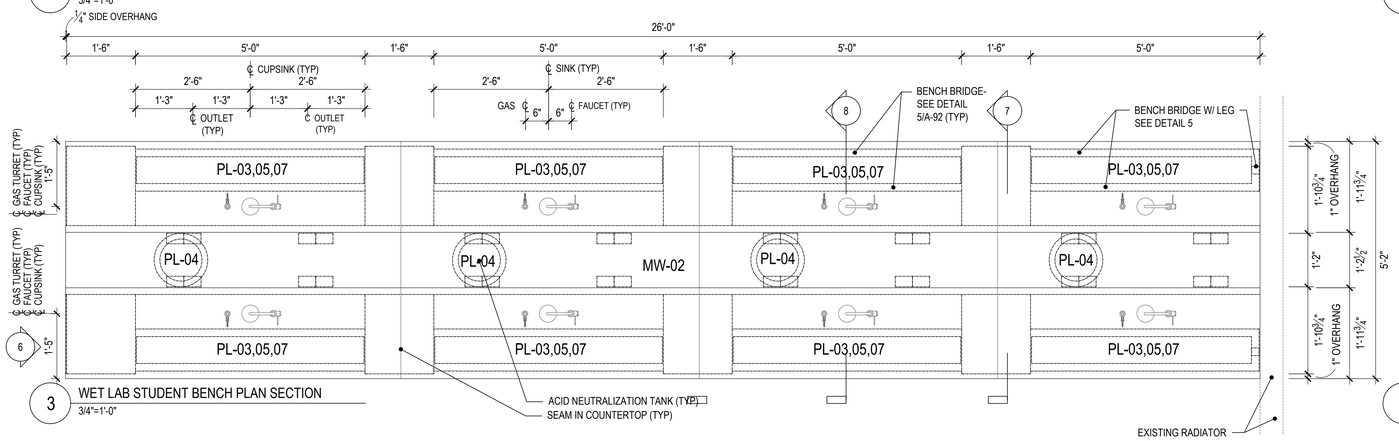
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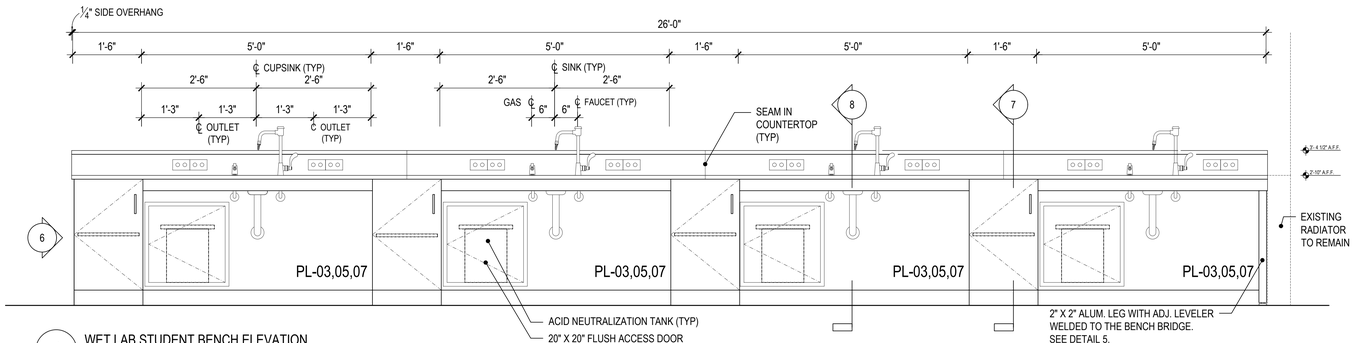
1 WET LAB STUDENT BENCH PLAN
3/4"=1'-0"



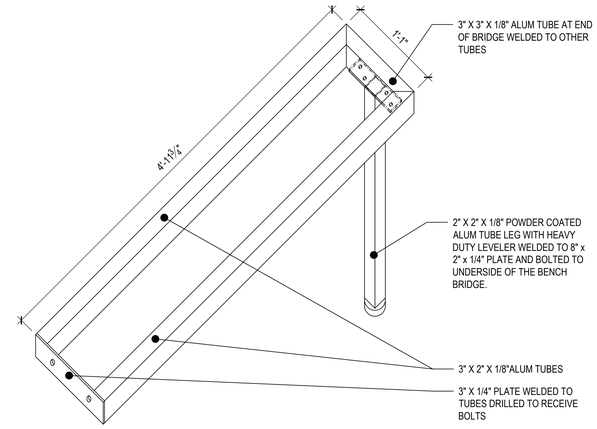
2 WET LAB STUDENT BENCH ELEVATION
3/4"=1'-0"



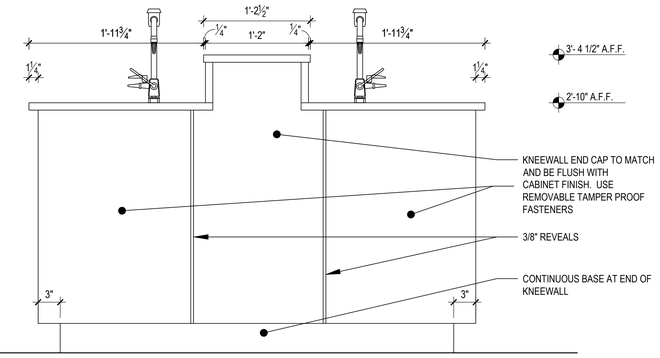
3 WET LAB STUDENT BENCH PLAN SECTION
3/4"=1'-0"



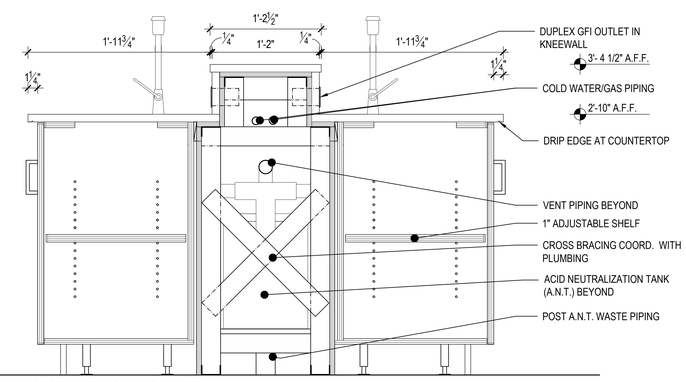
4 WET LAB STUDENT BENCH ELEVATION
3/4"=1'-0"



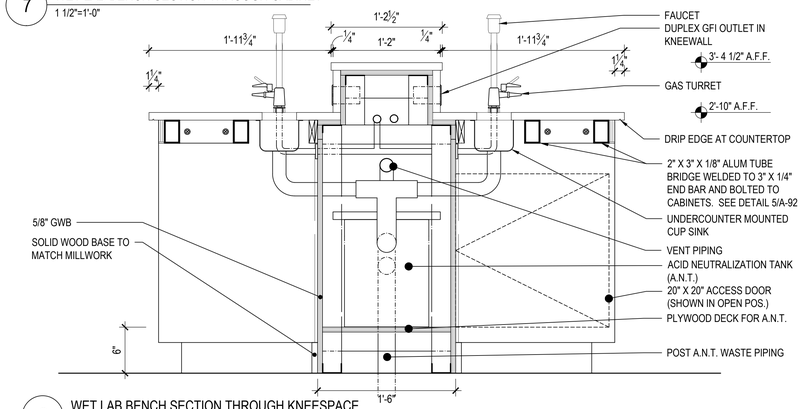
5 BENCH BRIDGE WITH LEG
1 1/2"=1'-0"



6 WET LAB BENCH SIDE ELEVATION
1 1/2"=1'-0"



7 WET LAB BENCH SECTION THROUGH CABINET
1 1/2"=1'-0"



8 WET LAB BENCH SECTION THROUGH KNEESPACE
1"=1'-0"

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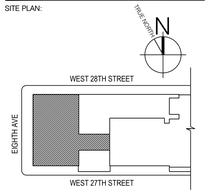
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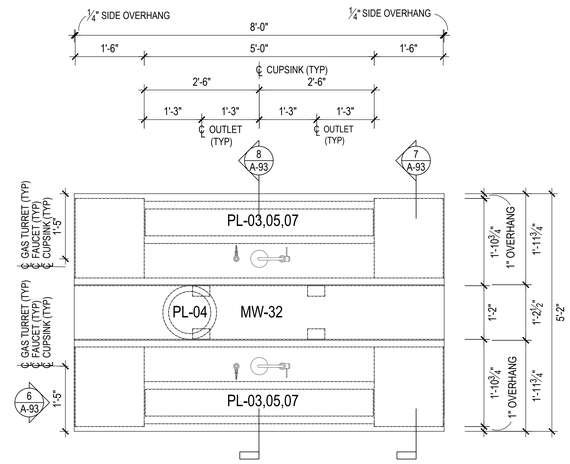
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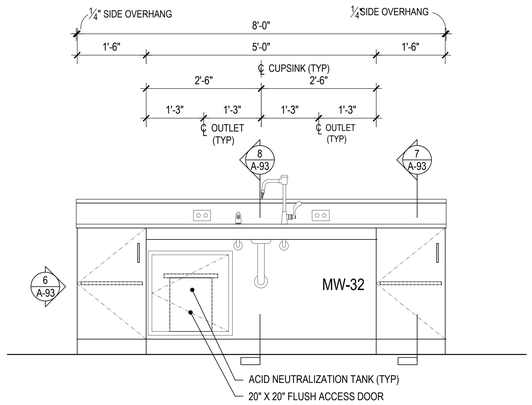
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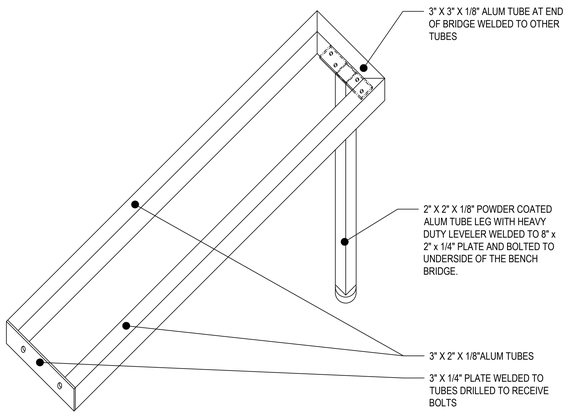
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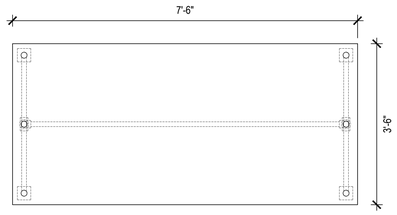
1 BIOMATERIALS RESEARCH STUDENT BENCH PLAN
3/4"=1'-0"



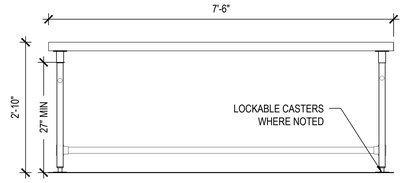
2 BIOMATERIALS STUDENT BENCH ELEVATION
3/4"=1'-0"



3 BENCH BRIDGE WITH LEG
1 1/2"=1'-0"



4 BIOMATERIALS WORK BENCH PLAN
3/4"=1'-0"



5 BIOMATERIALS WORKBENCH ELEVATION
3/4"=1'-0"

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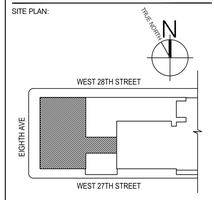
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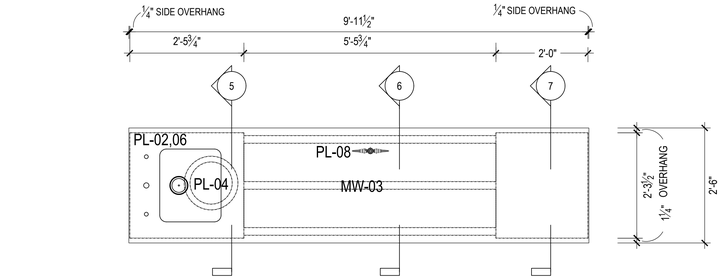
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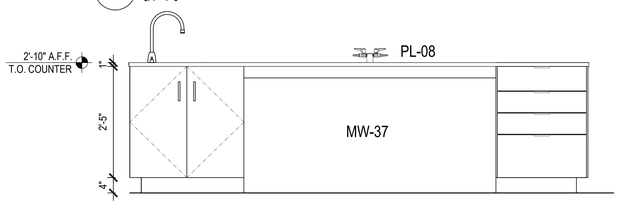
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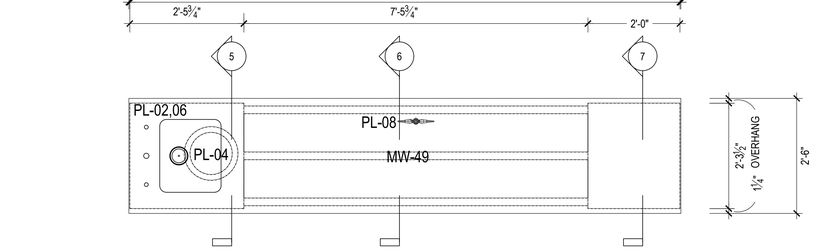
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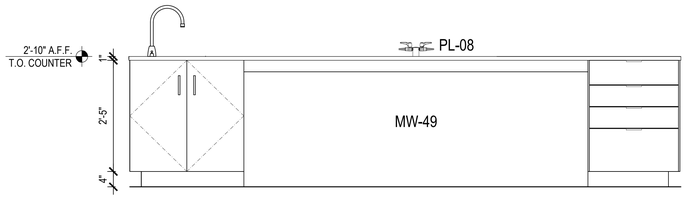
1 WET LAB TEACHER ISLAND PLAN
3/4"=1'-0"



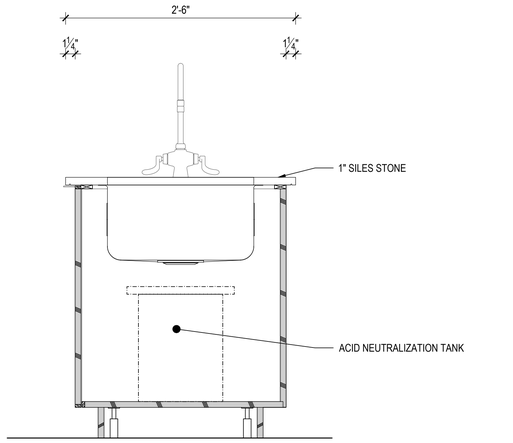
2 WET LAB TEACHER ISLAND ELEVATION
3/4"=1'-0"



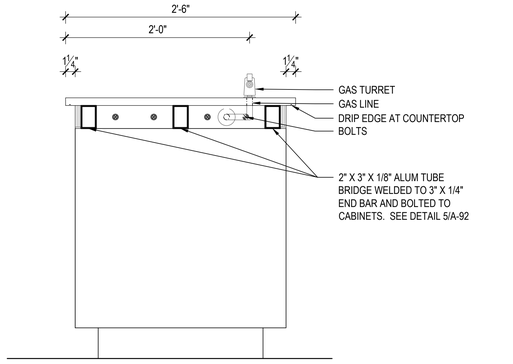
3 DRY LAB TEACHER ISLAND ELEVATION
3/4"=1'-0"



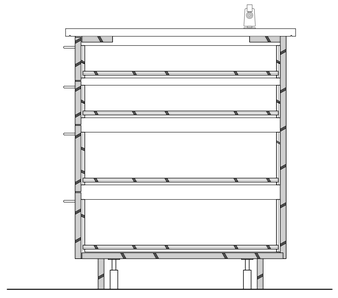
4 DRY LAB TEACHER ISLAND ELEVATION
3/4"=1'-0"



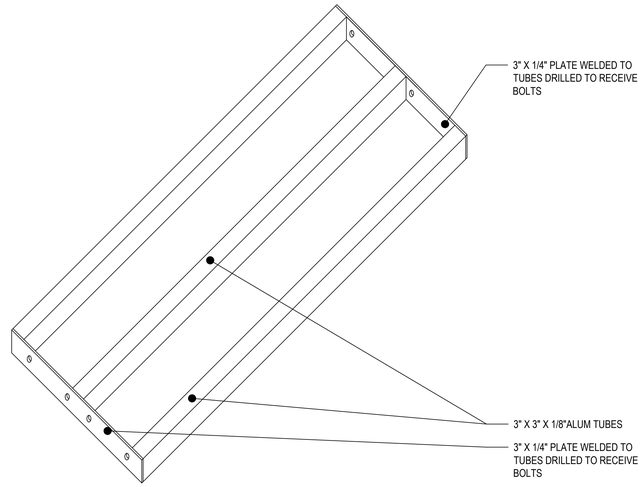
5 WET AND DRY LAB TEACHER ISLAND SECTION THROUGH SINK CABINET
1 1/2"=1'-0"



6 WET AND DRY LAB TEACHER ISLAND SECTION THROUGH KNEE SPACE
1 1/2"=1'-0"



7 WET AND DRY LAB TEACHER ISLAND SECTION THROUGH DRAWERS
1 1/2"=1'-0"



8 BENCH BRIDGE
1 1/2"=1'-0"

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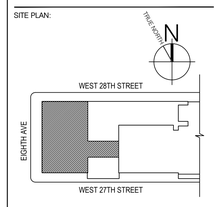
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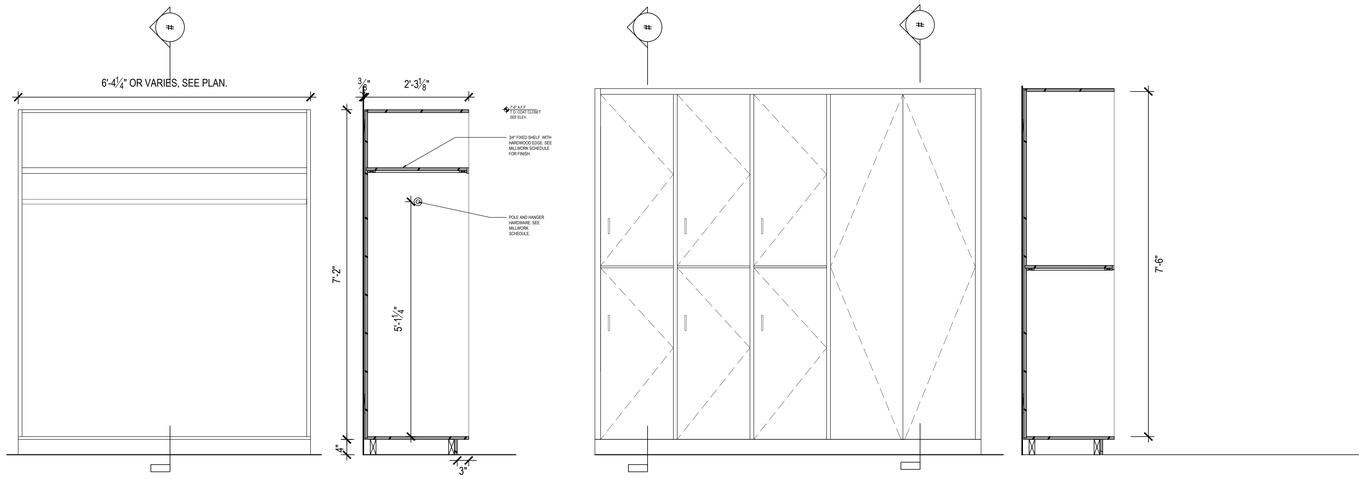
SEAL & SIGNATURE:

DRAWN BY: **AS**, AS CHECKED BY: KB, SA

SCALE:
AS NOTED

SHEET TITLE:
MILLWORK DETAILS

SHEET NUMBER:
A-095



1 WET LAB & DRY LAB COAT CLOSET ELEVATION
3/4"=1'-0"

2 WET LAB COAT CLOSET SECTION
3/4"=1'-0"

3 OFFICE LOCKERS ELEVATION
3/4"=1'-0"

4 OFFICE LOCKERS SECTION
3/4"=1'-0"

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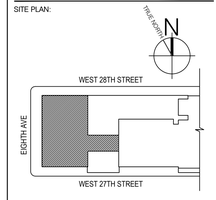
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A-096

G GENERAL

G.1 ALL WORK SHALL COMPLY WITH THE 2022 NEW YORK CITY BUILDING CODE.

G.2 THE STRUCTURAL CONSTRUCTION DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE SPECIFICATIONS AND THE ARCHITECTURAL AND MECHANICAL CONSTRUCTION DRAWINGS. IF THERE IS A DISCREPANCY BETWEEN ANY OF THE CONTRACT DOCUMENTS, THE MOST STRINGENT REQUIREMENT SHALL APPLY.

G.3 BEFORE PROCEEDING WITH ANY WORK, THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL VERIFY THAT ALL MAJOR DIMENSIONS (LOCATIONS OF GRID LINES, COLUMNS, SLAB EDGES, ETC.) SHOWN ON STRUCTURAL DRAWINGS ARE THE SAME AS SHOWN ON ARCHITECTURAL DRAWINGS AND THAT EXISTING CONDITIONS ARE AS INDICATED. ANY VARIANCES SHALL BE BROUGHT TO THE ARCHITECT'S ATTENTION IN WRITING.

G.4 THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL BE SOLELY RESPONSIBLE FOR COORDINATION BETWEEN TRADES INCLUDING BUT NOT LIMITED TO THE LOCATION OF SLOTS, TRENCHES AND SLEEVES AS REQUIRED FOR THE MECHANICAL OR OTHER TRADES AND THE PROVISION AND/OR INSTALLATION OF ANCHORS, INSERTS, HANGERS, ETC. AS REQUIRED FOR THE VARIOUS TRADES.

G.5 CONTROL OVER OR CHARGE OF AND RESPONSIBILITY FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES, OR FOR SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK OF THE PROJECT ARE SOLELY THE GENERAL CONTRACTOR'S OR CONSTRUCTION MANAGER'S RESPONSIBILITY.

G.6 THE CONSTRUCTION MANAGER OR GENERAL CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ACTS OR OMISSIONS OF CONTRACTORS OR ANY OTHER PERSONS PERFORMING ANY OF THE WORK, OR FOR THE FAILURE OF ANY OF THEM TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS.

G.7 THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL BE SOLELY AND FULLY RESPONSIBLE FOR THE SAFETY AND STABILITY OF EXISTING ADJACENT STRUCTURES INCLUDING BUT NOT LIMITED TO BUILDINGS, SIDEWALKS, ROADWAYS AND UTILITIES AND FOR ANY METHODS REQUIRED TO ENSURE THAT SAFETY AND STABILITY.

G.8 THE DESIGN, CONSTRUCTION, INSPECTION AND MAINTENANCE OF TEMPORARY STRUCTURES OR PROCEDURES INCLUDING BUT NOT LIMITED TO SUPPORT FOR AND STABILITY OF CRANES OR HOISTS OR LIFTS OR OTHER SIMILAR EQUIPMENT, TEMPORARY GUYING OR BRACING, SCAFFOLDING, FORMWORK OR SHORING, CONSTRUCTION STORAGE OR STAGING AREAS, CONSTRUCTION FENCES, TEMPORARY ENCLOSURES AT OPENIINGS, AT THE BUILDING'S PERIMETER, OR ELSEWHERE, ETC. ARE SOLELY THE RESPONSIBILITY OF THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER AND/OR CONTRACTORS AND/OR CONSULTANTS RETAINED BY THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER.

G.9 THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL MAKE NO DEVIATION FROM CONTRACT DOCUMENTS WITHOUT THE PRIOR WRITTEN APPROVAL OF THE ARCHITECT.

G.10 THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL REPORT TO THE ARCHITECT, IN WRITING, ANY DISCREPANCIES, AMBIGUITIES OR CONTRADICTIONS IN THE CONSTRUCTION DOCUMENTS.

G.11 THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL BE RESPONSIBLE FOR NOTIFYING THE ENGINEER RESPONSIBLE FOR CONTROLLED OR SPECIAL INSPECTIONS, IN A TIMELY MANNER, WHEN WORK IS READY FOR INSPECTION.

SD SHOP DRAWINGS - STRUCTURAL

SD.1 THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL SUBMIT STRUCTURAL SHOP DRAWINGS TO THE ARCHITECT AFTER THE GC OR CM HAS REVIEWED AND NOTED ON THESE SUBMITTALS THAT THEY ARE IN CONFORMANCE WITH CONTRACT REQUIREMENTS. THE STRUCTURAL ENGINEER, UPON RECEIPT OF THESE SUBMITTALS FROM THE ARCHITECT, WILL REVIEW AND APPROVE OR TAKE OTHER APPROPRIATE ACTION UPON AND RETURN TO THE ARCHITECT FOR FINAL DISPOSITION.

SD.2 CHANGES OR NON-CONFORMANCE TO CONTRACT REQUIREMENTS SHALL BE FLAGGED ON SUBMITTALS.

SD.3 SUBMITTALS SHALL NOT BE USED AS A SUBSTITUTE FOR REQUESTS FOR, OR APPROVALS OF SUBSTITUTIONS OR OTHER CHANGES OR PROCEDURES REQUIRED BY THE CONSTRUCTION CONTRACT.

SD.4 THE STRUCTURAL ENGINEER'S REVIEW OF, APPROVAL OF, OR OTHER ACTION UPON THE SHOP DRAWINGS IS ONLY FOR THE LIMITED PURPOSE OF CHECKING FOR CONFORMANCE WITH THE DESIGN INTENT AND INFORMATION EXPRESSED IN CONTRACT DOCUMENTS PREPARED BY THE STRUCTURAL ENGINEER.

SD.5 THE STRUCTURAL ENGINEER'S REVIEWS SHALL NOT INCLUDE THE ACCURACY OR COMPLETENESS OF DETAILS SUCH AS WEIGHTS, GAUGES, FABRICATION OR ERECTION PROCESS, CONSTRUCTION MEANS OR METHODS, COORDINATION OF THE WORK WITH OTHER TRADES, OR CONSTRUCTION SAFETY PRECAUTIONS, ALL OF WHICH ARE THE SOLE RESPONSIBILITY OF THE CONSTRUCTION MANAGER OR GENERAL CONTRACTOR.

SD.6 THE STRUCTURAL ENGINEER'S REVIEW OF A SPECIFIC ITEM SHALL NOT EXTEND TO A REVIEW OF AN ASSEMBLY OF WHICH THE ITEM IS A COMPONENT.

SD.7 THE STRUCTURAL ENGINEER WILL NOT REVIEW SUBMISSIONS WHICH ARE PARTIALLY COMPLETE.

SD.8 AFTER INITIAL REVIEW OF THE SHOP DRAWINGS BY THE ENGINEER OF RECORD, ALL RESUBMISSIONS SHALL INDICATE THE DATE OF REVISION AND HAVE ALL CHANGES SINCE THE PRIOR REVIEW CLEARLY CLOUDED. THE REVIEW OF RESUBMISSIONS IS LIMITED TO THE CLOUDED AREAS.

SD.9 NO WORK MAY COMMENCE UNTIL ALL RELEVANT SHOP DRAWINGS HAVE BEEN REVIEWED AND FINAL "APPROVAL WITH NO EXCEPTIONS" HAS BEEN GRANTED BY THE ARCHITECT.

SD.10 THE USE OF THE "REQUEST FOR INFORMATION" (RFI) PROCESS IS STRICTLY A FORM OF COMMUNICATION BETWEEN CM/GC AND THE DESIGN TEAM AND ITS SOLE PURPOSE IS TO RESOLVE MINOR ISSUES AND SHALL NOT BE USED TO PRE-PREPARE SHOP DRAWINGS.

SD.11 STRUCTURAL STEEL SHOP DRAWINGS SHALL BE PREPARED UNDER THE SUPERVISION OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF NEW YORK WHO IS EXPERIENCED IN THE DETAILING OF STRUCTURAL STEEL AND HAS A THOROUGH WORKING KNOWLEDGE OF THE REQUIREMENTS, SUGGESTIONS, EXAMPLES AND COMMENTARIES OF THE AISC MANUAL OF STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS, THE SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM F3125 GRADE A325(OR F1852 FOR TC BOLT) OR A490 (OR F2280 FOR TC BOLT), AND THE AMERICAN WELDING SOCIETY (AWS) D1.1 "STRUCTURAL WELDING CODE-STEEL".

SD.12 IF THE STRUCTURAL ENGINEER OF RECORD SO REQUESTS, THE CONSTRUCTION MANAGER AND/OR THE GENERAL CONTRACTOR SHALL SUBMIT CALCULATIONS FOR ANY OR ALL CONNECTIONS OR JOB STANDARDS SHOWN ON SHOP DRAWINGS. THESE CALCULATIONS SHALL BE SIGNED AND SEALED BY THE PROFESSIONAL ENGINEER SUPERVISING THE PREPARATION OF SHOP DRAWINGS.

S STRUCTURAL STEEL

S.1 ALL STRUCTURAL STEEL MATERIAL, FABRICATION AND ERECTION SHALL COMPLY WITH THE PROVISIONS OF THE AISC SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS, INCLUDING THE COMMENTARY AND ANY SUPPLEMENTS.

S.2 ALL STRUCTURAL STEEL WIDE FLANGE SHAPES SHALL BE ASTM A992 STEEL, GRADE 65 STEEL OR APPROVED EQUIVALENT STRENGTH. PLATES UP TO 4" THICK SHALL BE ASTM A572-50. CHANNELS AND ANGLES SHALL BE ASTM A572-50. PIPES SHALL BE ASTM A53, GRADE B. PLATES, ANGLES, ETC., USED AS CONNECTION MATERIAL SHALL BE ASTM A572-50 STEEL. THE TYPE OF STEEL FOR ALL STRUCTURAL STEEL SHAPES, PLATES, BARS, ETC. SHALL BE INDICATED ON SHOP DRAWINGS.

S.3 THE STEEL CONTRACTOR SHALL FURNISH MILL TEST REPORTS FROM THE PRODUCER OF STEEL CERTIFYING THAT THE STEEL MEETS THE MINIMUM REQUIREMENTS AS DEFINED BY ASTM SPECIFICATIONS. IF REQUIRED BY THE APPLICABLE BUILDING CODE, STEEL MILL REPORTS AND COMPLETION CERTIFICATES SHALL BE FILED WITH THE BUILDING DEPT.

S.4 ALL CONNECTIONS NOT DETAILED ON THE DRAWINGS SHALL CONFORM TO THOSE SHOWN IN THE AISC STEEL CONSTRUCTION MANUAL WHERE POSSIBLE. ALL SHOP CONNECTIONS SHALL BE HIGH-STRENGTH BOLTED OR WELDED. ALL FIELD CONNECTIONS SHALL BE WELDED OR MADE WITH HIGH-STRENGTH BOLTS WITH HARDENED WASHERS, INSTALLED BY MEANS OF PNEUMATIC WRENCHES OR TENSION-CONTROLLED (TC) GUNS (WHERE PERMITTED) AND TORQUED TO THE REQUIRED VALUE, IN ACCORDANCE WITH THE SPECIFICATIONS FOR STRUCTURAL JOINTS USING ASTM F3125 GRADE A325(OR F1852 FOR TC BOLT) OR A490 (OR F2280 FOR TC BOLT) APPROVED BY THE RESEARCH COUNCIL ON RIVETED AND BOLTED JOINTS. ALL BOLTS SHALL BE PRE-TENSIONED BOLTS, UNLESS OTHERWISE SPECIFICALLY NOTED OR DETAILED.

S STRUCTURAL STEEL (Continuation)

S.5 ALL CONNECTIONS SHALL MEET THE STRUCTURAL INTEGRITY REQUIREMENTS OF NYCBC CHAPTER 22.

S.6 ALL WELDING SHALL BE IN ACCORDANCE WITH THE STANDARD CODE FOR ARC AND GAS WELDING IN BUILDING CONSTRUCTION OF THE AMERICAN WELDING SOCIETY. THE WELDABILITY OF ALL EXISTING STRUCTURAL STEEL SHALL BE VERIFIED, WHERE APPLICABLE.

S.7 WELDING ELECTRODES SHALL CONFORM TO ASTM SPECIFICATION E-70XX FOR STEEL MATERIAL GRADES 50 KSI AND LOWER. MATERIAL GRADE 65 KSI STEEL SHALL CONFORM TO ASTM SPECIFICATION E-80XX. ALL BUTT WELDS SHALL BE 100% PENETRATION WELDS AND FILLET WELDS SHALL BE MINIMUM 1/4". ALL PARTIAL JOINT PENETRATION WELDS (PJP) INDICATED ON THE DRAWINGS SPECIFY THE EFFECTIVE THROAT THICKNESS. IF REQUIRED BY THE APPLICABLE BUILDING CODE, COPIES OF TEST REPORTS SHALL BE FILED WITH THE BUILDING DEPT.

S.8 ALL BOLTS SHALL BE 3/4" DIAMETER A-325 AND 1" DIAMETER A-490 UNLESS OTHERWISE NOTED. ALL BOLTS SHALL BE PRE-TENSIONED AS PER AISC 360 CHAPTER J REQUIREMENTS. ALL BOLTS SHALL BE DESIGNED AND PROVIDED AS PER TABLE S.10.1 (ON THIS DRAWING). ALL BOLTS IN STANDARD HOLES USED FOR MOMENT CONNECTIONS, TRUSS CONNECTIONS, AND BRACED FRAME CONNECTIONS MAY BE DESIGNED AS BEARING TYPE N CONNECTIONS, BUT SHALL BE DETAILED AND FURNISHED AS SLIP-CRITICAL CONNECTIONS (SHOP AND FIELD) WITH AT LEAST A "CLASS A" FAYING SURFACE.

S.9 ALL CONTACT SURFACES, INCLUDING SURFACES ADJACENT TO THE BOLT HEAD AND NUT, SHALL BE FREE OF SCALE, OIL, PAINT, LACQUER, AND OTHER FOREIGN MATERIAL. BURRS THAT WOULD PREVENT SOLID SEATING OF THE CONNECTED PARTS IN THE SNUG TIGHT CONDITION SHALL BE REMOVED. CONTACT SURFACES THAT ARE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A123 AND ROUGHENED BY MEANS OF AND WIRE BRUSHING (POWER BRUSHING IS PROHIBITED) WILL BE PERMITTED.

S.10 THE CONTRACTOR SHALL FURNISH AND INSTALL ALL PLATES, CLIP ANGLES, CONNECTIONS, NAILER HOLES, ETC., REQUIRED FOR THE COMPLETION OF THE STRUCTURE OR REQUIRED BY OTHER TRADES, EVEN IF SUCH ITEMS ARE NOT SHOWN ON THE STRUCTURAL DRAWINGS.

S.11 THE STRUCTURAL STEEL SHALL BE ERECTED TO THE TOLERANCE CALLED FOR IN THE AISC CODE OF STANDARD PRACTICE UNLESS MORE STRINGENT TOLERANCES ARE REQUIRED BY OTHER TRADES, SUCH AS BUT NOT LIMITED TO PRECAST, ELEVATOR, STAIR, ARCHITECTURALLY EXPOSED STRUCTURAL STEEL, STAINLESS STEEL, OR FAÇADE CONTRACTORS. THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER SHALL COORDINATE.

S.12 ALL STRUCTURAL STEEL EXPOSED TO THE WEATHER AND/OR ELEMENTS SHALL BE PROVIDED WITH A WEATHER RESISTANT COATING PER SPECIFICATIONS OR SHALL BE HOT DIP GALVANIZED (SEE EXTERIOR EXPOSED STRUCTURAL STEEL IN SPECIFIC SECTION 051200). FASTENERS AND COMPONENTS OF BOLTED CONNECTIONS EXPOSED TO WEATHER AND/OR ELEMENTS PROVIDED WITH STRUCTURAL STEEL WHICH IS PROTECTED BY A WEATHER RESISTANT COATING SHALL BE PROTECTED WITH AN EQUIVALENT COATING. FASTENERS AND COMPONENTS OF BOLTED CONNECTIONS EXPOSED TO WEATHER AND/OR ELEMENTS PROVIDED WITH STRUCTURAL STEEL WHICH IS PROTECTED BY HOT DIP GALVANIZING SHALL BE HOT DIP GALVANIZED; A-490 BOLTS MAY REQUIRE A HIGH-PERFORMANCE COLD GALVANIZED COATING OR A HIGH-PERFORMANCE WEATHER PROTECTED COATING.

S.13 PLACEMENT OF ANCHOR BOLTS SHALL BE FIELD SURVEYED PRIOR TO FABRICATION AND ERECTION OF COLUMNS AND/OR COLUMN BASE PLATES.

SI STRUCTURAL INSPECTIONS

SI1. ALL PROGRESS INSPECTIONS SHALL CONFORM TO CHAPTER 1 OF THE NEW YORK CITY BUILDING CODE. ALL SPECIAL INSPECTIONS SHALL CONFORM TO CHAPTER 17 OF THE NEW YORK BUILDING CODE.

SI2. THE FOLLOWING PROGRESS INSPECTIONS ARE REQUIRED:

A. FINAL (28-116.2.4.2, BC 110.5, DIRECTIVE 14 OF 1975 AND IRCNY 101.10)

SI3. THE FOLLOWING SPECIAL INSPECTIONS ARE REQUIRED:

A. STRUCTURAL STEEL - WELDING (BC 1705.2.1)
B. STRUCTURAL STEEL - DETAILS (BC 1705.2.2)
C. STRUCTURAL STEEL - HIGH STRENGTH BOLTING (BC 1705.2.3)

SI4. SPECIAL INSPECTIONS SHALL BE CONTINUOUS EXCEPT WHERE PERIODIC SPECIAL INSPECTIONS ARE SPECIFICALLY PERMITTED BY THE BUILDING CODE.

SI5. ALL SPECIAL INSPECTIONS SHALL BE PERFORMED BY SPECIAL INSPECTORS AND AGENCIES QUALIFIED BY 2022 NEW YORK CITY BUILDING CODE AND ACCEPTABLE TO THE ENGINEER OF RECORD.

SI6. ALL WORK FOR WHICH SPECIAL INSPECTION IS REQUIRED SHALL REMAIN ACCESSIBLE AND EXPOSED UNTIL APPROVED BY THE SPECIAL INSPECTOR.

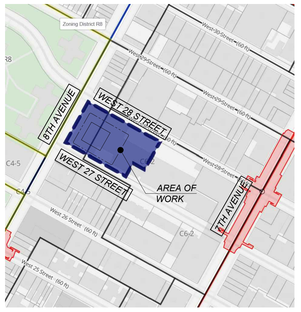
SI7. ALL SPECIAL INSPECTORS SHALL BRING ANY DISCREPANCIES TO THE ATTENTION OF THE OWNER AND ENGINEER OF RECORD.

SI8. ALL SPECIAL INSPECTORS SHALL FURNISH INSPECTION REPORTS TO THE OWNER AND TO THE ENGINEER OF RECORD.

SI9. STRUCTURAL ELEMENTS THAT ARE FABRICATED OR ASSEMBLED ON THE PREMISES OF A FABRICATOR'S SHOP SHALL HAVE SPECIAL INSPECTION PERFORMED ON THEM DURING FABRICATION. THIS REQUIREMENT CAN BE WAIVED IF THE SHOP IS APPROVED BY THE BUILDING OFFICIAL AND GRANTED BY THE ENGINEER OF RECORD.

STATEMENTS OF COMPLIANCE AND DOB FILING SCOPE NOTES:

1. CONTRACT DOCUMENTS CONTAINED HERE-WITHIN ARE FOR "STRUCTURAL WORKS ONLY".
2. CONSTRUCTION DOCUMENTS SUBMITTED COMPLY WITH REQUIREMENTS AS PER AC28-104.7 AND BC107.1, BC 107.7, AND BC 1603.1 (STRUCTURAL).
3. PER AC 28-104.7.1.1: SEE BELOW LIST OF BIS JOB #'s FOR ALL OTHER RELATED FILING APPLICATIONS (FILED SEPARATELY) ASSOCIATED WITH THIS STRUCTURAL CONSTRUCTION DRAWING SET:
   - 3.1. T.B.D.
   - 3.2. T.B.D.
   - 3.3. T.B.D.
   - 3.4. T.B.D.
4. CONTRACT DOCUMENTS AND DESIGN LOADS COMPLY WITH THE PROVISIONS OF CODE BC 107.7 AND BC 1604. REFER TO S-001 FOR LOADING SCHEDULE TABLE.
5. REFER TO DRAWING S-001 FOR DRAWING LIST.
6. BUILDING DEPARTMENT NOTES AS RELATES TO STRUCTURAL WORKS:
   - 6.1. PROJECT IS FILED UNDER 1968 NYC BUILDING CODE AND ADDITIONS SHALL COMPLY WITH CURRENT NYC BUILDING CODE.
   - 6.2. NO CHANGE IN USE, EGRESS, OR OCCUPANCY.
7. PROJECT SITE INFORMATION:
   - 7.1. ADDRESS: 344 8TH AVE, NEW YORK, NY 10001
   - 7.2. FLOORS OF STRUCTURAL WORK: 4TH FLOOR, 5TH FLOOR, 6TH FLOOR, 7TH FLOOR, ROOF
   - 7.3. TAX BLOCK: #777
   - 7.4. TAX LOT: #1
   - 7.5. ZONING MAP #: 8D
   - 7.6. ZONING DISTRICT: C6-2A
   - 7.7. TOTAL NO. OF FLOORS: 10
   - 7.8. CONSTRUCTION CLASSIFICATION: 1-A FIREPROOFED BUILDING
   - 7.9. OCCUPANCY GROUP: W6 (EDUCATIONAL STRUCTURES)



PROJECT SCOPE KEY PLAN



KEY PLAN

LOADING SCHEDULE (PSF)

LEVEL	SLAB	CEILING AND MECH.	PARTITIONS	MISC. DEAD LOAD	LIVE LOAD	TOTAL LOAD	REMARKS
4TH-8TH FLOOR	60	10	20	-	50	140	-
ROOF	60	10	-	-	30	100	-

ENERGY CODE REQUIREMENTS

SCOPE OF WORK: THE PROJECT ENTAILS PROVIDING NEW FUME EXHAUST SYSTEM IN THE ROOF AND PROVIDING EXHAUST RISER OPENINGS AND FRAMINGS IN THE 4TH, 5TH, 6TH, 7TH AND ROOF FLOORS. THE AREA OF WORK IS APPROX. 1000 SF. NO CHANGE TO USE EGRESS OR OCCUPANCY

SITE ADDRESS: 344 8TH AVE, NEW YORK, NY 10001
CLIMATE ZONE: 4A
APPLICABLE ENERGY CODE: 2020 NYC ENERGY CONSERVATION CODE

ITEM DESCRIPTION	CODE REQUIREMENT	DESIGN
STRUCTURAL SCOPE	N/A	N/A

"TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, ALL PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 NEW YORK CITY ENERGY CONSERVATION CODE"

STRUCTURAL DRAWING LIST:

SHEET NO.	DWG NO.	DRAWING TITLE
01	S-001	GENERAL NOTES AND KEY PLAN
02	S-100	4TH FLOOR - 6TH FLOOR PART FRAMING PLANS
03	S-101	7TH FLOOR - ROOF PART FRAMING PLANS
04	S-200	TYPICAL DETAILS

FIT Science Lab Renovation

Project No. 2449

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Stamp

SITE PLAN:



SUBMITTAL:
100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% CONSTRUCTION DOCUMENT	2026.08.17

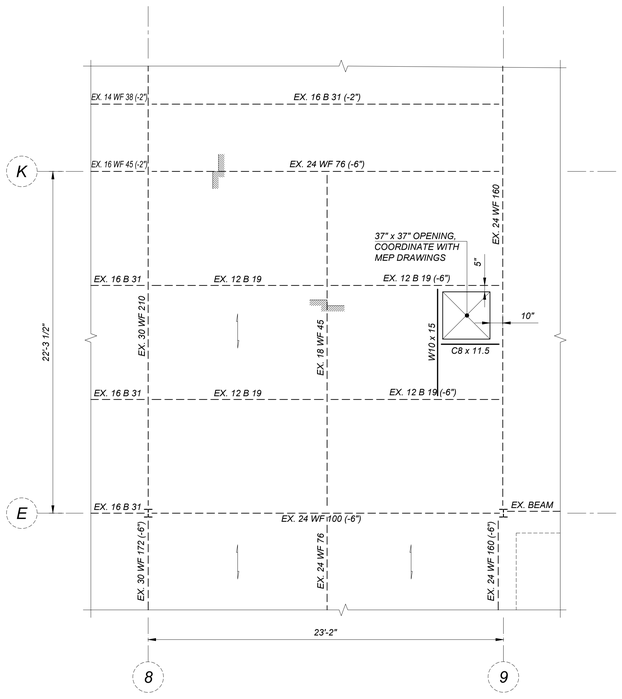
SEAL & SIGNATURE:

DRAWN BY: __ CHECKED BY: __

SCALE:
AS NOTED

SHEET TITLE:
GENERAL NOTES AND KEY PLAN

SHEET NUMBER:
S-001



FOURTH FLOOR PART FRAMING PLAN

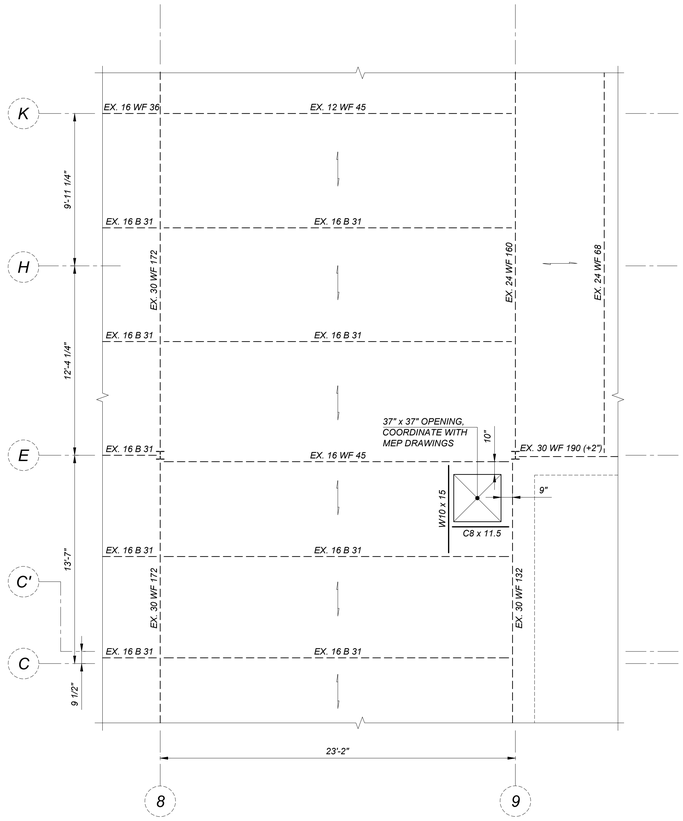
1/4" = 1'-0"

NOTES:

1. PROVIDE MINIMUM 1" DRYPACK BETWEEN UNDERSIDE OF DECK AND BEAM. DRYPACK/BLOCK UNDER FLUTES WHERE APPLICABLE.
2. NO EXISTING STEEL IS TO BE CUT FOR NEW OPENINGS.

LEGEND:

- — — EXISTING STEEL BEAM
- ——— NEW STEEL BEAM
- ~~~ EXISTING 4" CONCRETE ON 24 GAGE COFAR METAL DECK



FIFTH FLOOR PART FRAMING PLAN

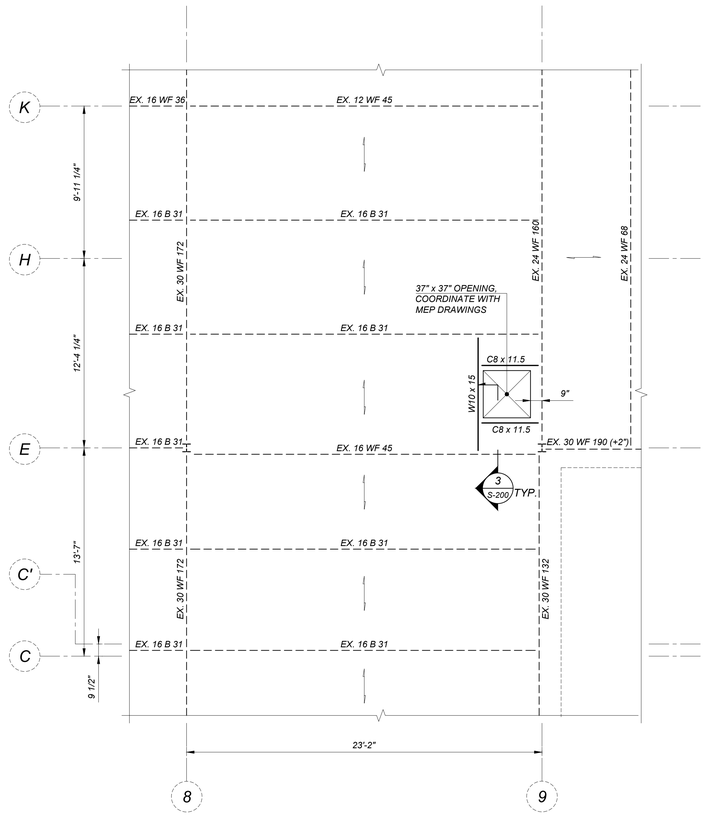
1/4" = 1'-0"

NOTES:

1. PROVIDE MINIMUM 1" DRYPACK BETWEEN UNDERSIDE OF DECK AND BEAM. DRYPACK/BLOCK UNDER FLUTES WHERE APPLICABLE.
2. NO EXISTING STEEL IS TO BE CUT FOR NEW OPENINGS.

LEGEND:

- — — EXISTING STEEL BEAM
- ——— NEW STEEL BEAM
- ~~~ EXISTING 4" CONCRETE ON 24 GAGE COFAR METAL DECK



SIXTH FLOOR PART FRAMING PLAN

1/4" = 1'-0"

NOTES:

1. PROVIDE MINIMUM 1" DRYPACK BETWEEN UNDERSIDE OF DECK AND BEAM. DRYPACK/BLOCK UNDER FLUTES WHERE APPLICABLE.
2. NO EXISTING STEEL IS TO BE CUT FOR NEW OPENINGS.

LEGEND:

- — — EXISTING STEEL BEAM
- ——— NEW STEEL BEAM
- ~~~ EXISTING 4" CONCRETE ON 24 GAGE COFAR METAL DECK

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SITE PLAN:



SUBMITTAL:

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ISSUE / REVISION:

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01	100% CONSTRUCTION DOCUMENT	2026.09.17

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SCALE:

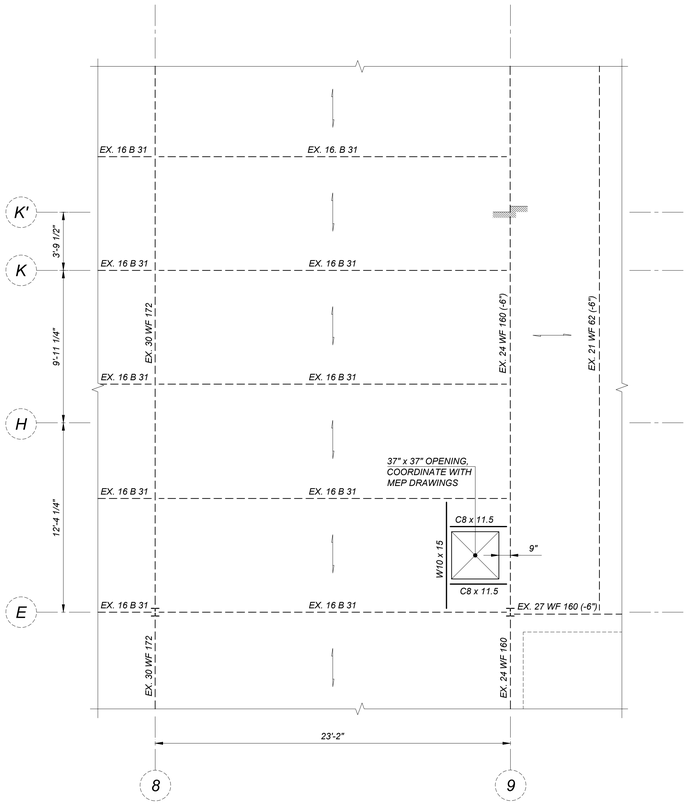
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SHEET TITLE:

4TH FLOOR - 6TH FLOOR PART FRAMING PLANS

SHEET NUMBER:

S-100



SEVENTH FLOOR PART FRAMING PLAN

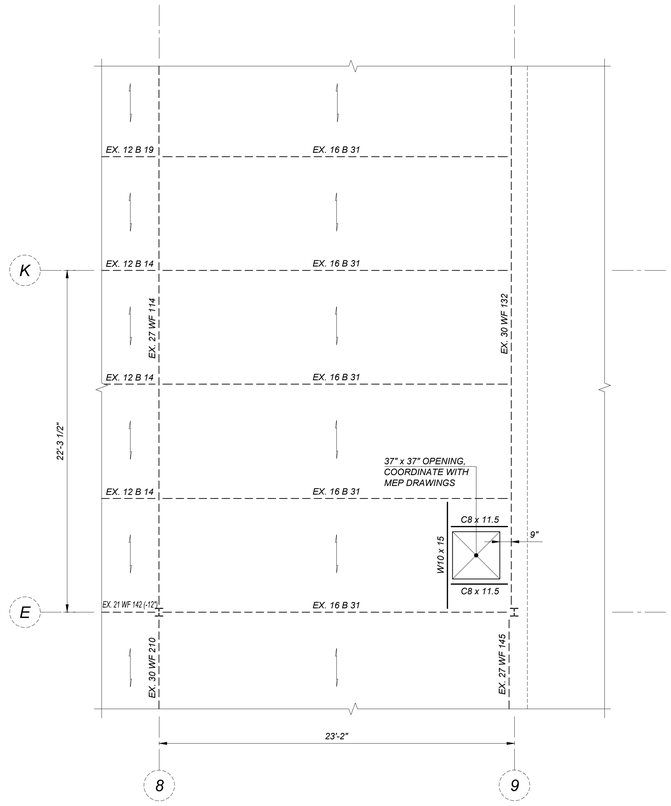
1/4" = 1'-0"

NOTES:

1. PROVIDE MINIMUM 1" DRYPACK BETWEEN UNDERSIDE OF DECK AND BEAM. DRYPACK/BLOCK UNDER FLUTES WHERE APPLICABLE.
2. NO EXISTING STEEL IS TO BE CUT FOR NEW OPENINGS.

LEGEND:

- – – – EXISTING STEEL BEAM
- ——— NEW STEEL BEAM
- ~~~ EXISTING 4" CONCRETE ON 24 GAGE COFAR METAL DECK



EIGHTH FLOOR PART FRAMING PLAN

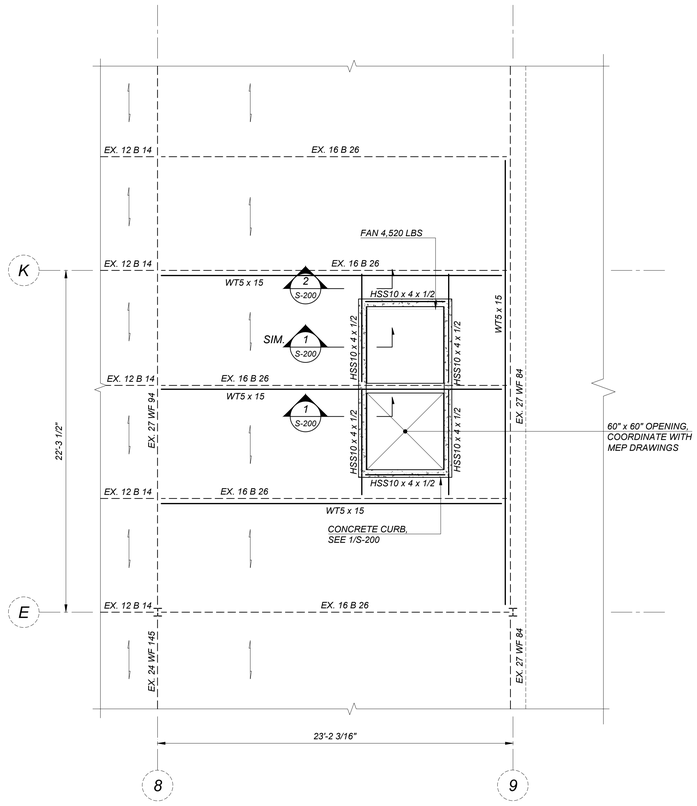
1/4" = 1'-0"

NOTES:

1. PROVIDE MINIMUM 1" DRYPACK BETWEEN UNDERSIDE OF DECK AND BEAM. DRYPACK/BLOCK UNDER FLUTES WHERE APPLICABLE.
2. NO EXISTING STEEL IS TO BE CUT FOR NEW OPENINGS.

LEGEND:

- – – – EXISTING STEEL BEAM
- ——— NEW STEEL BEAM
- ~~~ EXISTING 4" CONCRETE ON 24 GAGE COFAR METAL DECK



ROOF PART FRAMING PLAN

1/4" = 1'-0"

NOTES:

1. PROVIDE MINIMUM 1" DRYPACK BETWEEN UNDERSIDE OF DECK AND BEAM. DRYPACK/BLOCK UNDER FLUTES WHERE APPLICABLE.
2. NO EXISTING STEEL IS TO BE CUT FOR NEW OPENINGS.

LEGEND:

- – – – EXISTING STEEL BEAM
- ——— NEW STEEL BEAM
- ~~~ EXISTING 4" CONCRETE ON 24 GAGE COFAR METAL DECK

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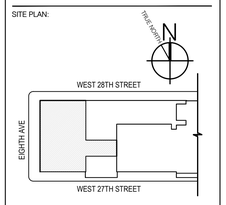
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SITE PLAN:



SUBMITTAL:

100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% CONSTRUCTION DOCUMENT	2026.08.17

SEAL & SIGNATURE:

DRAWN BY: __ CHECKED BY: __

SCALE:

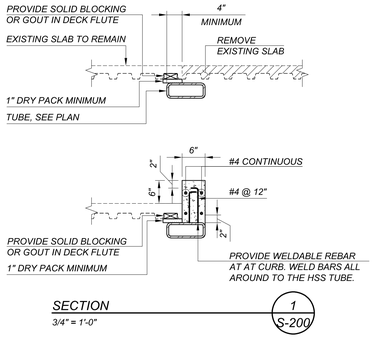
AS NOTED

SHEET TITLE:

7TH FLOOR - ROOF PART FRAMING PLANS

SHEET NUMBER:

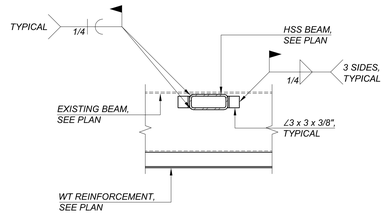
S-101



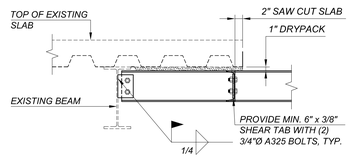
SECTION 1 / S-200
3/4" = 1'-0"

NOTES:

1. TUBE TO BE INSTALLED PRIOR TO SLAB REMOVAL.
2. FOR CURB LOCATIONS, SEE ARCHITECTURAL DRAWINGS AND/OR MECHANICAL AND/OR OTHER CONTRACT DOCUMENTS.

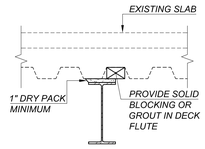


SECTION 2 / S-200
3/4" = 1'-0"



SECTION 3 / S-200
3/4" = 1'-0"

NOTE: STEEL IS TO BE INSTALLED PRIOR TO CUTTING OPENING.

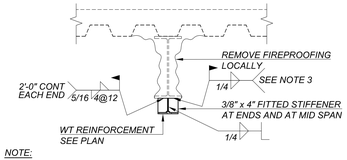


AT METAL DECK

NOTES:

1. PROVIDE BOLSTER WHERE DRYPACK EXCEEDS 3".
2. BLOCKING SHALL BE POSITIVELY CONNECTED TO UNDERSIDE OF DECK.
3. USE DRY-PACK WITH A COMPRESSIVE STRENGTH EQUAL TO 3,000 PSI MIN.
4. PROVIDE BLOCKING WITH A COMPRESSIVE STRENGTH EQUAL TO 1,500 PSI MINIMUM.

DETAIL FOR DRYPACK OF NEW BEAM AT EXISTING SLAB / SFL / S-200
N.T.S.



NOTE:

1. FOR LENGTH AND LOCATION OF REINFORCING, SEE PLAN.
2. FOR FIREPROOFING REQUIREMENTS, SEE ARCHITECTURAL DRAWINGS.
3. AT SPANDREL BEAMS, PROVIDE APPLICABLE PJP WELDING.

DETAIL FOR WT REINFORCING OF EXISTING STEEL / SFK / S-200
N.T.S.

FIT Science Lab Renovation

Project No. 2449

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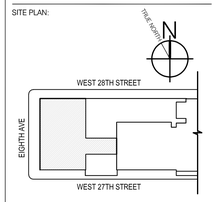
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Stamp

SITE PLAN:



SUBMITTAL:
100% CONSTRUCTION DOCUMENT - BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% CONSTRUCTION DOCUMENT	2026.08.17

SEAL & SIGNATURE:

DRAWN BY: __ CHECKED BY: __

SCALE:
AS NOTED

SHEET TITLE:
TYPICAL DETAILS

SHEET NUMBER:
S-200

GENERAL NOTES

1. THE CONTRACTOR SHALL VISIT AND EXAMINE THE PREMISES, PRIOR TO SUBMITTING THEIR PROPOSAL, IN ORDER TO UNDERSTAND THE EXISTING CONDITIONS RELATED TO THEIR WORK.
2. THE CONTRACTOR SHALL ADHERE TO ALL CONSTRUCTION RULES, REGULATIONS AND STANDARDS OF BUILDING.
3. MECHANICAL EQUIPMENT PERMITS SHALL BE DELIVERED TO THE LANDLORD FOR ALL MECHANICAL EQUIPMENT REQUIRING PERMITS.
4. ALL DUCTWORK AND MECHANICAL APPARATUS SHALL BE INSTALLED IN A NEAT AND PROFESSIONAL MANNER AND CLEANED. LABELS AND MARKINGS SHALL BE LOCATED ON DUCTWORK. DUCTWORK SHALL BE INSTALLED PER SMACNA STANDARDS.
5. ALL DUCTWORK SHALL BE INSTALLED TIGHT TO BOTTOM OF EXISTING BEAMS TO PROVIDE AS MUCH HEIGHT CLEARANCE AS POSSIBLE FOR THE INSTALLATION OF THE NEW CEILING AND TO AVOID CONFLICTS WITH PIPING, STEEL, LIGHT FIXTURES, ETC.
6. THE INSTALLATION OF ALL TENANT IMPROVEMENTS SHALL PERMIT ADEQUATE ACCESSIBILITY TO ALL NEW AND EXISTING EQUIPMENT FOR PROPER MAINTENANCE.
7. THE CONTRACTOR SHALL PROVIDE ACCESS TO ALL OVERHEAD VALVES, FIRE DAMPERS AND MAINTENANCE SENSITIVE EQUIPMENT, AND MAINTAIN ACCESS TO AREAS ALREADY ACCESSIBLE BY ACCESS DOORS.
8. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL VISIBLE EQUIPMENT, AIR DEVICES, ACCESS DOORS AND THERMOSTATS WITH ARCHITECTURAL PLANS AND NOTIFY OF ANY DISCREPANCIES.
9. CONTRACTOR TO INSPECT ALL SUPPLY MAINS FOR LEAKS AND SEAL AIRTIGHT WITH APPROVED SEALERS WHERE NECESSARY.
10. CONTRACTOR TO VERIFY ALL DAMPERS, NOT SHOWN, ARE IN THE OPEN POSITION THROUGHOUT THE SPACE. ALL DAMAGED OR CLOSED DAMPERS ARE TO BE REPLACED WITH APPROVED EQUALS TO MEET LOCAL CODE.
11. ALL EXISTING DUCTWORK SHALL REMAIN UNLESS OTHERWISE SHOWN. RELOCATE DIFFUSERS AS NEEDED WITH NEW FLEX BRANCH CONNECTIONS OR NEW SPOOL PIECE TO COORDINATE WITH NEW REFLECTED CEILING PLAN IF NEEDED. SUPPLY DIFFUSERS AND RETURN REGISTERS TO BE AS SPECIFIED ON DRAWING SCHEDULES. COORDINATE WITH ARCHITECT. WHERE SPECIFIED DEVICES ARE NOT CONSISTENT WITH EXISTING TO REMAIN, CONTRACTOR SHALL BRING TO THE ATTENTION OF THE DESIGN TEAM.
12. PROVIDE AIR BALANCE OF SYSTEM. INCLUDE EXISTING AC UNIT DATA (I.E., CFM, AMPERAGE, ETC). PROVIDE TOILET EXHAUST CONNECTION TO RISER TRAVERSE. THIS TO BE DONE AND REPORT ISSUED PRIOR TO START OF CONSTRUCTION. PROVIDE AIR SYSTEM BALANCING (CFM READINGS ON EXISTING DIFFUSERS) AND TAKE TRAVERSE READINGS ON ALL MAIN SUPPLY DUCTWORK BRANCHES. PROVIDE TRAVERSE READING ON TOILET EXHAUST DUCTWORK CONNECTION TO BUILDING RISER. COMPLETE AND ISSUE REPORT PRIOR TO THE START OF CONSTRUCTION. PROVIDE COMPLETE AIR SYSTEM BALANCING PER THE SPECIFICATIONS AT THE COMPLETION OF THE PROJECT. FINAL AIR BALANCING TO INCLUDE ANY COMFORT BALANCING REQUIRED BY THE CLIENT.
13. CONTRACTOR SHALL BE RESPONSIBLE TO BALANCE SYSTEM TO PROPERLY SATISFY NEW AND EXISTING WORK AREAS. CONTRACTOR TO SUBMIT AIR OUTPUT PRIOR TO CONSTRUCTION.
14. ALL NEW & EXISTING SHEET METAL SUPPLY DUCTWORK SHALL BE INSULATED WITH 1-1/2" THICK INSULATION.
15. ALL SHOP DRAWINGS AND ANY ADDITIONAL COORDINATION DRAWINGS AND SKETCHES OF ALL MECHANICAL SYSTEMS SHALL SUBMITTED TO THE PROPERTY MANAGEMENT OFFICE FOR REVIEW AND APPROVAL. NO WORK SHALL COMMENCE UNLESS APPROVALS ARE SECURED.
16. CONTRACTOR SHALL BE RESPONSIBLE TO RESTORE FIREPROOF AT ALL STEEL AREAS EXPOSED AS A RESULT OF THEIR WORK INCLUDING BUT NOT LIMITED TO THE EQUIPMENT, DUCTWORK, AND PIPING SUPPORT INSTALLATION.
17. CONNECT NEW BRANCH SUPPLY DUCTWORK TO EXISTING DUCTWORK. PROVIDE NEW MAIN DUCTWORK EXTENSIONS AND TRANSITION SECTIONS AS REQUIRED.
18. ALL BRANCH DUCT TAKE-OFFS TO AIR OUTLETS SHALL BE PROVIDED WITH VOLUME DAMPERS.
19. ALL VOLUME DAMPERS LOCATED ABOVE AN INACCESSIBLE CEILING SHALL BE CABLE OPERABLE FROM FACE OF AIR OUTLET.
20. CONTRACTOR TO VERIFY RETURN AIR PATH BACK TO BUILDING SHAFTS, MECHANICAL ROOMS AND SUPPLEMENTAL AIR CONDITIONING UNITS. CONTRACTOR SHALL PROVIDE OPENINGS AND TRANSFER DUCTWORK IN ALL FULL HEIGHT WALLS AS REQUIRED FOR TRANSFER OF RETURN AIR BACK TO SOURCES.
21. PROVIDE MERV 8 ASHRAE DUST SPOT AIR FILTERS ON MAIN RETURN DUCTS DURING DEMO PERIOD AND CONSTRUCTION TO KEEP DIRT AND DEBRIS FROM ENTERING THE MAIN AIR HANDLING SYSTEM.
22. ALL DUCTS TO BE PRESSURE TESTED MEDIUM & LOW PRESSURE TO HOLD 4" ON MEDIUM AND 2" ON LOW PRESSURE AS PER SMACNA STANDARD. TESTING SHALL BE COORDINATED WITH AND WITNESSED BY BUILDING PERSONNEL.
23. CONTRACTOR IS RESPONSIBLE TO CLEAN AND RELOCATE EXISTING SUPPLY DIFFUSERS AND LINEAR DIFFUSERS SO AS TO SECURELY AND PROPERLY FIT AND PERFORM IN CEILING.
24. CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY CONTROL AND ACTUATORS FOR EXISTING VAV BOXES. NEW THERMOSTATS, TEMPERATURE SENSORS, AND CONTROLS TO MATCH EXISTING AS TO ENSURE PROPER OPERATION OF VAV UNITS.
25. FINAL LOCATION OF ALL WALL-MOUNTED HVAC CONTROL DEVICES SHALL BE COORDINATED IN THE FIELD WITH THE ARCHITECT AND THE ENGINEER PRIOR TO INSTALLATION.

DEMOLITION NOTES

1. GENERAL DEMOLITION
   a) ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW YORK CITY BUILDING CODE, NATIONAL ELECTRIC CODE AND OSHA RULES AND REGULATIONS.
   b) CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS BEFORE ANY WORK IS TO BEGIN.
   c) ALL EXITS SHALL BE KEPT READILY ACCESSIBLE AND UNOBSTRUCTED AT ALL TIMES.
   d) ALL WASTE AND DEBRIS SHALL BE REMOVED FROM THE INTERIOR AND EXTERIOR OF BUILDING, AND PLACED IN APPROVED CONTAINERS.
2. HVAC DEMOLITION
   a) HVAC CONTRACTOR SHALL VISIT THE PREMISES PRIOR TO SUBMITTING ITS PROPOSAL AND EXAMINE THE EXISTING AREAS AFFECTED BY THIS WORK TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND WITH DIFFICULTIES THAT WILL ATTEND THE EXECUTION OF THIS WORK.
   b) REMOVALS SHALL BE PERFORMED IN PHASES. COORDINATE WITH CONSTRUCTION MANAGER.
   c) MAINTAIN AIRFLOW TO OCCUPIED SPACES DURING NORMAL OCCUPIED HOURS.
   d) REMOVE AND DISPOSE ALL DUCTWORK, SUPPORTS, COIL CONDENSATE PUMPS, DRAIN PANS, DIFFUSERS, REGISTERS, GRILLES AND ALL MISCELLANEOUS ACCESSORIES ASSOCIATED WITH ANY REMOVED OR RELOCATED EQUIPMENT.
   e) THE CONTRACTOR, PRIOR TO THE REMOVAL AND DEMOLITION OF ANY EQUIPMENT (I.E., AIR HANDLERS, STEAM CONVECTORS, WINDOW AC UNITS, ETC.), IS TO INFORM THE OWNER OF THE EQUIPMENT BEING REMOVED AND TO DETERMINE IF THE OWNER WOULD LIKE TO TAKE POSSESSION OF THE EQUIPMENT.
   f) CONTRACTOR SHALL DEMOLISH ALL HVAC EQUIPMENT, DUCTWORK, AND APPURTENANCES APPEARING SHOWN AS EXISTING TO BE REMOVED.
   g) THE DEMOLITION DRAWING SHALL BE CONSIDERED ONLY AS A GUIDE AND IS NOT INTENDED TO SHOW EVERY SINGLE ITEM OF WORK AS REQUIRED. ACTUAL FIELD CONDITIONS WILL DETERMINE THE PRECISE WORK TO BE DONE. SHOULD ANY QUESTION ARISE AS TO WHETHER OR NOT ANY PIPING, EQUIPMENT OR ANY OTHER ITEM SHOULD BE REMOVED, OR REMAIN AS PRESENTLY INSTALLED, THIS CONTRACTOR SHALL REQUEST, IN WRITING, CLARIFICATION FROM THE ARCHITECT. BECAUSE THE MECHANICAL DRAWINGS INDICATE THE INTENT OF THE SCOPE OF WORK, NO EXTRA CHARGES WILL BE ALLOWED FOR ANY REMOVALS NECESSARY FOR THE COMPLETION OF THE WORK UNDER THIS PROJECT.
   h) ANY DEMOLITION OF EXISTING EQUIPMENT SHALL INCLUDE THE REMOVAL OF THEIR RELATED CONTROLS AND CONTROL WIRING.
   i) THIS CONTRACTOR SHALL CAP ALL REMAINING DUCTS, AT ALL POINTS OF DISCONNECTION, AIRTIGHT, UNLESS OTHERWISE NOTED.
   j) THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR WORK WITH ITS COMPLETION AND FINAL ACCEPTANCE AND SHALL REPLACE ANY OF THE SAME WHICH MAY BE DAMAGED, LOST OR STOLEN WITHOUT ADDITIONAL COST TO THE OWNER.
   k) THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE FAILURE OF ANY DUCTWORK SYSTEM OR EQUIPMENT TO FUNCTION PROPERLY UPON COMPLETION OF THEIR WORK UPON SAID SYSTEM OR EQUIPMENT.
   l) ALL RETURN AIR DUCT OPENINGS SHALL BE COVERED WITH TEMPORARY FILTER DURING THE DEMOLITION.
   m) PROVIDE PLUGS FOR ALL PIPING TAKE-OFFS WHERE THE BRANCH PIPING IS TO BE REMOVED.

DRAWING LIST

M-001.00	SYMBOL LIST, ABBREVIATIONS AND NOTES
M-011.00	3RD FLOOR DEMOLITION PLAN
M-101.00	3RD FLOOR PLAN
M-102.00	4TH , 5TH, 6TH FLOOR AND ROOF PART PLANS
M-103.00	7TH FLOOR PLAN
M-104.00	8TH FLOOR PLAN
M-501.00	DETAILS 1
M-502.00	DETAILS 2
M-701.00	EQUIPMENT SCHEDULES 1
M-702.00	EQUIPMENT SCHEDULES 2
M-801.00	CONTROL DIAGRAMS

N.Y.C. BUILDING DEPARTMENT NOTES

1. ALL WORK SHALL COMPLY WITH THE APPLICABLE SECTIONS OF THE BUILDING CODE, NEW YORK CITY, EFFECTIVE NOVEMBER 7, 2022 AND ALL AMENDMENTS AND RULES AND REGULATIONS OF THE DEPARTMENT OF BUILDINGS TO DATE, AND MATERIALS AND EQUIPMENT SUBJECT TO SPECIAL INSPECTION.
2. THE FOLLOWING SPECIAL INSPECTIONS ARE REQUIRED BY THE NYC BUILDING CODE FOR HVAC SYSTEMS:
   a) FIRE-RESISTANT PENETRATIONS AND JOINTS - BC 1705.17
   b) MECHANICAL SYSTEMS - BC 1705.21
3. THE FOLLOWING ITEMS REQUIRE PROGRESS INSPECTIONS:
   a) FIRE RESISTANT RATED CONSTRUCTION - BC 110.3.4
   b) ENERGY CODE COMPLIANCE INSPECTIONS - BC 110.3.5
   c) FINAL INSPECTIONS - UNDER DIRECTIVE 14
4. UPON COMPLETION OF THE WORK, A TEST SHALL BE CONDUCTED IN THE PRESENCE AND UNDER DIRECTION OF A SPECIAL INSPECTOR RETAINED BY THE OWNER QUALIFIED TO CONDUCT SUCH TESTS. THE TEST SHALL SHOW COMPLIANCE WITH THE CODE REQUIREMENTS FOR VENTILATION AND THE PROPER FUNCTIONING OF ALL OPERATING DEVICES, BEFORE THE SYSTEM IS APPROVED (BC 1705.21).
5. ALL INSPECTIONS AND TESTS WILL BE MADE IN COMPLIANCE WITH BC 1705.
6. CERTIFICATES OF COMPLIANCE (BC 110.6 AND 28-116.4) SHALL BE OBTAINED AND PAID FOR BY THE CONTRACTOR.
7. ALL HVAC SYSTEMS AND EQUIPMENT COMPLY WITH THE REQUIREMENTS OF THE ENERGY CONSERVATION CONSTRUCTION CODE OF THE STATE OF NEW YORK (MC 301.2).
8. THE FOLLOWING ENERGY CODE INSPECTIONS ARE REQUIRED BY THE NYC ENERGY CONSERVATION CODE FOR HVAC SYSTEMS:
   a) VENTILATION AND AIR DISTRIBUTION SYSTEM (IB2)
   b) HVAC-R AND SERVICE WATER HEATING EQUIPMENT - (IIB3), (IIB3)
   c) HVAC-R AND SERVICE WATER HEATING SYSTEM CONTROLS - (IB4), (IIB4)
   d) HVAC-R AND SERVICE WATER PIPING DESIGN AND INSULATION - (IB5), (IIB5)
   e) DUCT LEAKAGE TESTING, INSULATION AND DESIGN - (IB6), (IIB6)
   f) MAINTENANCE INFORMATION - (ID1), (IID1)
   g) SHUTOFF DAMPERS - (IIB2)
   h) ELECTRICAL MOTORS - (IIC6)
9. TEST OF MECHANICAL SYSTEMS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION MC 108 AND THE FOLLOWING SECTIONS OF THE NEW YORK CITY MECHANICAL CODE:
   a) VENTILATION SYSTEM BALANCING - MC 403.3.1.6
   b) HYDRONIC PIPING SYSTEMS - MC 1208
10. THE FOLLOWING WORK ITEMS, COMPONENTS, MATERIALS, CAPACITIES, ETC., SHALL COMPLY WITH THE FOLLOWING CODE REFERENCE:
    a) STANDARD OF HEATING - MC 309.1, MC 312
    b) NOISE CONTROL - MC 313, BC 1207
    c) DUCT CONSTRUCTION, SUPPORT - MC 603
    d) AIR INTAKE, EXHAUSTS AND RELIEFS - MC 401.4
    e) FIRE DAMPERS AND SMOKE DAMPERS AND SMOKE DETECTORS - MC 607
    f) MANUAL AND AUTOMATIC, FIRE AND SMOKE CONTROLS FOR AIR DISTRIBUTION SYSTEMS - MC 513
    g) PIPING AND INSULATION - MC 1201, MC 1204
    h) AIR INTAKES AND OUTLETS - MC 401
    i) FANS - MC 603
    j) ELECTRIC WIRING & EQUIPMENT - MC 301.10
    k) CONTROLS - MC 405
    l) PLENUMS AND CORRIDORS - MC 602, 601
11. MINIMUM TEMPERATURE TO BE MAINTAINED DURING HEATING SEASON: BC 1204 - WHEN 13 DEGREES FAHRENHEIT OUTSIDE.
12. VENTILATION FOR ALL AREAS SHALL COMPLY WITH MC 401, MC 402, AND MC 403.
13. UPON COMPLETION OF THIS VENTILATION SYSTEM, A TEST SHALL BE CONDUCTED IN THE PRESENCE OF AND DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR HAVING NOT LESS THAN FIVE (5) YEARS OF EXPERIENCE SUPERVISING INSTALLATION OF VENTILATING SYSTEMS. THE TEST SHALL SHOW COMPLIANCE WITH THE CODE REQUIREMENTS FOR VENTILATION AND THE PROPER FUNCTIONING OF ALL OPERATING DEVICES BEFORE THE SYSTEM IS APPROVED. THE LICENSED PROFESSIONAL ENGINEER OR REGISTERED ARCHITECT WHO CONDUCTS THE TESTS SHALL FILE A CERTIFICATE AS TO WHETHER THE SYSTEM COMPLIES WITH THE APPLICABLE LAWS. HE SHALL ALSO FILE WITH THE CERTIFICATION, A REPORT OF THE TEST, THE TEST AND REPORT SHALL BE MADE IN A MANNER SATISFACTORY TO THE SUPERINTENDENT. A STATEMENT SHALL BE FILED BY THE OWNER OR TENANT IN POSSESSION THAT THE SYSTEM WILL BE KEPT IN CONTINUOUS OPERATION AT ALL TIMES DURING NORMAL OCCUPANCY OF THE STRUCTURE AS PROVIDED IN THE APPLICABLE SECTIONS OF THE CODE. BASE BUILDING PLANS ARE FILED FOR SINGLE TENANT OCCUPANCY. ALL TENANT PLANS WILL BE FILED UNDER SEPARATE APPLICATIONS.
14. ALL FIRE DAMPERS SHALL BE APPROVED BY THE NEW YORK CITY DEPARTMENT OF BUILDINGS AND SHALL BE MANUFACTURED AND INSTALLED IN ACCORDANCE WITH UL 555, STANDARD FOR FIRE DAMPERS AND CEILING DAMPERS.
15. REFER TO ARCHITECTURAL DRAWING FOR FIRE RATED WALL LOCATIONS AND RATED CONSTRUCTION.

MECHANICAL DUCTWORK SYMBOLS

SYMBOL	DESCRIPTION
	SUPPLY DUCT UP (POSITIVE PRESSURE)
	RETURN OR EXHAUST DUCT UP (NEGATIVE PRESSURE)
	SUPPLY DUCT DOWN (POSITIVE PRESSURE)
	RETURN OR EXHAUST DUCT DOWN (NEGATIVE PRESSURE)
R	SLOPING RISE IN DUCT IN DIRECTION OF ARROW
D	SLOPING DROP IN DUCT IN DIRECTION OF ARROW
18x12	DUCT SIZE IN INCHES (CLEAR INSIDE DIMENSION) FIRST FIGURE INDICATES PLAN DIMENSION
24"Ø	ROUND DUCT DIAMETER SIZE
24/12	FLAT OVAL DUCT SIZE
	ACOUSTIC LINING IN DUCT (CLEAR INSIDE DIMENSION)
	FLEXIBLE CONNECTION
	ELBOW WITH TURNING VANES
	RADIUS ELBOW
	LINEAR SUPPLY DIFFUSER (CEILING, SIDEWALL)
	SUPPLY REGISTER
	CEILING DIFFUSER (4 WAY, 3 WAY, 2 WAY, 1 WAY, ROUND)
	RETURN GRILLE, EXHAUST GRILLE
20Ø	NOZZLE DIFFUSER
	VOLUME DAMPER
MD	MOTORIZED DAMPER & ACCESS DOOR
FD	FIRE DAMPER & ACCESS DOOR
FSD	FIRE SMOKE DAMPER & ACCESS DOOR
SD	SMOKE DAMPER
COD	CABLE OPERATED DAMPER
BD	BACK DRAFT DAMPER
BBD	BAROMETRIC BACK DRAFT DAMPER
	VAV BOX
	TRANSFER GRILLE
	LOUVER
	ELECTRIC DUCT HEATER
	FLEX DUCT
	DUCT SOUND ATTENUATOR

MECHANICAL SYMBOLS

SYMBOLS	DESCRIPTION
	EXISTING WORK
	CONNECT NEW WORK TO EXISTING WORK
	EXISTING WORK TO BE DEMOLISHED/REMOVED
	NEW CONNECTION TO EXISTING
	CAP EXISTING TO REMAIN AT REMOVAL
	ACCESS DOOR
	CLEARANCE
SD	DUCT SMOKE DETECTOR
T	THERMOSTAT
TS	TEMPERATURE SENSOR
S	SWITCH
SP	STATIC PRESSURE SENSOR
FS	FREEZE STAT
RD	REFRIGERANT LEAK DETECTOR
LD	LEAK DETECTOR
C	CO2 SENSOR
H	HUMIDISTAT
BG	BREAK GLASS
CA	CARBON MONOXIDE SENSOR
N	NITROUS DIOXIDE SENSOR
	SUPPLY / DISCHARGE ARROW
	RETURN / INTAKE ARROW
	LOUVERED DOOR
	UNDERCUT DOOR
RISER 1	RISER TAG (REFER TO ABBREVIATIONS)
EQUIPMENT TYPE, FLOOR, DESIGNATION; VAV-7-5; (1,200) SIZE	MECHANICAL EQUIPMENT TAG INSTANCE (REFER TO SCHEDULES AND/OR ABBREVIATIONS)
EQUIPMENT TYPE, SIZE; VAV-8	MECHANICAL EQUIPMENT TAG TYPE (REFER TO SCHEDULES AND/OR ABBREVIATIONS)
SIZE, TAG; 24x24 CD; (500) CFM	GRD TAG (REFER TO SCHEDULES AND/OR ABBREVIATIONS)
ACTIVE PLENUM LENGTH, LINEAR DIFFUSER TAG; 4'-0" LD-A; (500); 8'-0" TL TOTAL LENGTH	LINEAR DIFFUSER KEY

MECHANICAL PIPING SYMBOLS

SYMBOL	DESCRIPTION
	DIRECTION OF FLOW
	PITCH PIPE DOWN IN DIRECTION OF ARROW
	PIPE ANCHOR
	PIPE GUIDE
	PIPE EXPANSION JOINT
(3'-0"x6'-0")	EXPANSION LOOP (SIZE) 1ST DIMENSION IS OFFSET AND 2ND DIMENSION IS LENGTH
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	UNION
	ELBOW TURNED UP
	ELBOW TURNED DOWN
	BOTTOM PIPE CONNECTION
	TOP PIPE CONNECTION
	FLEXIBLE PIPE CONNECTION
	SHUTOFF / ISOLATION VALVE
	GLOBE VALVE
	BUTTERFLY VALVE
	BALL VALVE
	CHECK VALVE
	MOTORIZED CONTROL VALVE (3-WAY)
	MOTORIZED CONTROL VALVE (2-WAY)
	STRAINER
	PRESSURE REDUCING VALVE
	RELIEF VALVE
	ANGLE RELIEF VALVE
	THERMOMETER
	PRESSURE GAUGE WITH COCK
	AIR VENT
	PUMP
	CAPPED OUTLET
	HEAT TRACING
	PIPE RISER

NYC 2025 ENERGY CODE COMPLIANCE

ENERGY ANALYSIS (DUCTWORK INSULATION)

ITEM DESCRIPTION	PROPOSED DESIGN VALUE	CODE PRESCRIBED VALUE
ALL SUPPLY AND RETURN DUCTWORK AND ACCESSORIES	R-VALUE ≥ 6	R-VALUE ≥ 6

NOTES:
1. ALL SEALING TAPE SHALL CONFORM TO UL-181A OR UL-181B WHEN USED AS A PRIMARY SEALANT.
2. WHEN LOCATED WITHIN A BUILDING ENVELOPE ASSEMBLY, THE DUCT OR PLENUM SHALL BE SEPARATED FROM THE BUILDING EXTERIOR OR UNCONDITIONED OR EXEMPT SPACES BY A MINIMUM OF R-8 INSULATION.

ENERGY ANALYSIS (PIPING INSULATION)

ITEM DESCRIPTION	PROPOSED DESIGN VALUE		CODE PRESCRIBED VALUE	
	NOMINAL PIPE DIAMETER ≤ 1"	NOMINAL PIPE DIAMETER > 1.5"	NOMINAL PIPE DIAMETER ≤ 1"	NOMINAL PIPE DIAMETER > 1.5"
200° F HOT WATER	1-1/2	-	1-1/2	-

NOTES:
1. INSULATION SHALL HAVE A CONDUCTIVITY (k) NOT EXCEEDING 0.27 BTUs PER IN/H*SQFT**F.

ABBREVIATIONS

AC	AIR CONDITIONING
ACC	AIR COOLED CONDENSER
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AL	ACOUSTIC LINING
BD	BACKDRAFT DAMPER
BBD	BAROMETRIC BACKDRAFT DAMPER
BG	BOTTOM GRILLE
BHP	BRAKE HORSEPOWER
BR	BOTTOM REGISTER
CAR	CONSTANT AIRFLOW REGULATOR
CD	CONDENSATE DRAIN
CFM	CUBIC FEET OF AIR PER MINUTE
CG	CEILING GRILLE
CHWS/R	CHILLED WATER SUPPLY AND RETURN
CO	CLEANOUT
COD	CABLE OPERATED DAMPER
COP	COEFFICIENT OF PERFORMANCE
CR	CEILING REGISTER
CT	COOLING TOWER
CTE	CONNECT TO EXISTING
CW	DOMESTIC COLD WATER MAKE-UP
CWS/R	CONDENSER WATER SUPPLY AND RETURN
DB	DRY BULB (TEMPERATURE)
DN	DOWN
DR	DRAIN
EAT	ENTERING AIR TEMPERATURE
EBH	ELECTRIC BASEBOARD HEATER
ESP	EXTERNAL STATIC PRESSURE
EUH	ELECTRIC UNIT HEATER
EWT	ENTERING WATER TEMPERATURE
FC	FLEXIBLE CONNECTION
FD	FIRE DAMPER
FLA	FULL LOAD AMPERES
FLR	FLOOR
FOF	FUEL OIL FILL
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOV	FUEL OIL VENT
FSD	COMBINATION FIRE/SMOKE DAMPER
FT	FEET
FTR	HOT WATER FINNED TUBE RADIATION
GA	GAUGE
GPM	GALLONS PER MINUTE
GS/R	GLYCOL SUPPLY AND RETURN
HPWLS/R	HEAT PUMP LOOP SUPPLY AND RETURN
HWS/R	HOT WATER SUPPLY AND RETURN
HZ	HERTZ

ABBREVIATIONS

KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LD	LINEAR DIFFUSER
LRA	LOCKED ROTOR AMPS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
MCA	MINIMUM CIRCUIT AMPACITY
MD	MOTORIZED DAMPER
MFS	MAXIMUM FUSE SIZE
MHP	MOTOR HORSEPOWER
MIN.	MINIMUM
MOCP	MAXIMUM OVERCURRENT PROTECTION
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OED	OPEN ENDED DUCT
PD	PRESSURE DROP
PH	PHASE
RG	RETURN GRILLE
RL	REFRIGERANT LIQUID PIPING
RLA	RUNNING LOAD AMPS
RR	RETURN REGISTER
RS	REFRIGERANT SUCTION PIPING
SEN	SENSIBLE
SPXF	SMOKE PURGE EXHAUST FAN
SR	SUPPLY REGISTER
TG	TOP GRILLE
TL	TOTAL LENGTH
TO	TRANSFER OPENING
TR	TOP REGISTER
TRXF	TRASH ROOM EXHAUST FAN
TSP	TOTAL STATIC PRESSURE
TX	TOILET EXHAUST
TYP	TYPICAL
UH	UNIT HEATER
UON	UNLESS OTHERWISE NOTED
V	VENT
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VRF	VARIABLE REFRIGERANT FLOW
VRV	VARIABLE REFRIGERANT VOLUME
WB	WET BULB (TEMPERATURE)
WC	WATER COLUMN
WCC	WATER COOLED CONDENSER
WMS	WIRE MESH SCREEN
WPD	WATER PRESSURE DROP

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2025 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT Science Lab Renovation

Project No. 2449

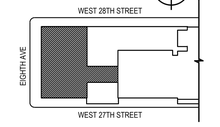
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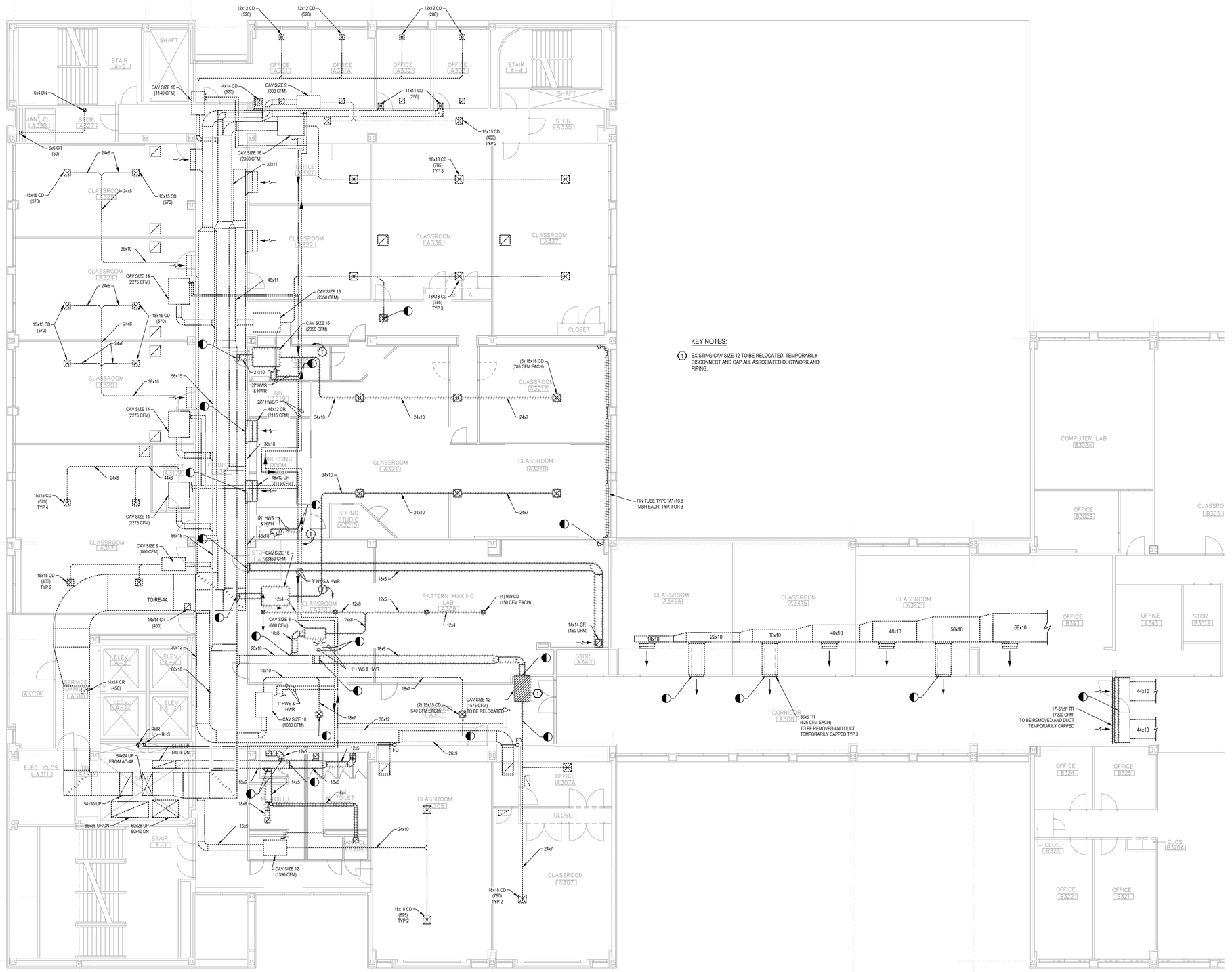
SHEET TITLE:

SYMBOL LIST, ABBREVIATIONS AND NOTES

DOB NOW JOB# M01470747-S1

SHEET NUMBER:

M-001.00



KEY NOTES:

1 EXISTING CAV SIZE 12 TO BE RELOCATED. TEMPORARILY DISCONNECT AND CAP ALL ASSOCIATED DUCTWORK AND PIPING.

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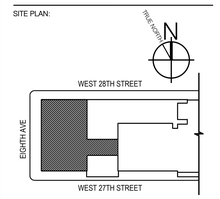
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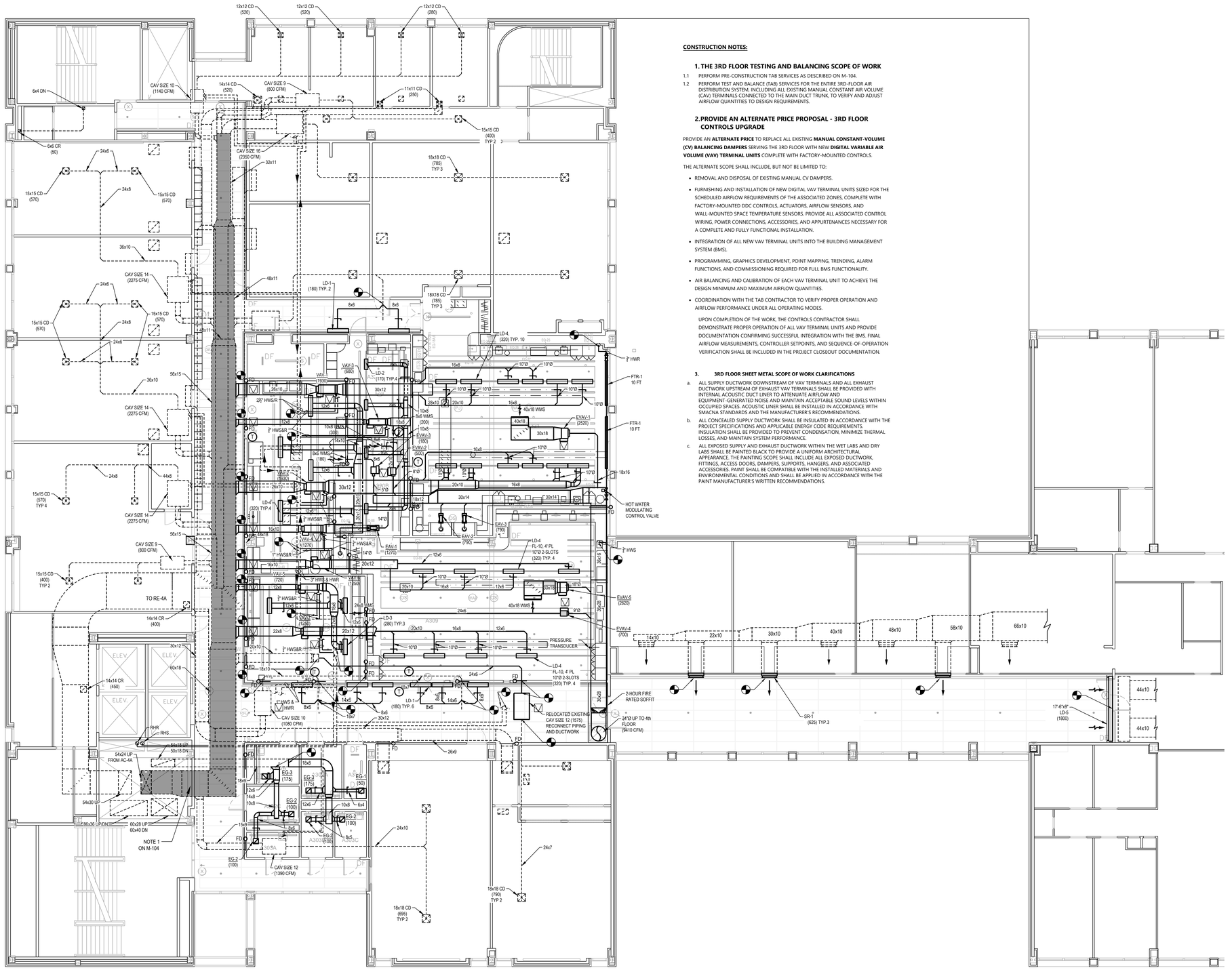
SHEET TITLE:

3RD FLOOR DEMOLITION PLAN

DOB NOW JOB# M01470747-S1

SHEET NUMBER:

M-011.00



CONSTRUCTION NOTES:

1. THE 3RD FLOOR TESTING AND BALANCING SCOPE OF WORK

1.1 PERFORM PRE-CONSTRUCTION TAB SERVICES AS DESCRIBED ON M-104.

1.2 PERFORM TEST AND BALANCE (TAB) SERVICES FOR THE ENTIRE 3RD-FLOOR AIR DISTRIBUTION SYSTEM, INCLUDING ALL EXISTING MANUAL CONSTANT AIR VOLUME (CAV) TERMINALS CONNECTED TO THE MAIN DUCT TRUNK, TO VERIFY AND ADJUST AIRFLOW QUANTITIES TO DESIGN REQUIREMENTS.

2.PROVIDE AN ALTERNATE PRICE PROPOSAL - 3RD FLOOR CONTROLS UPGRADE

PROVIDE AN **ALTERNATE PRICE** TO REPLACE ALL EXISTING **MANUAL CONSTANT-VOLUME (CV) BALANCING DAMPERS** SERVING THE 3RD FLOOR WITH NEW **DIGITAL VARIABLE AIR VOLUME (VAV) TERMINAL UNITS** COMPLETE WITH FACTORY-MOUNTED CONTROLS.

THE ALTERNATE SCOPE SHALL INCLUDE, BUT NOT BE LIMITED TO:

- REMOVAL AND DISPOSAL OF EXISTING MANUAL CV DAMPERS.
- FURNISHING AND INSTALLATION OF NEW DIGITAL VAV TERMINAL UNITS SIZED FOR THE SCHEDULED AIRFLOW REQUIREMENTS OF THE ASSOCIATED ZONES, COMPLETE WITH FACTORY-MOUNTED DDC CONTROLS, ACTUATORS, AIRFLOW SENSORS, AND WALL-MOUNTED SPACE TEMPERATURE SENSORS. PROVIDE ALL ASSOCIATED CONTROL WIRING, POWER CONNECTIONS, ACCESSORIES, AND APPURTENANCES NECESSARY FOR A COMPLETE AND FULLY FUNCTIONAL INSTALLATION.
- INTEGRATION OF ALL NEW VAV TERMINAL UNITS INTO THE BUILDING MANAGEMENT SYSTEM (BMS).
- PROGRAMMING, GRAPHICS DEVELOPMENT, POINT MAPPING, TRENDING, ALARM FUNCTIONS, AND COMMISSIONING REQUIRED FOR FULL BMS FUNCTIONALITY.
- AIR BALANCING AND CALIBRATION OF EACH VAV TERMINAL UNIT TO ACHIEVE THE DESIGN MINIMUM AND MAXIMUM AIRFLOW QUANTITIES.
- COORDINATION WITH THE TAB CONTRACTOR TO VERIFY PROPER OPERATION AND AIRFLOW PERFORMANCE UNDER ALL OPERATING MODES.

UPON COMPLETION OF THE WORK, THE CONTROLS CONTRACTOR SHALL DEMONSTRATE PROPER OPERATION OF ALL VAV TERMINAL UNITS AND PROVIDE DOCUMENTATION CONFIRMING SUCCESSFUL INTEGRATION WITH THE BMS. FINAL AIRFLOW MEASUREMENTS, CONTROLLER SETPOINTS, AND SEQUENCE-OF-OPERATION VERIFICATION SHALL BE INCLUDED IN THE PROJECT CLOSEOUT DOCUMENTATION.

3. 3RD FLOOR SHEET METAL SCOPE OF WORK CLARIFICATIONS

a. ALL SUPPLY DUCTWORK DOWNSTREAM OF VAV TERMINALS AND ALL EXHAUST DUCTWORK UPSTREAM OF EXHAUST VAV TERMINALS SHALL BE PROVIDED WITH INTERNAL ACOUSTIC DUCT LINER TO ATTENUATE AIRFLOW AND EQUIPMENT-GENERATED NOISE AND MAINTAIN ACCEPTABLE SOUND LEVELS WITHIN OCCUPIED SPACES. ACOUSTIC LINER SHALL BE INSTALLED IN ACCORDANCE WITH SMACNA STANDARDS AND THE MANUFACTURER'S RECOMMENDATIONS.

b. ALL CONCEALED SUPPLY DUCTWORK SHALL BE INSULATED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND APPLICABLE ENERGY CODE REQUIREMENTS. INSULATION SHALL BE PROVIDED TO PREVENT CONDENSATION, MINIMIZE THERMAL LOSSES, AND MAINTAIN SYSTEM PERFORMANCE.

c. ALL EXPOSED SUPPLY AND EXHAUST DUCTWORK WITHIN THE WET LABS AND DRY LABS SHALL BE PAINTED BLACK TO PROVIDE A UNIFORM ARCHITECTURAL APPEARANCE. THE PAINTING SCOPE SHALL INCLUDE ALL EXPOSED DUCTWORK, FITTINGS, ACCESS DOORS, DAMPERS, SUPPORTS, HANGERS, AND ASSOCIATED ACCESSORIES. PAINT SHALL BE COMPATIBLE WITH THE INSTALLED MATERIALS AND ENVIRONMENTAL CONDITIONS AND SHALL BE APPLIED IN ACCORDANCE WITH THE PAINT MANUFACTURER'S WRITTEN RECOMMENDATIONS.

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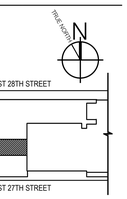
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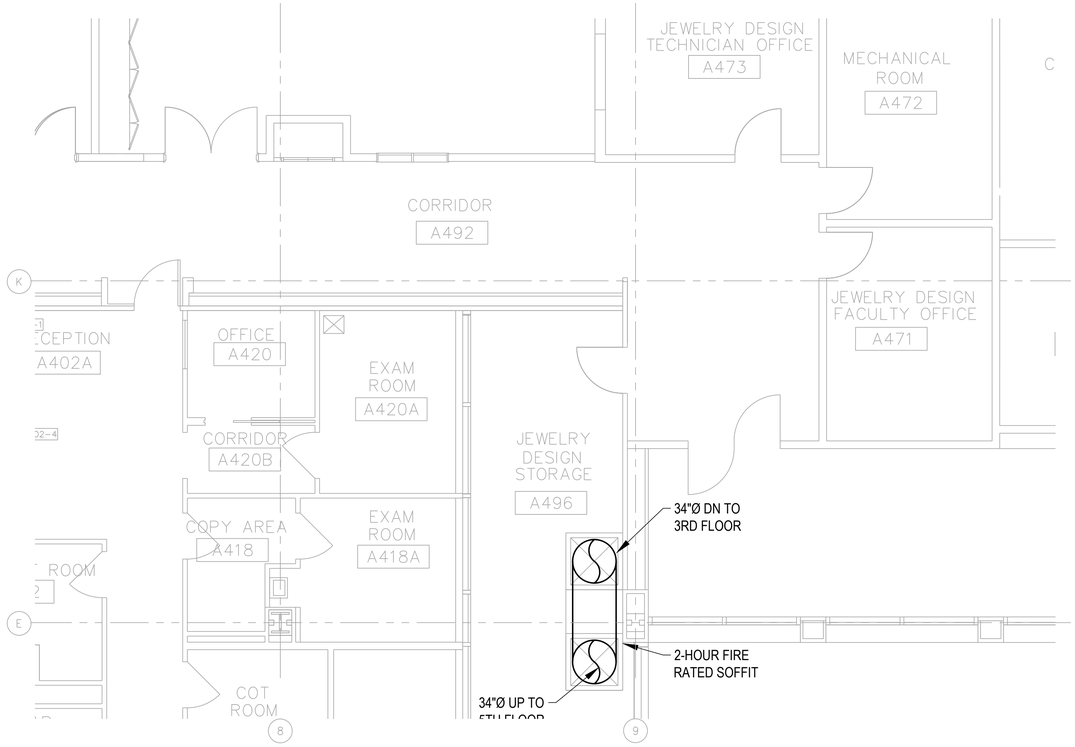
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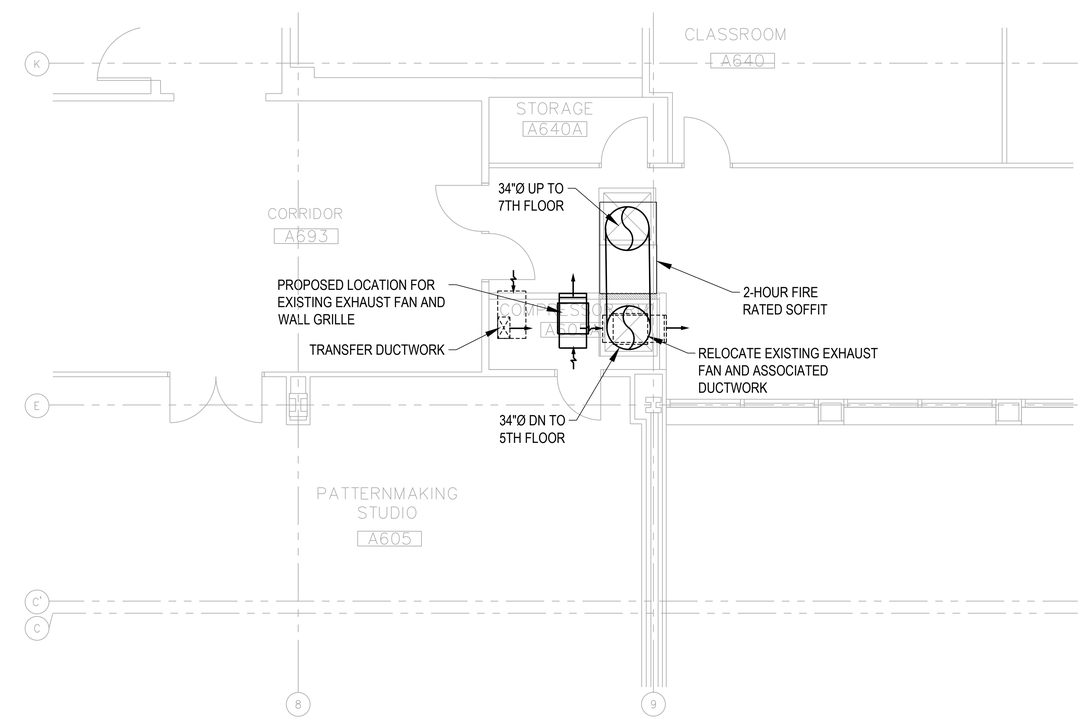
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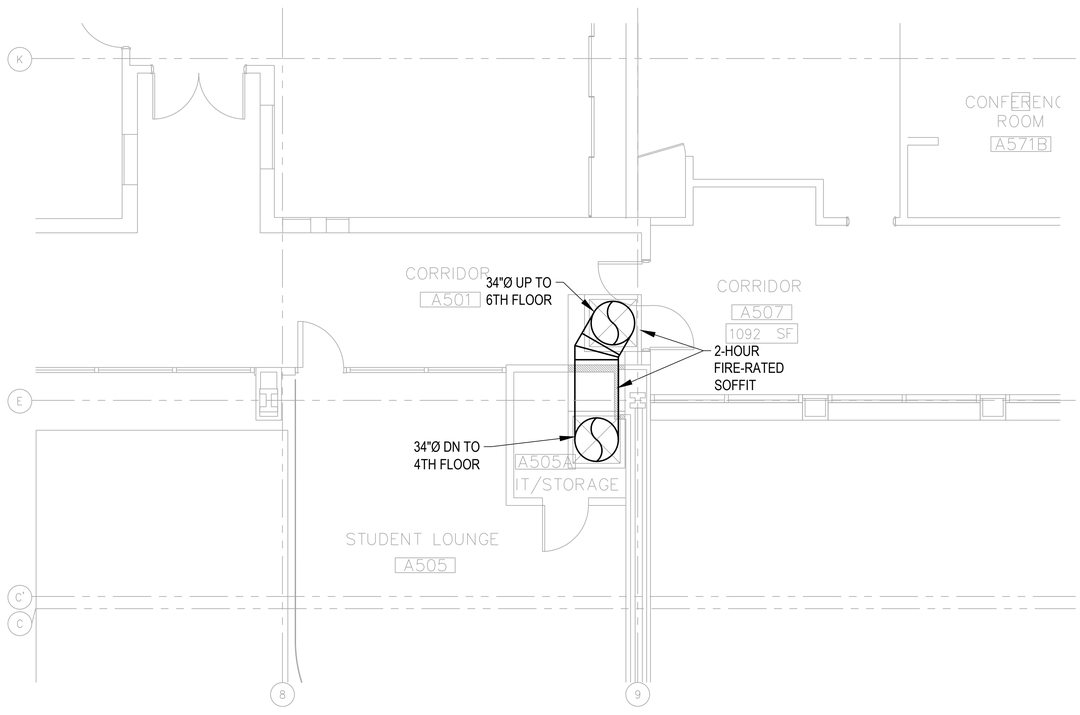
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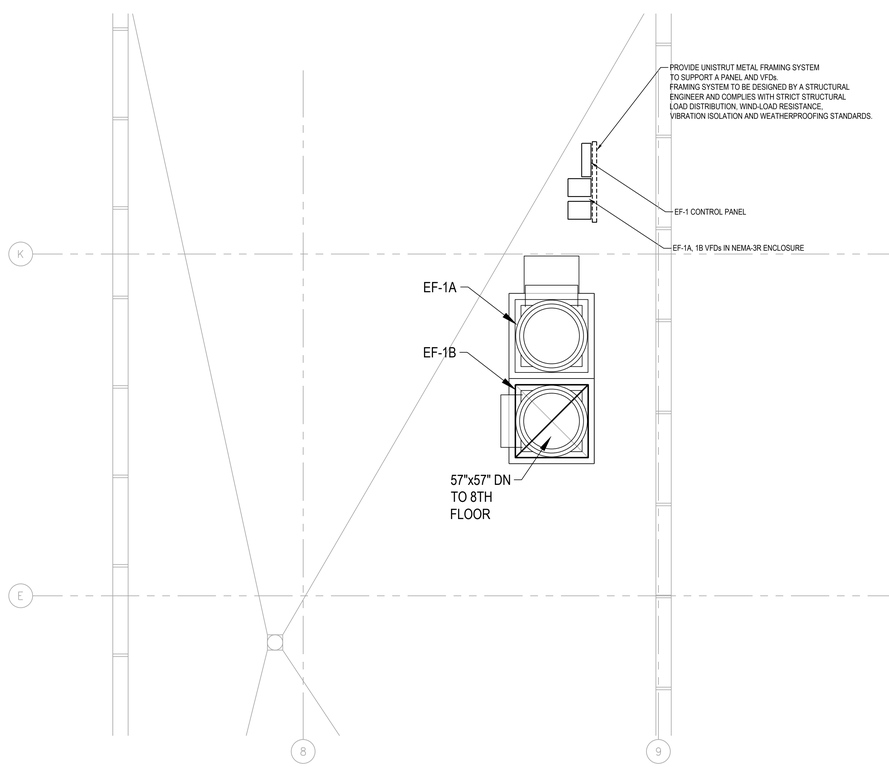
1 4TH FLOOR MECHANICAL PART PLAN
1/4"=1'-0"



3 6TH FLOOR MECHANICAL PART PLAN
1/4"=1'-0"



2 5TH FLOOR MECHANICAL PART PLAN
1/4"=1'-0"



4 ROOF MECHANICAL PART PLAN
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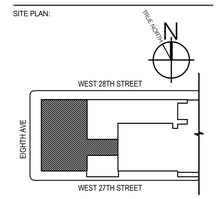
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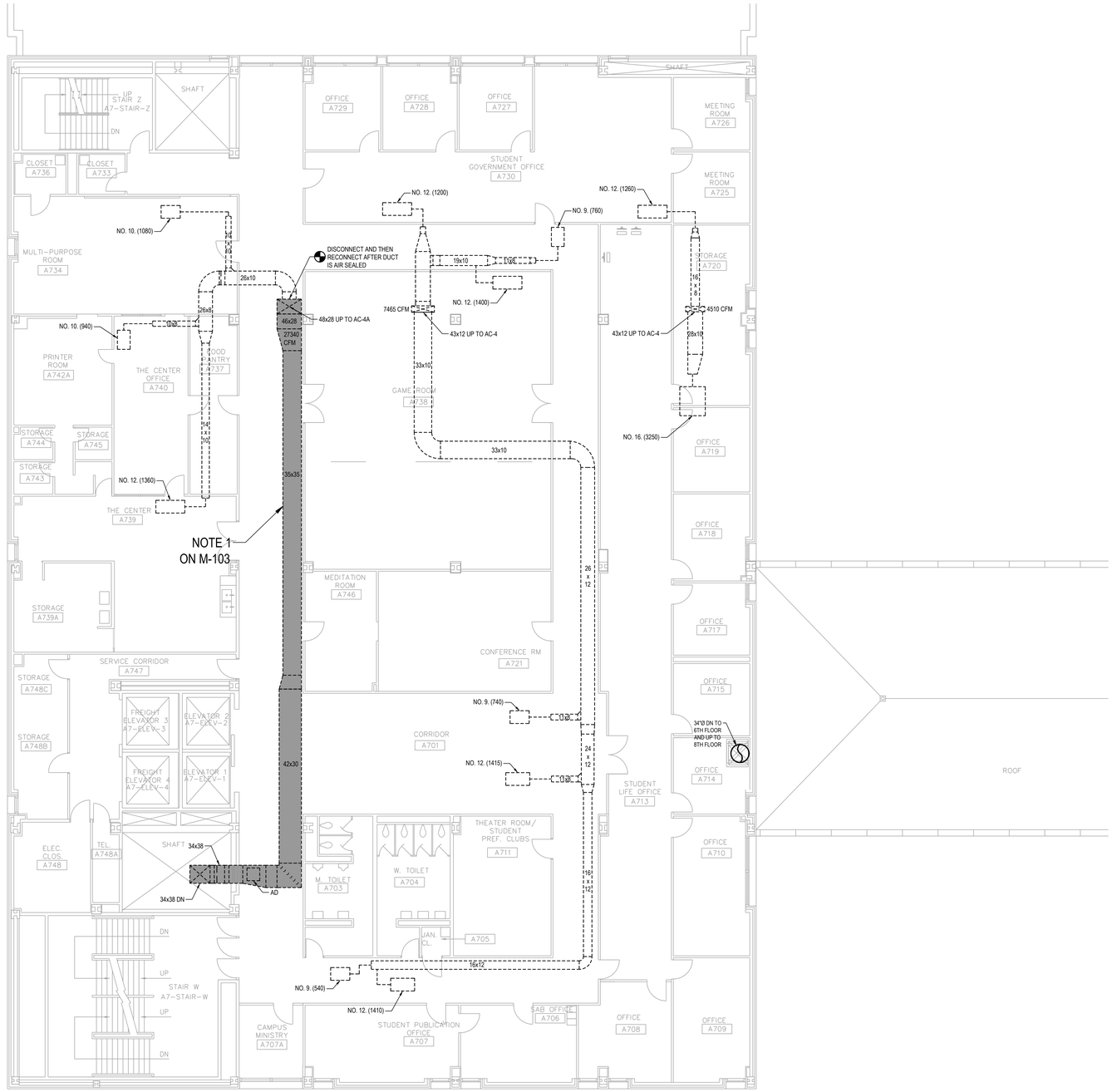
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4TH, 5TH, 6TH FLOOR AND ROOF PART PLANS

DOB NOW JOB# M01470747-S1

SHEET NUMBER:

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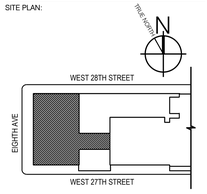
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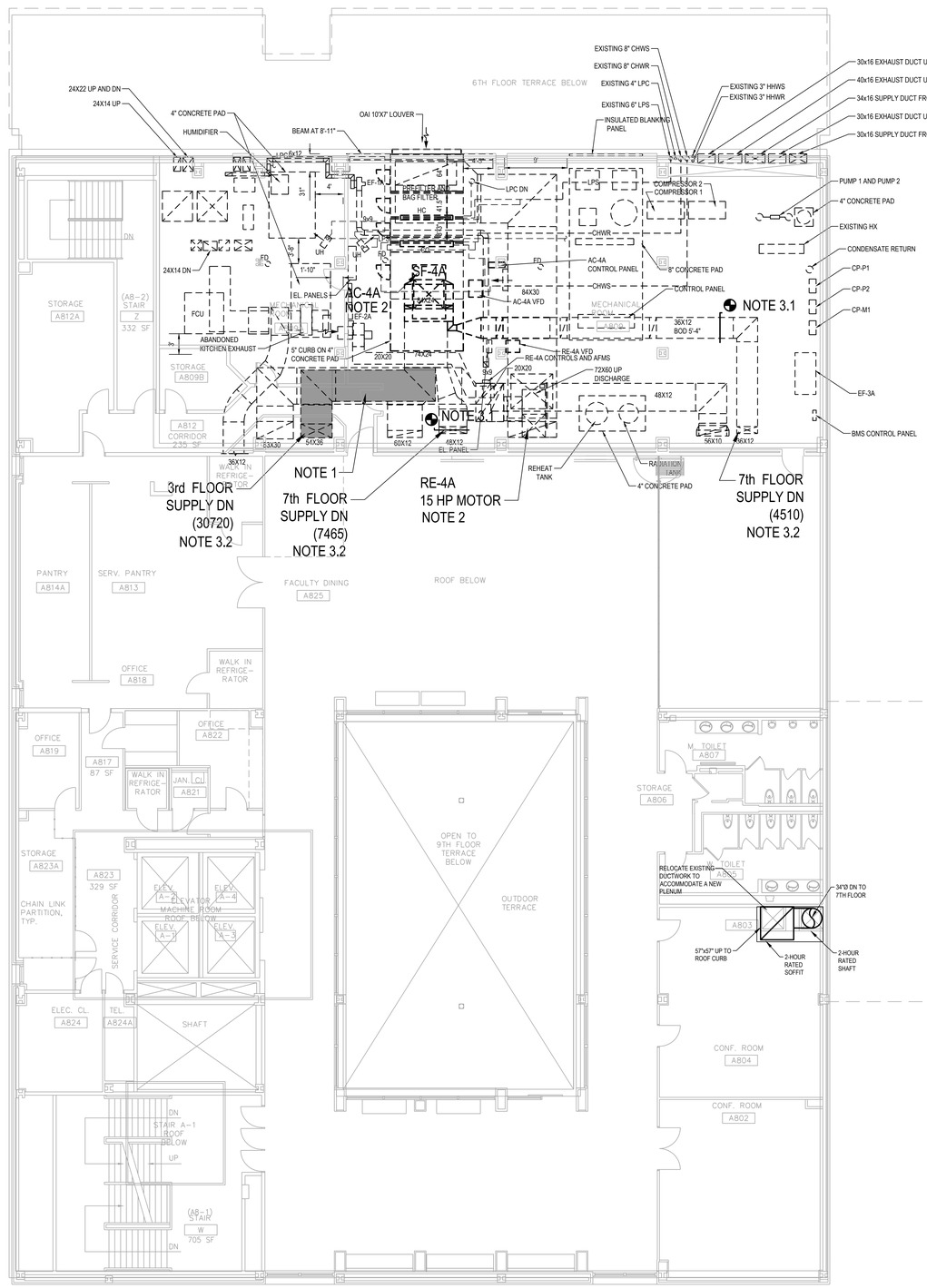
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7TH FLOOR PLAN

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CONSTRUCTION NOTES:

1. DUCT SEALING REQUIREMENTS - MAIN SUPPLY AIR DISTRIBUTION SYSTEM

THE MAIN SUPPLY DUCT TRUNK SERVING THE 3RD FLOOR (AS HIGHLIGHTED ON THE DRAWINGS) SHALL BE SEALED USING AEROSEAL DUCT SEALING TECHNOLOGY. THE SCOPE SHALL INCLUDE, BUT NOT BE LIMITED TO:

- THE DUCTWORK LOCATED WITHIN THE 8TH FLOOR MECHANICAL EQUIPMENT ROOM (MER).
- THE 7TH FLOOR CORRIDOR MAIN HORIZONTAL DUCT RUN.
- THE VERTICAL DUCT RISER EXTENDING FROM THE 7TH FLOOR TO THE 3RD FLOOR.
- THE 3RD FLOOR MAIN HORIZONTAL SUPPLY DUCT TRUNK.

PRIOR TO SEALING OPERATIONS, THE CONTRACTOR SHALL DISCONNECT AND ISOLATE ALL BRANCH DUCT CONNECTIONS FROM THE MAIN DUCT TRUNK AS REQUIRED TO FACILITATE THE AEROSEAL APPLICATION PROCESS AND PREVENT SEALANT MIGRATION INTO BRANCH DUCTWORK AND TERMINAL DEVICES.

THE DUCT SEALING WORK SHALL BE PERFORMED BY AN AEROSEAL-CERTIFIED CONTRACTOR IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND INDUSTRY STANDARDS.

UPON COMPLETION OF THE DUCT SEALING PROCESS, THE CONTRACTOR SHALL SUBMIT A COMPREHENSIVE DUCT SEALING VERIFICATION REPORT TO THE ENGINEER OF RECORD (EOR) FOR REVIEW. THE REPORT SHALL INCLUDE, AT A MINIMUM:

- PRE-SEALING DUCT LEAKAGE MEASUREMENTS.
- POST-SEALING DUCT LEAKAGE MEASUREMENTS.
- TOTAL LEAKAGE REDUCTION AND SEALING EFFECTIVENESS.
- DOCUMENTATION OF SEALING PERFORMANCE AND SYSTEM OPERATING CONDITIONS.
- CERTIFICATION THAT THE WORK WAS COMPLETED IN ACCORDANCE WITH AEROSEAL REQUIREMENTS.

THE COMPLETED DUCT SEALING WORK SHALL ACHIEVE THE MAXIMUM LEAKAGE REDUCTION ATTAINABLE THROUGH THE AEROSEAL PROCESS AND SHALL MAINTAIN THE INTEGRITY AND OPERATIONAL PERFORMANCE OF THE EXISTING AIR DISTRIBUTION SYSTEM.

2. PROPOSED DESIGN NARRATIVE / MECHANICAL SCOPE FOR UPGRADING THE EXISTING UNIT AC-4A AT THE 8TH FLOOR MER.

INCREASE THE EXISTING AC-4A SUPPLY FAN CAPACITY BY REPLACING THE FAN DRIVE PULLEY AND ADJUSTING THE FAN SPEED AS REQUIRED TO ACHIEVE 42,695 CFM AT 6.0 IN. W.G. EXTERNAL STATIC PRESSURE (ESP) WITH THE UNIT OPERATING AT 60 HZ VRF SPEED.

PRIOR TO IMPLEMENTING THE FAN SPEED INCREASE, THE CONTRACTOR SHALL VERIFY THAT ALL AFFECTED FAN SYSTEM COMPONENTS ARE SUITABLE FOR THE REVISED OPERATING CONDITIONS, INCLUDING BUT NOT LIMITED TO:

- FAN MOTOR HORSEPOWER, FULL-LOAD AMPERAGE, AND SERVICE FACTOR.
- FAN SHAFT DIAMETER AND MAXIMUM ALLOWABLE RPM.
- FAN BEARINGS AND BEARING LIFE AT THE REVISED SPEED.
- V-BELTS, SHEAVES/PULLEYS, AND DRIVE ASSEMBLY.
- FAN WHEEL AND FAN CASING STRUCTURAL LIMITS.
- UNIT VIBRATION AND BALANCE REQUIREMENTS.

ANY COMPONENT FOUND TO BE INADEQUATE FOR THE REVISED OPERATING SPEED OR POWER REQUIREMENTS SHALL BE REPLACED WITH PROPERLY RATED COMPONENTS.

THE EXISTING RE-4A RETURN FAN SHALL REMAIN UNCHANGED AND SHALL OPERATE IN ACCORDANCE WITH THE ORIGINAL DESIGN PARAMETERS.

EXISTING AC-4A AND RE-4A SCHEDULES ARE PROVIDED FOR REFERENCE.

3. THE 8TH FLOOR MER TESTING AND BALANCING SCOPE OF WORK

3.1 PROVIDE AND INSTALL A MANUAL OPPOSED-BLADE BALANCING (OBD) DAMPER WITH LOCKING QUADRANT IN THE EXISTING MAIN SUPPLY AIR DUCT TRUNK SERVING THE 7TH FLOOR. THE DAMPER SHALL BE MODEL 820ALN-2, MANUFACTURED BY YOUNG REGULATOR COMPANY, OR APPROVED EQUAL.

3.2 FOLLOWING DAMPER INSTALLATION, PERFORM A DUCT TRAVERSE AIRFLOW MEASUREMENT IN THE MAIN SUPPLY DUCT SYSTEMS SERVING THE 3RD AND 7TH FLOORS TO DETERMINE ACTUAL AIRFLOW QUANTITIES.

ADJUST THE BALANCING DAMPER AS REQUIRED TO PROPORTION AIRFLOW BETWEEN THE 3RD FLOOR AND 7TH FLOOR MAIN DUCT SYSTEMS AND ACHIEVE THE DESIGN AIRFLOW QUANTITIES INDICATED ON THE CONTRACT DOCUMENTS.

UPON COMPLETION OF BALANCING, PERMANENTLY SECURE THE DAMPER POSITION USING THE LOCKING QUADRANT. PROVIDE FINAL DUCT TRAVERSE MEASUREMENTS AND AIRFLOW READINGS DOCUMENTING THE BALANCED OPERATING CONDITIONS AND DEMONSTRATING COMPLIANCE WITH THE DESIGN AIRFLOW REQUIREMENTS FOR BOTH FLOORS.

ALL TESTING, ADJUSTING, AND BALANCING (TAB) WORK SHALL BE PERFORMED BY A QUALIFIED TAB CONTRACTOR, AND THE FINAL AIRFLOW MEASUREMENTS SHALL BE INCLUDED IN THE TAB REPORT SUBMITTED TO THE ENGINEER OF RECORD EOR) FOR REVIEW.

4. PRE-CONSTRUCTION AIRFLOW MEASUREMENTS

4.1 PROVIDE PRE-CONSTRUCTION AIRFLOW MEASUREMENTS FOR THE MAIN DUCT TRUNKS SERVING THE 3RD FLOOR AND 7TH FLOOR. RECORD A SEPARATE AIRFLOW READING FOR THE 3RD FLOOR MAIN DUCT LOCATED WITHIN THE 7TH FLOOR CORRIDOR, AND A SEPARATE AIRFLOW READING AT THE 3RD FLOOR MAIN TRUNK.

4.2 PERFORM COMPREHENSIVE TESTING AND OPERATIONAL VERIFICATION OF EXISTING HVAC UNITS AC-4A AND RE-4A, INCLUDING AIRFLOW, TEMPERATURE, MOTOR OPERATION, CONTROLS, AND OVERALL UNIT PERFORMANCE. DOCUMENT AND SUBMIT ALL TEST RESULTS FOR REVIEW.

4.3 ON THE 3RD FLOOR, PROVIDE PRE-CONSTRUCTION AIRFLOW READINGS FOR EACH EXISTING CV (CONSTANT VOLUME) TERMINAL. MEASURE AND RECORD AIRFLOW AT EACH TERMINAL IN CFM USING CALIBRATED TESTING AND BALANCING INSTRUMENTS. IDENTIFY EACH TERMINAL BY TAG NUMBER AND LOCATION. DOCUMENT AND SUBMIT ALL MEASURED AIRFLOW READINGS AS PART OF THE PRE-CONSTRUCTION TESTING REPORT FOR REVIEW AND FUTURE COMPARISON WITH POST-CONSTRUCTION CONDITIONS.

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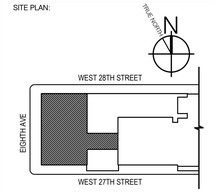
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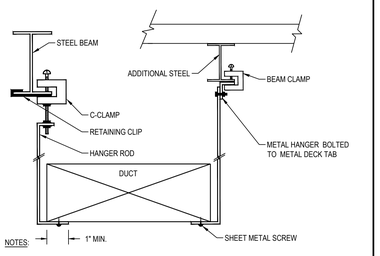
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8TH FLOOR PLAN

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NOTES:

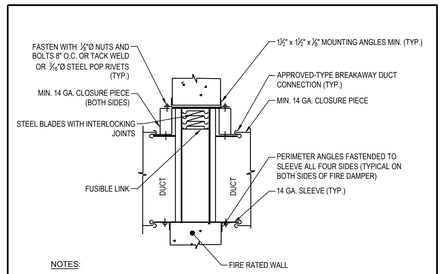
1. HANGERS SHALL BE OF METAL NOT LESS THAN 1/16" FOR DUCTS 2 SQ.FT. & LESS, AND NOT LESS THAN 1/4" FOR DUCTS LARGER THAN 2 SQ.FT.
2. WHERE CROSS-SECTIONAL AREA OF DUCT EXCEEDS 8 SQ.FT., HANGERS SHALL BE SPACED NOT MORE THAN 4 FT. ON CENTERS.
3. C-CLAMP FOR DUCTS UP TO 36" MAXIMUM DIMENSION.

DUCT SUPPORT ATTACHMENT TO STRUCTURE

DUCT SUPPORT SCHEDULE

HALF OF DUCT PERIMETER	PAIR AT 10 FT. SPACING		PAIR AT 8 FT. SPACING		PAIR AT 5 FT. SPACING		PAIR AT 4 FT. SPACING	
	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD
30"	1" x 22 GA	10 GA (.135")	1" x 22 GA	10 GA (.135")	1" x 22 GA	12 GA (.135")	1" x 22 GA	12 GA (.135")
72"	1" x 18 GA	3/8"	1" x 20 GA	1/4"	1" x 22 GA	1/4"	1" x 22 GA	1/4"
96"	1" x 16 GA	3/8"	1" x 18 GA	3/8"	1" x 20 GA	3/8"	1" x 22 GA	1/4"
120"	10" x 16 GA	1/2"	1" x 16 GA	3/8"	1" x 18 GA	3/8"	1" x 20 GA	1/4"
168"	10" x 16 GA	1/2"	10" x 16 GA	1/2"	1" x 16 GA	3/8"	1" x 18 GA	3/8"
192"	-	1/2"	10" x 16 GA	1/2"	1" x 16 GA	3/8"	1" x 16 GA	3/8"

1 DUCT SUPPORT SCHEDULE
Not to Scale

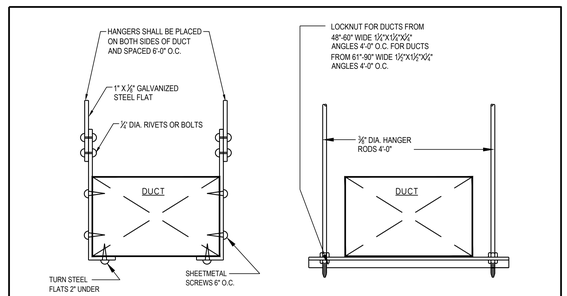


NOTES:

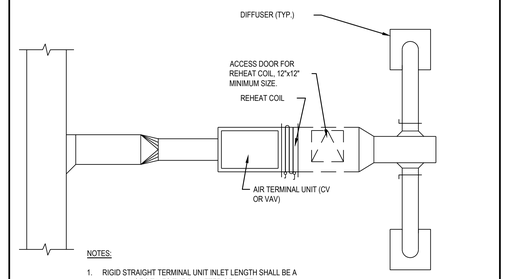
1. ACCESS DOORS FOR FIRE DAMPERS SHALL BE 12"x12" MIN. UNLESS NOTED OTHERWISE. FOR DUCTS SMALLER THAN 12", INCREASE DUCT WITH TRANSITION TO 12" IN ORDER TO ACCOMMODATE A 12"x12" ACCESS DOOR.
2. FIRE DAMPER INSTALLATION SHALL CONFORM WITH SMACNA & NFPA STANDARD.
3. DETAIL SHOWN IS FOR FIRE DAMPER IN HORIZONTAL DUCTWORK. FOR FIRE DAMPER IN VERTICAL DUCTWORK, DETAIL SHALL BE SIMILAR.
4. DAMPER BLADES SHALL BE OUT OF THE AIR STREAM.
5. INSTALLATION OF FIRE DAMPER MUST COMPLY WITH THE MANUFACTURER'S UL APPROVAL AND ASSOCIATED REQUIREMENTS.

(SEE FLOOR PLAN FOR REQUIREMENTS AND LOCATIONS)

2 Fire Damper Detail
Not to Scale



3 METHOD OF SUPPORTING DUCTS
Not to Scale



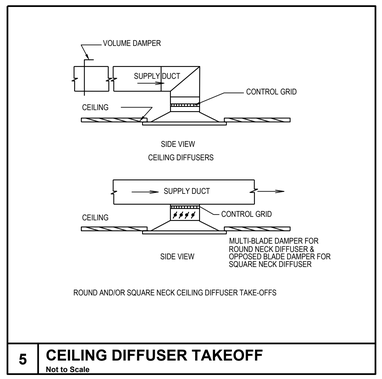
NOTES:

1. RIGID STRAIGHT TERMINAL UNIT INLET LENGTH SHALL BE A MINIMUM OF 3 TIMES THE DIAMETER OF INLET.
2. A BRANCH DUCT SERVING AN INDIVIDUAL BOX MAY BE THE SAME SIZE AS THE BOX INLET, PROVIDED THE EQUIVALENT LENGTH OF THE BRANCH DUCT, AS SHOWN, DOES NOT EXCEED 10 FEET (3 METERS). FOR LONGER LENGTHS, INCREASE THE DUCT SIZE AND PROVIDE A DUCT TRANSITION TO MAINTAIN THE DUCT STATIC PRESSURE DROP AT OR BELOW 0.2"/100'.

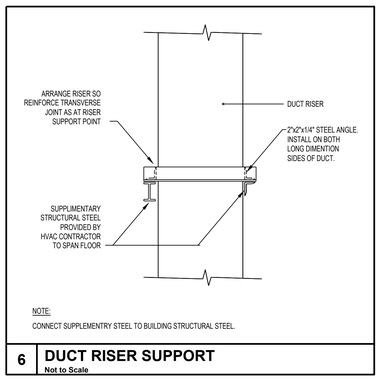
COMPONENT ARRANGEMENT MAY VARY BY MANUFACTURER. PROVIDE

3. INSULATION W/VAPOR BARRIER FOR CONNECTING DUCT SECTIONS.

4 VAV Box with Reheat Coil Detail
Not to Scale



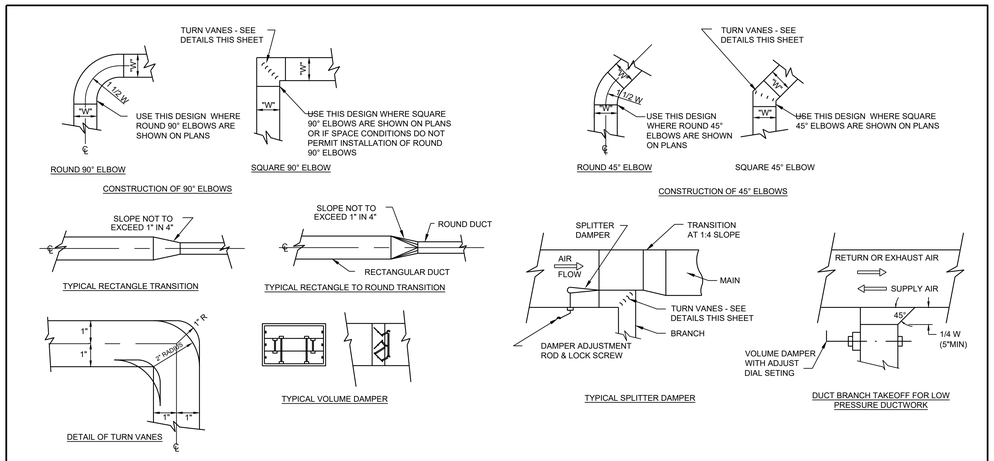
5 CEILING DIFFUSER TAKEOFF
Not to Scale



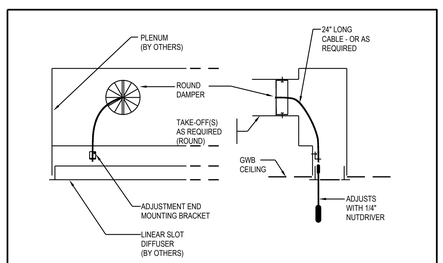
NOTE:

CONNECT SUPPLEMENTRY STEEL TO BUILDING STRUCTURAL STEEL.

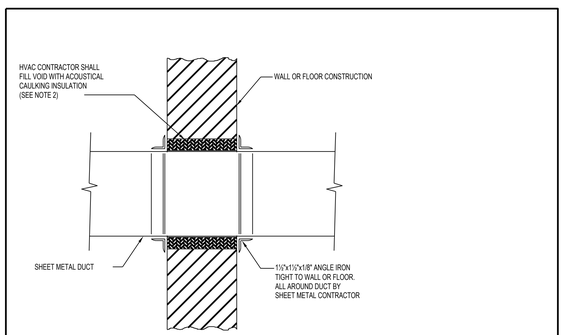
6 DUCT RISER SUPPORT
Not to Scale



7 DUCTWORK DETAILS
Not to Scale



8 Remote Damper Operator for Inaccessible Damper Locations
Not to Scale



NOTES:

1. FOR WALLS REQUIRING FIRE DAMPERS SEE OTHER DETAILS.
2. PACK WITH GLASS FIBER OR ROCKWOOL PACKED TIGHTLY AND SEAL WITH JOHNS MANVILLE DUCT SEAL OR UNI-SEAL.

9 DUCT PIERCING WALL WHERE FIRE DAMPER IS NOT REQUIRED
Not to Scale

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FIT Science Lab Renovation

Project No. 2449

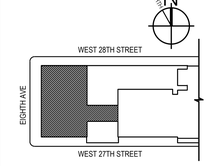
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150 WEST 28TH STREET, SUITE 1603
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212.206.8356

SITE PLAN:



SUBMITTAL:

100% Construction Documents

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2026.03.31
	100% CONSTRUCTION DOCUMENT	2026.08.19
	ISSUED FOR DOB FILING	2026.10.21
	100% BID DOCUMENTS	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: SKC CHECKED BY: SB

SCALE: NTS PROJECT#: 8969.109

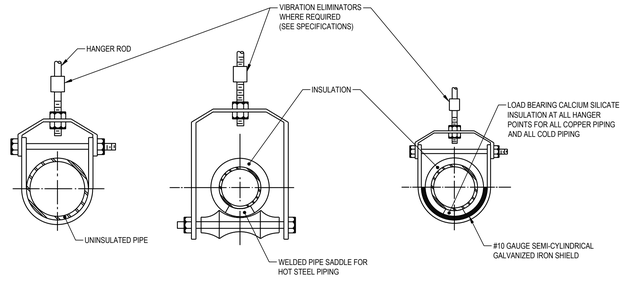
SHEET TITLE:

DETAILS 1

DOB NOW JOB# M01470747-S1

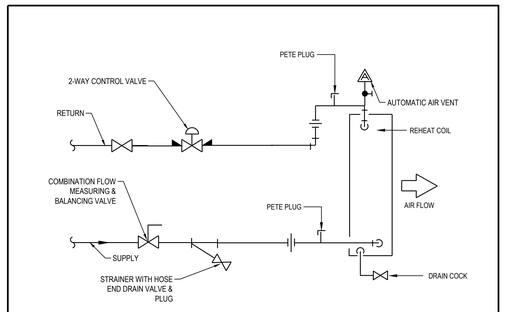
SHEET NUMBER:

M-501.00

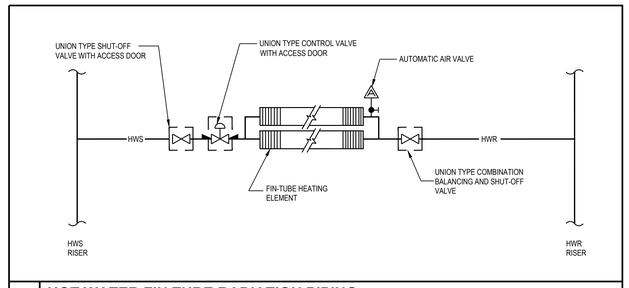


INDIVIDUAL PIPE HANGER ROD & SPACING SCHEDULE												
NOMINAL PIPE OR TUBE SIZE - INCHES	3/4	1	1 1/2	2	2 1/2	3	4	5	6	8	10	12
HANGER ROD SIZES -INCHES	3/8	3/8	3/8	3/8	1/2	1/2	5/8	5/8	7/8	7/8	7/8	7/8
MAXIMUM SPACING BETWEEN PIPE SUPPORT - FEET	6	7	9	10	11	12	14	16	17	19	22	23
MAX. SPACING BETWEEN COPPER. TUBE SUPPORTS - FEET	6	6	8	9	10	10	12	14	14	16	18	20

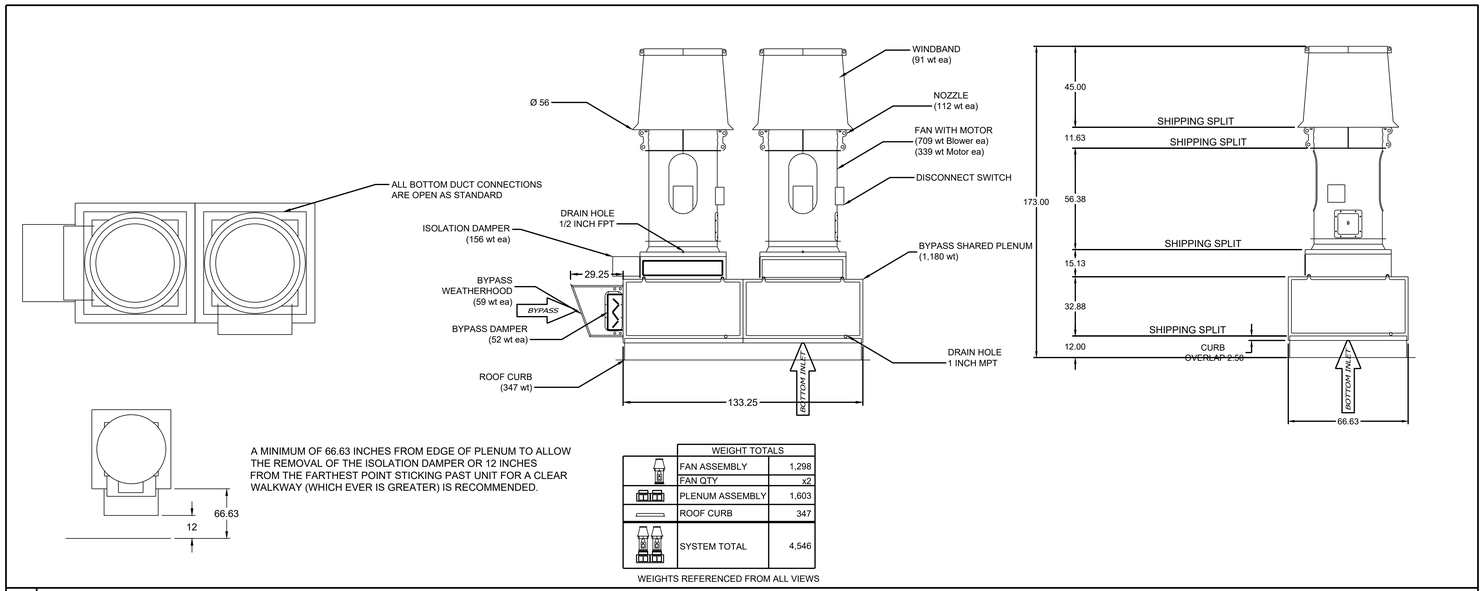
1 CLEVIS AND ROLLER HANGER DETAILS
Not to Scale



2 REHEAT COIL PIPING DETAIL
Not to Scale



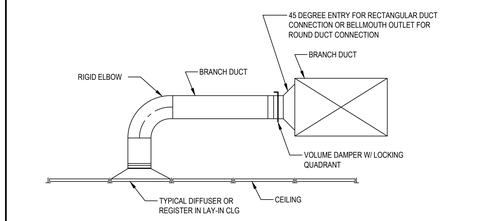
3 HOT WATER FIN TUBE RADIATION PIPING
Not to Scale

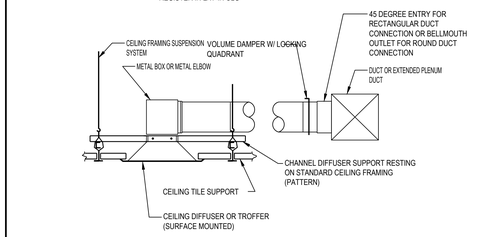


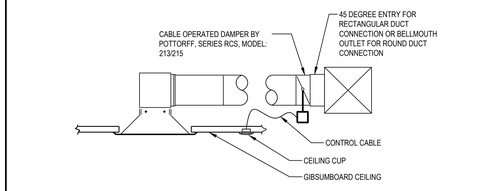
WEIGHT TOTALS	
FAN ASSEMBLY	1,298
FAN QTY	x2
PLENUM ASSEMBLY	1,603
ROOF CURB	347
SYSTEM TOTAL	4,546

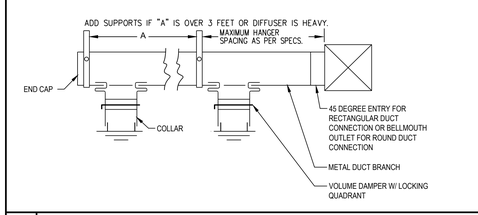
WEIGHTS REFERENCED FROM ALL VIEWS

4 EF-1 INSTALLATION DETAILS
Not to Scale









5 CEILING DIFFUSER BRANCH PRODUCTS
Not to Scale

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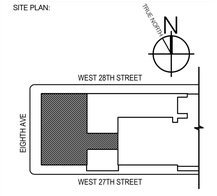
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SEAL & SIGNATURE:

DRAWN BY: SKC CHECKED BY: SB

SCALE: NTS

PROJECT#: 8969.109

SHEET TITLE:

DETAILS 2

DOB NOW JOB# M01470747-S1

SHEET NUMBER:

M-502.00

Single Duct Terminal Unit Schedule

Tag	AHU	Room	Model	Size		CFM		Static Pressure			NC Levels						Hot Water Heat Coil							Unit Information
	Tag			Unit	Outlet	Max	Min	Inlet	Down	Min	Rad	Dis	CFM	MBH	EAT	EWT	LAT	APd	GPM	LWT	WPd	Rows	FPI	Hand
EVAV-01	EF-1	Wet Lab	DEXV	16	24x18	2520	1386	1	0.5	0.02	19	19	0		0	0	0	0		0	0			RH
EVAV-02	EF-1	Prep room	DEXV	07	12x10	500	275	1	0.5	0.09	22	23	0		0	0	0	0		0	0			RH
EVAV-03	EF-1	Bio Lab	DEXV	05	12x8	180	180	1	0.5	0.02	14	24	0		0	0	0	0		0	0			RH
EVAV-04	EF-1	Analytics Lab	DEXV	09	14x12.5	700	385	1	0.5	0.03	17	23	0		0	0	0	0		0	0			RH
EVAV-05	EF-1	Dry Lab	DEXV	16	24x18	2620	1441	1	0.5	0.03	20	20	0		0	0	0	0		0	0			RH
VAV-01	4A	Wet Lab	DESV	14	20x17.5	1930	1062	1	0.35	0.3	21	-	1062	50	55	180	98.4	0.27	2.3	136.2	0.26	2-RH	10	RH
VAV-02	4A	Wet Lab	DESV	14	20x17.5	1930	1062	1	0.35	0.3	21	-	1062	50	55	180	98.4	0.27	2.3	136.2	0.26	2-RH	10	RH
VAV-03	4A	Prep. Room	DESV	09	14x12.5	680	374	1	0.35	0.11	17	13	374	10	55	180	79.7	0.08	0.6	146.4	0.07	1-RH	10	RH
VAV-04	4A	BIO Lab	DESV	12	16x15	1270	1270	1	0.35	0.14	22	14	1270	27.6	55	180	75	0.13	2.6	158.2	0.84	1-RH	10	RH
VAV-05	4A	Analytics Lab	DESV	09	14x12.5	720	396	1	0.35	0.12	18	14	396	10.2	55	180	78.7	0.09	0.6	145.7	0.07	1-RH	10	RH
VAV-06	4A	Dry Lab	DESV	14	20x17.5	1250	688	1	0.35	0.15	17	-	688	32	55	180	97.8	0.14	1.2	126.9	0.1	2-RH	10	RH
VAV-07	4A	Dry Lab	DESV	14	20x17.5	1250	688	1	0.35	0.15	17	-	688	32	55	180	97.8	0.14	1.2	126.9	0.1	2-RH	10	RH

Notes:
1. Selections are based on Titus as Manufacturer.
2. All performance based on tests conducted in accordance with ASHRAE 130-2008 and AHRI 880-2011.
3. All NC levels determined using AHRI 885-2008 Appendix E.
4. All airflow, pressure losses and heating performance values have been corrected for altitude.
5. Units of measure: dimensions (in), airflow (cfm), water flow (gpm), air pressure (in wg), water head losses (ft) and temperatures (degF).
6. Water pressure drop (WPd) units is in ft. water.

Fume Exhaust System

BASIS OF DESIGN: GREENHECK

MARK INFORMATION		FAN INFORMATION									SOUND INFORMATION		MOTOR INFORMATION						
MARK	QTY	MODEL	DRIVE TYPE	VOLUME (CFM)	EXTERNAL SP (IN. WG)	TOTAL EXTERNAL SP (IN. WG)	FAN SPEED (RPM)	OUTLET VELOCITY (FT/MIN)	FEI	TOTAL WEIGHT (LB)	INLET dBA	OUTLET dBA	OPERATING POWER (HP)	MOTOR SIZE (HP)	ENCLOSURE	VOLTAGE	CYCLE	PHASE	EC MOTOR
EF-1A, EF-1B	2	VEKTOR-MD-24-4-85-MV-HPW	Direct	10,350	4	4.15	1,704	3,920	1.11	4,546	93	97	12.87	20	TEFC	208	60	3	0

EF-1 : SELECTED OPTIONS AND ACCESSORIES

NEMA PREMIUM EFFICIENT MOTOR - MEETS NEMA TABLE 12-12
MOTOR VFD RATED
MOTOR WITH SHAFT GROUNDING
MOTOR WITH MINIMUM 40 DEGREE C AMBIENT TEMPERATURE
MOTOR WITH CLASS F OR GREATER INSULATION
MOTOR DUTY - INDUSTRIAL
MOTOR WITH GREASEABLE BEARINGS
BYPASS AIR PLENUM - SINGLE WALL, STEEL, BOTTOM EXHAUST INTAKE
COATED WITH LABCOAT, RAL7023, ENTIRE UNIT
SWITCH - NEMA-4X, TOGGLE, FOR INDOOR OR OUTDOOR USE, MOUNTED AND WIRED
UL/CUL-705 - "POWER VENTILATORS"
FAN PANEL MATERIAL - COATED POLISHED STEEL
BYPASS DAMPER - HCD-130-LE, GALVANIZED, MILL FINISH, 16 IN. X 16 IN., QTY: 1
BYPASS DAMPER ACT. - ELECTRIC, MODULATING, W/O TRANSFORMER, 24 VAC, MODEL: EFB24-SR, QTY: 1
ISOLATION DAMPER - HCD-230-LE, GALVANEAL, COATED, 42 IN. X 40 IN., PARALLEL BLADES, MOUNTED IN BAP, ONE PER FAN
ISOLATION DAMPER ACT. - ELECTRIC, 24 VAC, 2 POS., SR, W/O TRANSFORMER, MODEL: EFB24-S, QTY: 2
SURE-AIRE FLOW STATION (WITH ELECTRONICS), QTY 2
FACTORY VIBRATION TEST, 0.08 IN/SEC, PEAK, FILTER-IN AS MEASURED AT THE FAN RPM
WIND SPEED LEVEL 125 MPH WITHOUT GUY WIRES
STANDARD WEATHERHOOD OVER BYPASS DAMPER WITH INLET SCREEN
DRAIN CONNECTION - 1" PIPE THREAD W/O PLUG
UNIT WARRANTY: 1 YR (STANDARD)
VEKTOR SYSTEM CONTROL
VK-CURB

AIR OUTLETS SCHEDULE

BASIS OF DESIGN: TITUS

LABEL	MODEL	PATTERN	BORDER TYPE	ACCESS	NECK SIZE	CFM RANGE	NC	PANEL	MODULE	REMARKS
LD-1	FL-10	1 SLOT	NT	VD	8"Ø	180		48		4 FEET PLENUM FTI-10
LD-2	FL-10	2 SLOT	NT	VD	8"Ø	170		24		2 FEET PLENUM FTI-10
LD-3	FL-10	2 SLOT	NT	VD	10"Ø	280		36		3 FEET PLENUM FTI-10
LD-4	FL-10	2 SLOT	NT	VD	10"Ø	320		48		4 FEET PLENUM FTI-10
LD-5	CT-540	9" WIDTH	NT	-	-	1800		17'-6"(L) X 9"(W)		
SR-1	300RL	-	-	-	36x6	625		-	-	
EG-1	355RL	-	1	-	6x6	50	-	-	-	
EG-2	355RL	-	1	-	8x8	100	-	-	-	
EG-3	355RL	-	1	-	10x10	175	-	-	-	

FUME HOOD EXHAUST VALVE SCHEDULE

BASIS OF DESIGN: "ANTEC"

TAG	LOCATION					DESIGN AIRFLOW		CFM RANGE		MODEL	REMARKS
		SIZE	SHAPE	MATERIAL	ACTUATOR	CFM	OPERATING PRESSURE (IN WC)	MIN	MAX		
EAV-1	MICROBIOLOGY	112	VENTURI	304 SS	019128-014	1270	0.15	240	3000	VFX	6 FOOT HOOD, MODEL V15
EAV-2	WET LAB	110	VENTURI	304 SS	019128-014	790	0.15	120	1300	VFX	4 FOOT HOOD, MODEL V15
EAV-3	WET LAB	110	VENTURI	304 SS	019128-014	790	0.15	120	1300	VFX	4 FOOT HOOD, MODEL V05

NOTES:
STAINLESS STEEL CONSTRUCTION

FIN TUBE RADIATOR SCHEDULE

BASIS OF DESIGN: "ZEHNDER RITTLING"

TAG	ROWS OF ELEMENT	TOTAL CAPACITY (BTU/HR)	FLUID FLOW (GPM)	ENTERING WATER TEMPERATURE (°F)	LEAVING WATER TEMPERATURE (°F)	TUBE DATA		FIN DATA				ENCLOSURE			LENGTH OF SECTION (FT.)
						DIAMETER (IN.)	MATERIAL	NUMBER OF FINS/LINEAR FEET	FIN SIZE (IN.X IN.)	FIN THICKNESS (IN.)	MATERIAL	MODEL	DEPTH (IN)	HEIGHT (IN)	
FTR-1	2	1650	3	180	160	3/4	COPPER	40	3-5/8" x 4-1/4"	1/5"	ALUMINUM	C3/4-434	5-9/16"	20-3/16"	REFER TO FLOOR PLAN

NOTES:
1. SUBJECT TO ENCLOSURE DETAILED BY ARCHITECT.
2. PROVIDE CONTINUE FIN-TUBE ENCLOSURE FROM WALL TO WALL AND ACCESS PANELS FOR EACH VALVE.
3. CONTRACTOR TO PROVIDE ELEMENT AND PIPING SUPPORT AND MOUNTING BRACKETS, SUITED TO THE CONDITION
4. PROVIDE MODULATING CONTROL VALVE AND CONNECT TO BMS.
5. PROVIDE BLANK SECTIONS AS INDICATED ON THE MECHANICAL AND ARCHITECTURAL DRAWINGS.

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FIT Science Lab Renovation

Project No. 2449

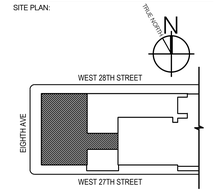
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NEW YORK, NY 10001
212.206.8356

SITE PLAN:



SUBMITTAL:

100% Construction Documents

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2026.03.31
	100% CONSTRUCTION DOCUMENT	2026.08.19
	ISSUED FOR DOB FILING	2026.10.21
	100% BID DOCUMENTS	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: ASB CHECKED BY: SB

SCALE: NTS

PROJECT#: 8969.109

SHEET TITLE:

SCHEDULES #1

DOB NOW JOB# M01470747-S1

SHEET NUMBER:

M-701.00

EXISTING HVAC UNIT SCHEDULE FOR REFERENCE ONLY

GENERAL					FAN DATA													COOLING COIL									
UNIT NUMBER	SERVICE	LOCATION	MANUFACTURER MODEL NUMBER	TYPE OF RIG	TOTAL AIR QUANTITY (CFM)	OUTLET VELOCITY (FPM)	STATIC PRESSURE (IN./WG.)	ARRANGEMENT	CLASS	DISCHARGE	ROTATION	FAN SPEED (RPM)	WHEEL DIAMETER (IN)	MAX REQUIRED BRAKE HP	MOTOR			VIBRATION ISOLATION		TOTAL AIR QUANTITY (CFM)	MIN OUTSIDE AIR (CFM)	NO. OF COILS	SIZE OF EACH COIL			MAX AIR VELOCITY (FPM)	CIRCUITING	FINS PER INCH	TYPE OF COIL	ROWS
															MIN MOTOR SIZE HP	MOTOR SPEED RPM	MOTOR POSITION	SPEC TYPE	MAX STATIC DEFLECTION (IN.)				FACE AREA (FT^2)	TUBE LENGTH (IN.)	TUBE FACE					
AC-4A	GENERAL SUPPLY 3RD & 7TH FLOOR	STUDENT CENTER 8TH FLOOR FAN ROOM NO 2	CP-631	AIR HANDLING UNIT (MED PRESSURE)	36,390	1790	5	3	2	VERTICAL	CW	1018	39	36.2	40	1750	LH	II	1	36,390	9100	2	30.6	107 107	24 26	592	DOUBLE	10	W	6

EXISTING HVAC UNIT SCHEDULE FOR REFERENCE ONLY.

COOLING COIL CONT.										HEATING COIL																
MAX PRESSURE DROP		CHILLED WATER			ENTERING AIR		LEAVING AIR		REMARKS	SERVICE	TOTAL AIR QUANTITY (CFM)	TOTAL LOAD (MBH)	NO. OF COILS	SIZE OF EACH COIL			MAX AIR VELOCITY (FPM)	ROWS	FINS PER INCH	TYPE OF COIL	MAX AIR PRESSURE DROP (IN. WG)	STEAM		AIR TEMP		REMARKS
AIR PRESSURE DROP (IN. WG.)	WATER PRESSURE DROP (FT H20)	GPM	ON	OFF	D.B. (°F)	W.B. (°F)	D.B. (°F)	W.B. (°F)						FACE AREA (FT^2)	TUBE LENGTH (IN.)	TUBE FACE						LBS/HR	PRESSURE PSIG	ENTERING (°F)	LEAVING (°F)	
0.84	4.5	255	42	52	82.3	67.8	58	57		PREHEAT	36,390	590	2	30.6 27.2	107	16 18	630	1	T	SD	0.28	610	5	40	55	1" TUBES

EXISTING HVAC UNIT SCHEDULE FOR REFERENCE ONLY.

FILTERS								
TYPE	MANUFACTURER MODEL NUMBER	NO. & SIZE	TOTAL FACE AREA (FT^2)	MAX AIR VELOCITY (FPM)	MAX PRESSURE DROP		NO. OF FILTERS	REMARKS
					CLEAN (IN. WG.)	REPLACE (IN. WG.)	WIDTH x HEIGHT	
FACTORY ASSEMBLED HI-EFFICIENCY DRY TYPE	SFM-95-70-120	18 24x24x29 16 24x12x29	84	434	0.7	1.2	H - 86 ⅞" W - 143 ⅜" D - 35"	WITH INTEGRAL GRATE AND 2" THROW AWAY PRE-FILTER

EXISTING RETURN FAN SCHEDULE FOR REFERENCE ONLY

GENERAL					FAN DATA																REMARKS
TAG	SERVICE	LOCATION	TOTAL AIR QUANTITY (CFM)	TYPE	MANUFACTURER MODEL NUMBER	OUTLET VELOCITY (FPM)	STATIC PRESSURE (IN. WG)	ARRANGEMENT	CLASS	DISCHARGE	ROTATION	FAN SPEED (RPM)	WHEEL DIAMETER (IN)	WEIGHT	MAX REQUIRED BRAKE HP	MOTOR DATA			MOUNTING	VIBRATION ISOLATION		
																MIN MOTOR SIZE HP	MOTOR SPEED RPM	MOTOR POSITION		SPEC VIBRATION ISOLATION TYPE	MIN STATIC DEFLECTION (IN)	
RE-4A	AC-4A	STUDENT CENTER 8TH FLOOR FAN ROOM	30,815	CENTRIFUGAL AIR FOIL	SIZE 542 SWSI	1825	1 ½	3	I	UB	CW	476	54 ¼	2070	9.72	15	1750	W	FLOOR	I	4	

M

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NEW YORK CITY ENERGY CONSERVATION CODE

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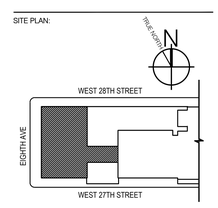
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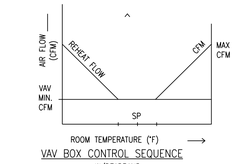
SHEET TITLE:

SCHEDULES #2

DOB NOW JOB# M01470747-S1

SHEET NUMBER:

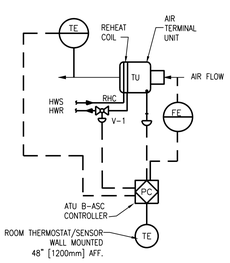
M-702.00



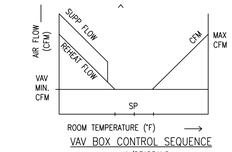
VAV BOX CONTROL SEQUENCE

W/DEADBAND

A. SET POINTS SHALL SET AS FOLLOWS:
COOLING 75° F (ADJ.)
HEATING 70° F (ADJ.)
DEADBAND OF 5° F BETWEEN HEATING AND COOLING SET POINT WILL BE MAINTAINED
B. UPON FALL IN SPACE TEMPERATURE BELOW SET POINT VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT ± .5°,THE ADJUSTABLE TOLERANCE OF ± .5° HAS BEEN SELECTED TO PREVENT VALVE HUNTING
C. THE REVERSE SHALL OCCUR ON RISE IN SPACE TEMPERATURE.
D. UPON A RISE IN SPACE TEMPERATURE ABOVE SET POINT, THE VAV TERMINAL DAMPER SHALL MODULATE OPEN FROM MINIMUM AIR VOLUME TO MAXIMUM AIR VOLUME.
E. THE REVERSE SHALL OCCUR ON A DROP IN SPACE TEMPERATURE



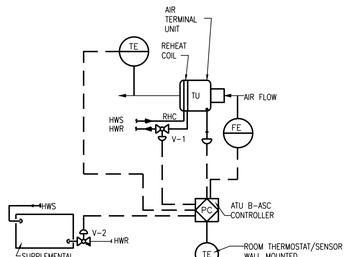
NO SUPPLEMENTAL HEATING



VAV BOX CONTROL SEQUENCE

W/DEADBAND

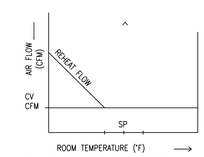
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HEATING 70° F (ADJ.)
DEADBAND OF 5° F BETWEEN HEATING AND COOLING SET POINT WILL BE MAINTAINED
B. UPON FALL IN SPACE TEMPERATURE BELOW SET POINT VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT ± .5°, THE ADJUSTABLE TOLERANCE OF ± .5° HAS BEEN SELECTED TO PREVENT VALVE HUNTING
C. VALVE V-2 SHALL BE ENABLED WHEN OUTSIDE AIR FALLS BELOW 40° F (ADJ) AND VALVE V-1 HAS BEEN MODULATED OPEN ABOVE 30% (ADJ) V-2 SHALL THEN BE MODULATED TO MAINTAIN SET POINT ± .5° F. THE ADJUSTABLE TOLERANCE OF .5° F HAS BEEN SELECTED TO PREVENT VALVE HUNTING.
D. THE REVERSE SHALL OCCUR ON RISE IN SPACE TEMPERATURE.
E. UPON A RISE IN SPACE TEMPERATURE ABOVE SET POINT, THE VAV TERMINAL DAMPER SHALL MODULATE OPEN FROM MINIMUM AIR VOLUME TO MAXIMUM AIR VOLUME.
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WITH SUPPLEMENTAL HEATING

VARIABLE AIR VOLUME AIR TERMINAL UNIT CONTROL DIAGRAM

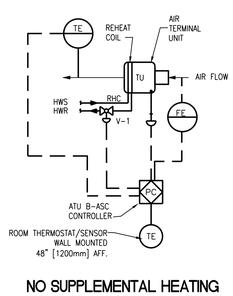
NTS



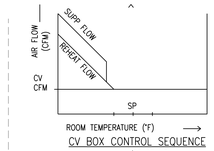
CV BOX CONTROL SEQUENCE

W/DEADBAND

A. SET POINTS SHALL SET AS FOLLOWS:
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HEATING 70° F (ADJ.)
DEADBAND OF 5° F BETWEEN HEATING AND COOLING SET POINT WILL BE MAINTAINED
B. UPON FALL IN SPACE TEMPERATURE BELOW SET POINT VALVE V-1 WILL MODULATE TO MAINTAIN SET POINT ± .5°, THE ADJUSTABLE TOLERANCE OF ± .5° HAS BEEN SELECTED TO PREVENT VALVE HUNTING
C. THE REVERSE SHALL OCCUR ON RISE IN SPACE TEMPERATURE.



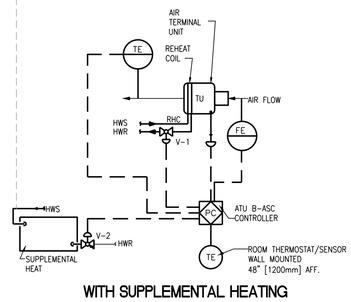
NO SUPPLEMENTAL HEATING



CV BOX CONTROL SEQUENCE

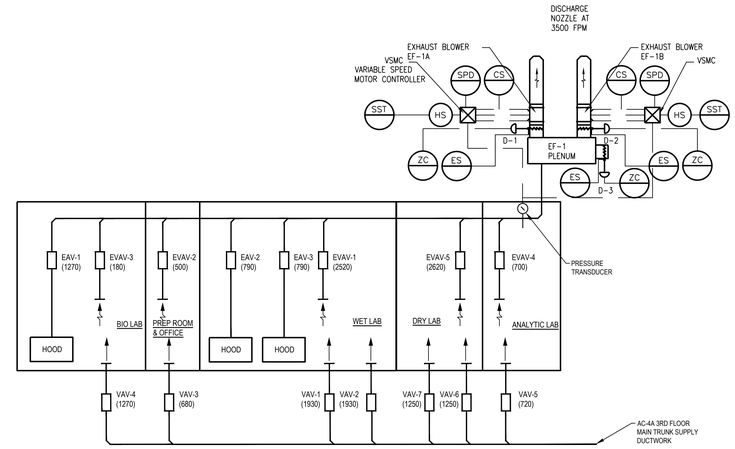
W/DEADBAND

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D. THE REVERSE SHALL OCCUR ON RISE IN SPACE TEMPERATURE.



WITH SUPPLEMENTAL HEATING

CONSTANT VOLUME AIR TERMINAL UNIT CONTROL DIAGRAM



LABs EXHAUST SYSTEM DIAGRAM

NTS

SEQUENCE OF OPERATION

1. LABS FUME HOODS AND GENERAL EXHAUST SYSTEM

FUME HOOD EXHAUST FANS SHALL OPERATE WHEN THE BMS OPERATING SCHEDULE INDICATES THAT THEY SHALL OPERATE. BMS OPERATOR SCHEDULE SHOULD INCLUDE A LEAD/LAG SEQUENCE FOR EACH FAN.

WHEN THE FUME HOOD EXHAUST FAN IS STARTED, ITS ISOLATION DAMPER SHALL OPEN AND UPON CONFIRMATION THAT THE ISOLATION DAMPER HAS OPENED, THE FAN SHALL START.

THE VFD DRIVE FOR EACH FAN SHALL BE CONTROLLED TO MAINTAIN A CONSTANT EXHAUST AIR DUCT STATIC PRESSURE. PROVIDE A STATIC PRESSURE SENSOR AT LOCATION SHOWN ON M-101 DRAWING. THE EXHAUST PLENUM STATIC PRESSURE SETPOINT SHALL BE ESTABLISHED WITH THE AIR BALANCER TO MAINTAIN THE REQUIRED FUME HOOD EXHAUST CFM.

AN ALARM SHALL INDICATE AT THE BMS SHOULD THE EXHAUST DUCT STATIC PRESSURE DROP BELOW THE SETPOINT.

AN AIR VALVE IN THE DUCTWORK FROM EACH FUME HOOD SHALL MAINTAIN AN AIRFLOW AT EACH FUME HOOD AS SHOWN ON THE AIR DIAGRAM ABOVE. THE AIRFLOW TRACKING SYSTEM DESCRIBED BELOW IN PARAGRAPH 3 SHOULD MODULATE SUPPLY AIR TERMINALS TO MAINTAIN A FIXED CFM DIFFERENCE BETWEEN THE SUPPLY AND EXHAUST. THE EXHAUST FAN SHOULD MAINTAIN THE ORIGINAL AIRFLOW AND THE EXHAUST AIR PLENUM STATIC PRESSURE SET POINT SHOULD BE MAINTAINED BY MODULATING THE NORMALLY CLOSED BYPASS DAMPER D3.

2. FIRE ALARM INTERFACE

THE ELECTRICAL CONTRACTOR SHALL PROVIDE A SET OF DRY CONTACTS WHICH SHALL CLOSE WHEN AN ALARM IS INDICATED. THE ATC SUB-CONTRACTOR SHALL WIRE FROM THE DDC SYSTEM TO THE FACP SO THAT AN ALARM SHALL INDICATE AT THE DDC/BMS SYSTEM.

RESTARTING OF FANS FOLLOWING A FIRE ALARM SYSTEM SHUTDOWN SHALL OCCUR VIA A KEY SWITCH AT THE FIRE ALARM PANEL. THE DDC/BMS SYSTEM SHALL PROVIDE A STAGED AND TIME-SEQUENCED RESTART OF ALL HVAC FANS TO PREVENT OVERLOADING OF THE ELECTRICAL SYSTEM FUSES, CIRCUIT BREAKERS AND OTHER PROTECTIVE DEVICES. INTERVALS BETWEEN STARTING OF EACH FAN SHALL BE FULLY ADJUSTABLE.

3. VARIABLE VOLUME AIR TERMINAL BOXES AND AIR VALVES.

BOTH SUPPLY AND EXHAUST AIR VOLUME TERMINALS AND AIR VALVES SHALL PROVIDE PRESSURE-INDEPENDENT CONTROL.

ALL VAV DDC CONTROLLERS SHALL BE PROVIDED UNDER THIS SECTION AND CONNECTED TO BMS SYSTEM COMMUNICATIONS TRUNK OR NETWORK FOR CENTRAL MONITORING AND CONTROL OF SETPOINTS. SETPOINTS AND AIR FLOWS SHALL ALSO BE READ AND ADJUSTED FROM THE PORTABLE OPERATOR'S TERMINAL.

PROVIDE A TRACKING SYSTEM CONTROL LOOP OR PROGRAM TO CONTROL THE EXHAUST AIR TERMINALS TO MAINTAIN A FIXED CFM DIFFERENCE, ADJUSTABLE, BETWEEN SUPPLY AND EXHAUST CFM, EXHAUST CFM BEING GREATER THAN SUPPLY CFM, TO MAINTAIN A NEGATIVE PRESSURE IN THE LABS AND SUPPLY CFM BEING GREATER THAN EXHAUST CFM, TO MAINTAIN A POSITIVE PRESSURE IN THE PREPARATION ROOM AND THE OFFICE. PROGRAM SHALL INITIATE A MAINTENANCE ALARM TO BMS SYSTEM WHEN DIFFERENTIAL CFM IS OUT OF LIMITS AND A SAFETY ALARM TO BAS SYSTEM WHEN NEGATIVE PRESSURE (OR POSITIVE PRESSURE IN POSITIVE PRESSURE ROOMS) IN THE ROOM CANNOT BE MAINTAINED OR WHEN THE REQUIRED ACH AIR FLOW RATE IS NOT BEING MAINTAINED.

3.1 BIO LAB.

AIR VOLUME TERMINAL BOXES VAV-4, EAV-1 AND EVAV-3 SERVING THE BIO LAB SHALL MAINTAIN A FIXED CFM SETPOINT BY SENSING BOX AIRFLOW CROSS SENSOR DIFFERENTIAL PRESSURE AND MODULATING THE BOX DAMPER ACTUATOR VIA A LOCAL DDC CONTROLLER. SETPOINT SHALL BE FULLY ADJUSTABLE FROM THE BAS SYSTEM WITHIN THE CAPACITY LIMITS OF THE BOX. THE TEMPERATURE IN THE BIO LAB SHALL BE MAINTAINED BY A MODULATING HOT WATER CONTROL VALVE ON THE REHEAT COIL OF THE BOX AS DESCRIBED IN THIS DRAWING FOR A CONSTANT VOLUME TERMINAL UNIT CONTROL DIAGRAM WITH NO SUPPLEMENTAL HEAT.

3.2 PREPARATION ROOM AND OFFICE, DRY LAB, ANALYTIC LAB.

SUPPLY AIR VOLUME TERMINALS SHALL MAINTAIN THE TEMPERATURE IN THE ROOMS AS DESCRIBED ON THIS DRAWING FOR VARIABLE VOLUME AIR TERMINAL UNIT CONTROL DIAGRAM WITH NO SUPPLEMENTAL HEAT.

3.3 WET LAB.

SUPPLY AIR VOLUME TERMINALS VAV-1 AND VAV-2 SHALL MAINTAIN THE TEMPERATURE IN THE ROOM AS DESCRIBED ON THIS DRAWING FOR VARIABLE VOLUME AIR TERMINAL UNIT CONTROL DIAGRAM WITH SUPPLEMENTAL HEAT.

AIR VALVES EAV-2 AND EAV-3 SHALL MAINTAIN A FIXED CFM SETPOINT BY SENSING BOX AIRFLOW CROSS SENSOR DIFFERENTIAL PRESSURE AND MODULATING THE BOX DAMPER ACTUATOR VIA A LOCAL DDC CONTROLLER. EXHAUST AIR VOLUME TERMINAL EVAV-1 SHALL MAINTAIN THE NEGATIVE PRESSURE IN THE LAB.

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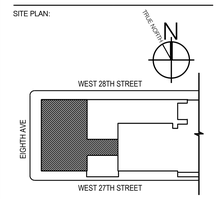
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SHEET TITLE:

CONTROL DIAGRAMS

DOB NOW JOB# M01470747-S1

SHEET NUMBER:

M-801.00

ELECTRICAL - SYMBOLS

	WALL MOUNTED EXIT LIGHT.
	CEILING MOUNTED EXIT LIGHT WITH SELF CONTAINED BATTERY PACK. SHADED AREA INDICATES ILLUMINATED FACE(S). DIRECTIONAL ARROWS ARE INDICATED.
OR	PANELBOARD
	DISTRIBUTION OR POWER PANELBOARD.
	GROUND BAR
C/T	CT CABINET
M	METER (DIRECT / UTILITY)
SM	SUB-METER
CK#	HOMERUN TO DESIGNATED PANELBOARD - NUMERALS INDICATE CIRCUIT NUMBER.
	GROUND CONNECTION
CK# WP GFI	DUPLEX RECEPTACLE. SUBSCRIPT INDICATES: WP - WEATHERPROOF ENCLOSURE GFI - GROUND-FAULT CIRCUIT-INTERRUPTER RECEPTACLE IG - ISOLATED GROUNDING RECEPTACLE 20A - 20 AMP RECEPTACLE HG - HOSPITAL GRADE RECEPTACLE C - AUTOMATICALLY CONTROLLED RECEPTACLE F - FUTURE SWITCHED RECEPTACLES FOR MOTORIZED SHADES # - IDENTIFIES PANELBOARD CIRCUIT NUMBER (TYPICAL FOR ALL RECEPTACLES) USB - USB RECEPTACLE - NEMA 5-15R USB. PASS & SEYMOUR CAT# TM8-USB-CC6 OR EQUIVALENT
	DOUBLE DUPLEX CONVENIENCE RECEPTACLE WALL MOUNTED IN GANG BOX
	HALF-SWITCHED DUPLEX RECEPTACLE.
	NEMA 5-20R, 20A RECEPTACLE (GFCI)
	RECEPTACLE, NEMA 6-50R 208V, 50A COORDINATE WITH MANUFACTURER
	DOUBLE DUPLEX RECEPTACLE
	STUB UP FACE PLATE TO BE MTD. ON MILLWORK FOR RECEPTACLE
	DUPLEX RECEPTACLE GFI
FD / FB / FD	FLOOR MOUNTED DUPLEX / DOUBLE DUPLEX / SIMPLEX RECEPTACLE, 15A, 3 WIRE, 125 VOLT, POKE-THRU SERVICE FITTING, UON.
	SPECIAL PURPOSE OUTLET. (COORDINATE REQUIREMENTS WITH VENDOR FOR EACH EQUIPMENT)
	SIMPLEX RECEPTACLE
CH	NEMA 5-15R RECESSED SIMPLEX CLOCK-HANGAR RECEPTACLE
	SINGLE CEILING MOUNTED CONVENIENCE RECEPTACLE
	DUPLEX CEILING MOUNTED CONVENIENCE RECEPTACLE
	SPECIAL PURPOSE CEILING MOUNTED RECEPTACLE
a,3 b	SINGLE POLE SWITCH, LOWER CASE LETTER INDENTIFIES OUTLET(S) CONTROLLED, UPPER CASE LETTER AND OR NUMERAL INDICATES: 2 - DOUBLE POLE 3 - THREE WAY 4 - FOUR WAY P - WITH PILOT LIGHT H - HORSEPOWER RATED WITH HASP FOR LOCK K - KEY OPERATED D - DIMMER SWITCH T - TIMER SWITCH J - DOOR JAM SWITCH L - LOCKING - WITH HASP FOR LOCK MM - MANUAL MOTOR STARTER SWITCH (LOCKING) TS - THERMAL SWITCH OS - OCCUPANCY SENSOR SWITCH VS - VACANCY SENSOR SWITCH SS - SCENE SELECTOR TC - IN-WALL DIGITAL ASTRONOMICAL TIME-CLOCK WITH 7 DAY PROGRAMMING AND HOLIDAY SCHEDULING. SWITCH SHALL INCLUDE INTEGRAL OVERRIDE CAPABILITIES OV - TIME-CLOCK OVER-RIDE SWITCH
OS	CEILING MOUNTED DUAL TECHNCLOGY OCCUPANCY SENSOR
VS	CEILING MOUNTED DUAL TECHNCLOGY VACANCY SENSOR
PS	CEILING MOUNTED PHOTOSENSOR
WP	3-POLE UNFUSED DISCONNECT (SAFETY) SWITCH. NUMERAL INDICATES AMPACITY, 'WP' DENOTES WEATHERPROOF ENCLOSURE. NO NUMBER INDICATES 30A OR LESS.
WP	3-POLE FUSED DISCONNECT (SAFETY) SWITCH. NUMERAL INDICATES SWITCH AMPACITY/FUSE SIZE, 'WP' DENOTES WEATHERPROOF ENCLOSURE. NO NUMBER INDICATES 30A OR LESS.
WP	3-POLE COMBINATION DISCONNECT & MOTOR STARTER. NUMERAL INDICATES FUSE SIZE, 'WP' DENOTES WEATHERPROOF ENCLOSURE.
WP	3-POLE MOTOR STARTER. NUMERAL INDICATES FUSE SIZE, 'WP' DENOTES WEATHERPROOF ENCLOSURE.
VFD / VFD	VARIABLE FREQUENCY DRIVE
	JUNCTION BOX MOUNTED ON CONDUIT STUBBED UP FROM FLOOR.
	STUB UP FROM FLOOR
	JUNCTION BOX FLOOR MOUNTED FOR POWER CONNECTON TO PREFABRICATED FURNITURE CONNECTON
	EMERGENCY BATTERY PACK LIGHTING FIXTURE WITH TWO HEADS

ELECTRICAL - SYMBOLS

/ T	TRANSFORMER
ELR	EMERGENCY LIGHTING RELAY (ELR). CONTRACTOR TO FURNISH, INSTALL AND WIRE EMERGENCY LIGHTING RELAY, WATTSTOPPER (LEGRAND) CATⅡ ELCU-220 OR EQUAL APPROVED IN WRITING BY ENGINEER. CONTRACTOR TO PROVIDE TEST BUTTON AND BACK-BOX FLUSH-MOUNTED PREFERRABLY 66" AFF. COORDINATE EXACT LOCATION AND HEIGHT OF TEST BUTTON WITH ARCHITECT. RELAY SHALL BE CONFIGURED SO THAT UNDER NORMAL CONDITIONS, LIGHT FIXTURES ARE CONTROLLED BY DIMMER (OR SWITCH) AND SUPPLIED BY NORMAL POWER FROM LOCAL LIGHTING PANEL. UNDER POWER FAILURE OF CIRCUIT, RELAY SHALL PROVISE UN-DIMMED (OR UN-SWITCHED) EMERGENCY POWER FROM EMERGENCY LIGHTING PANEL.
RAN	GENERATOR REMOTE ANNUNCIATOR AND ATS REMOTE CONTROL PANEL
RT	REMOTE LIGHTING TRANSFORMER
FCO	FUSE CUT OUT
FDS	FIRE ALARM FUSED DISCONNECT SWITCH
DCP	FIRE ALARM DATA GATHERING PANEL
FACP	FIRE ALARM CONTROL PANEL
FAA	FIRE ALARM REMOTE ANNUNCIATOR
FSD	FIRE SMOKE DAMPER
HT	HEAT TRACE
M	MOTORIZED SHADE
MD	MOTORIZED DAMPER
BG	BREAK GLASS SWITCH
EPO	EMERGENCY POWER OFF
ES	EMERGENCY STOP
T	THERMOSTAT
J / J / J	CEILING/WALL/FLOOR MOUNTED JUNCTION BOX
SB	SPLICE BOX
PB	PULLBOX
TC	TIME CLOCK
C / R	CONTACTOR / RELAY
LD	LEAK DETECTOR
CP	CONDENSATE PUMP
SV	SOLENOID VALVE
A	CONNECTOR - LETTER DESIGNATES UNIQUE CONNECTION POINT
	PUSHBUTTON
	DOOR CONTACT. SEE LIGHTING PLANS FOR LOCATIONS.

LEGEND

	NEW WORK
	EXISTING
XXXXXXXX	DEMO

TELEPHONE, COMMUNICATION, SECURITY & LOW-VOLTAGE SYMBLOLS

W	TELEPHONE OUTLET. W - FOR WALL TELEPHONE
	TWO DATA PORT OUTLET
	COMBINATION TELEPHONE/DATA OUTLET.
	TELEPHONE OUTLET FLOOR MOUNTED
	COMBINATION TELEPHONE / DATA FLOOR MOUNTED OUTLET
	FLOOR MOUNTED DATA SYSTEM CUTLET
	CEILING MOUNTED DATA SYSTEM OUTLET
TV	TV OUTLET
	NID - NETWORK INTERFACE DEVICE PANEL
SC	SECURITY CAMERA
SPK	PUBLIC ADDRESS SPEAKER - WALL MOUNTED
PA	PUBLIC ADDRESS SPEAKER - CEILING MOUNTED
WA	WIRELESS ACCESS POINT - CEILING MOUNTED

ELECTRICAL ABBREVIATIONS

A	-AMPS	DIA	- DIAMETER	IN	- INCHES	RMS	- ROOT MEAN SQUARE
AC	- ALTERNA"ING CURRENT	DISC	- DISCONNECT	INCAN	- INCANDESCENT	SB	- SPLICE BOX
ACC	- ACCENT	DN	- DOWN	INT	- INTERCOM	SN	- SCLID NEUTRAL
ADJ	- ADJUSTABLE	DP	- DISTRIBUTION PANEL	JB	- JUNCTION BOX	SP	- SPARE
AF	- AMP FUSE (FUSES)	DTL	- DETAIL	KP	- KITCHEN PANEL	SPECS	- SPECIFICATIONS
AF	- AMP FRAME (CKT BKRS)	DWG	- DRAWING	KVA	- KILOVOLT AMPERES	SPKR	- SPEAKER
AFCI	- ARC FAULT INTERRUPT	E	- EXISTING	KW	- KILOWATT	SQ	- SQUARE
AFF	- ABOVE FINISHED FLOOR	EC	- EMPTY CONDUIT	KWH	- KILOWATT HOURS	STBY	- STANDBY / LEGALLY-REQUIRED STANDBY (NEC ART. 701)
AFG	- ABOVE FINISHED GRADE	EL	- ELECTRIC	LP	- LIGHTING PANEL	STD	- STANDARD
AC	- AIR CONDITIONING	ELEC	- ELECTRICAL	LTG	- LIGHTING	SURF	- SURFACE
AIC	- AMP INTERRUPTING CAPACITY	ELEV	- ELEVATOR	M	- MAIN	SW	- SWITCH
AG	- ABOVE GRADE	EM	- ON EMERGENCY CIRCUIT / EMERGENCY	MACH	- MACHINE	SWBD	- SWITCHBOARD
AL	- ALUMINUM	EMR	- ELEVATOR MACHINE ROOM	MCC	- MOTOR CONTROL CENTER	SWGR	- SWITCHGEAR
ALM	- ALARM	EMT	- ELECTRICAL METALLIC TUBING	MCM	- THOUSAND CIRCULAT MILS	SYM	- SYMMETRICAL
AM	- AMMETER	ENCL	- ENCLOSURE	MECH	- MECHANICAL	TB	- TERMINAL BLOCK
ARCH	- ARCHITECTURAL	EP	- EXPLOSION PROOF	MFG	- MANUFACTURED	TEL	- TELEPHONE
AP	- AMP PLUG	EQPMT	- EQUIPMENT	MFR	- MANUFACTURER	TELCO	- TELEPHONE COMPANY
APPROX	- APPROXIMATELY	ER	- EXISTING TO REMAIN	MH	- MAN-HOLE	TV	- TELEVISION
AS	- AMP SWITCH	E / R	- EXISTING TO RELOCATE	MIC	- MICROPHONE	TYP	- TYPICAL
AT	- AMP TRIP	EWC	- ELECTRIC WATER COOLER	MISC	- MISCELLANEOUS	U/G, UG	- UNDER-GROUND
ATS	- AUTOMATIC TRANSFER SWITCH	EXIST	- EXISTING	MTD	- MOUNTED	UC	- UNDER COUNTER
AUTO	- AUTOMATIC	EXT	- EXTERIOR, EXTERNAL	MTR	- MOTOR	UF	- UNFUSED
AWG	- AMERICAN WIRE GAUGE	F@	- FUSED AT	N	- NEUTRAL	UG	- UNDERGROUND
BL	- BLANK	FA	- FIRE ALARM	NEC	- NATIONAL ELECTRIC CODE	U.O.N., UON	- UNLESS OTHERWISE NOTED
BLDG	- BUILDING	FBO	- FURNISHED BY OTHERS	NEMA	- NATIONAL ELECTRICAL MANUFACTURERS	V	- VOLTS
BG	- BELOW GRADE	FCO	- FUSE CUT-OUT	NIC	- NOT IN CONTRACT	VA	- VOLT AMPERE
BPS	- BOLTED PRESSURE SWITCH	FDR	- FEEDER	NM	- NON-METALLIC	VIF	- VERIFY IN FIELD
C	- CONDUIT	FDS	- FUSED DISC. SWITCH (FIRE ALM)	NL	- ON NIGHT LIGHTING CIRCUIT	VM	- VOLTMETER
CAB	- CABINET	FIXT	- FIXTURE	NTS	- NOT TO SCALE	W	- WATTS
CAT	- CATALOGUE	FL	- FLOOR	OCPD	- OVER-CURRENT PROTECTIVE DEVICE	W/	- WITH
CB	- CIRCUIT BREAKER	FLUOR	- FLUORESCENT	OL	- OVERLOAD	W/O	- WITHOUT
CCTV	- CLOSED CIRCUIT TELEVISION	FT	- FEET	OH, OH	- OVER-HEAD	WP	- WEATHERPROOF
CDT	- CONDUIT	G	- GROUND	OPT-STBY	- OPTIONAL STANDBY (NEC ART. 702)	WT	- WIRING TROUGH
CKT	- CIRCUIT	GA	- GAUGE	P	- POLES	XFMR	- TRANSFORMER
CLG	- CEILING	GALV	- GALVANIZED	PB	- PULL BOX	1/C,2/C,3/C	- QTY OF CONDUCTORS
CM	- CIRCULAR MIL	GEN	- GENERATOR	PF	- POWER FACTOR	C/B, BKR	- CIRCUIT BREAKER
COL	- COLUMN	GFI	- GROUND FAULT INTERRUPT	PH	- PHASE	C/C	- CENTER TO CENTER
CONC	- CONCRETE	GND	- GROUND	PNL	- PANEL	C/L	- CENTER LINE
CONST	- CONSTRUCTION	HC	- HUNG CEILING	PP	- POWER PANEL	CT, C/T	- CURRENT TRANSFORMER
CONT	- CONTINUOUS	HH	- HAND-HOLE	PWR	- POWER	CONV/O	- CONVENIENCE OUTLET
CONV	- CONVENIENCE	HP	- HORSEPOWER	PT	- POTENTIAL TRANSFORMER	N/C	- NORMALLY CLOSED
COORD	- COORDINATE	HT	- HEIGHT	R	- RELOCATED	N/O	- NORMALLY OPEN
CT	- CURRENT TRANSFORMER	HTG	- HEATING	RC	- REMOTE CONTROL	PT, P/T	- POTENTIAL TRANSFORMER
CTRL	- CONTROL	HVAC	- HEATING VENTILATING AND AIR CONDITIONING	RCS	- REMOTE CONTROL SWITCH	Ø	- PHASE
CTRLR	- CONTROLLER	HZ	- HERTZ	REC	- RECEPTACLE		
CU	- COPPER	IC	- INTERRUPTING CAPACITY	RGS	- RIGID GALVANIZED STEEL		
DC	- DIRECT CURRENT	IG	- ISOLATED GROUND	RM	- ROOM		

NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2025 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT Science Lab Renovation

Project No. 2449

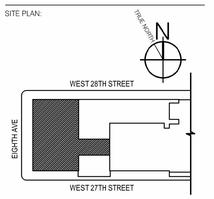
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SITE PLAN:



SUBMITTAL:

100%
Construction Documents

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2026.03.31
	100% CONSTRUCTION DOCUMENT	2026.08.19
	ISSUED FOR DOB FILING	2026.10.21
	100% BID DOCUMENTS	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: IAN CHECKED BY: EGV

SCALE: NTS PROJECT#: 8969.109

SHEET TITLE:

ELECTRICAL SYMBOL ABBREVIATION AND DRAWING LIST

SHEET NUMBER:

E-001.00

GENERAL NOTES

1. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO VISIT AND INSPECT SITE TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS. CONTRACTOR'S INSPECTION SHALL BE CONDUCTED PRIOR TO FINAL BID, AND ANY ADDITIONAL WORK REQUIRED DUE TO FAILURE TO VISIT SITE OR INADEQUATE INSPECTION SHALL NOT BE CONSIDERED FOR COMPENSATION.
2. ELECTRICAL CONTRACTOR TO CAREFULLY STUDY ALL NEW LIGHTING FIXTURES AND COORDINATE WITH LIGHTING MANUFACTURER FOR ANY TRANSFORMERS/DRIVERS (REMOTE/LOCAL), MOUNTING HARDWARE, IN-FEED CONNECTORS, JUNCTION BOXES, JUMPER CABLES, AND WIRING WITHIN MANUFACTURER RECOMMENDED DISTANCE INCLUDING ALL ASSOCIATED CONTROL REQUIREMENTS AND INCLUDE IT IN BID CONTRACT.
3. ELECTRICAL CONTRACTOR SHALL VERIFY ELECTRICAL AND GROUNDING REQUIREMENTS OF ALL NEW AND EXISTING EQUIPMENT TO BE USED. ALL SPECIAL PURPOSE RECEPTACLES INDICATED ON PLAN SHALL BE VERIFIED WITH EQUIPMENT MANUFACTURER TO INSURE PROPER WIRING.
4. CIRCUIT NUMBERS ARE FOR GUIDANCE ONLY. CONTRACTOR SHALL BE RESPONSIBLE TO BALANCE PHASES. REFER TO PANEL SCHEDULES FOR BRANCH CIRCUIT REQUIREMENTS.
5. CIRCUIT WIRE SIZES OTHER THAN 2 #12-3/4"C ARE INDICATED ON PLAN. REFER TO PANEL SCHEDULES FOR BRANCH CIRCUIT BREAKERS OTHER THAN 1 POLE, 20 AMP. ALL CIRCUITS AND FEEDERS SHALL HAVE A FULL SIZE INSULATED GREEN GROUND CONDUCTOR AND BE CONNECTED TO GROUND BUS IN RESPECTIVE PANEL. MINIMUM SIZE CONDUCTOR AND CONDUIT IS #12 THHN CU, 3/4"C (EMT).
6. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING AND PROVIDING THE ACTUAL NUMBER OF CONDUCTORS REQUIRED FOR ALL BRANCH CIRCUIT WIRING TO SERVE THE INTENDED FUNCTION.
7. ALL DEVICE PLATE FINISHES/COLORS SHALL BE AS INDICATED BY ARCHITECT. REFER TO ARCHITECT'S TELECOM AND ELECTRIC PLANS FOR ADDITIONAL ELECTRICAL INFORMATION.
8. FOR EXACT LOCATION AND QUANTITY OF RECEPTACLES, TELEPHONE AND OTHER OUTLETS, REFER TO THE ARCHITECT'S DRAWINGS.
9. MOUNT ALL WALL SWITCHES, DIMMERS, ETC., AT 4'0" A.F.F. TO CENTER LINE OF DEVICES, UON. RECEPTACLES SHALL BE MOUNTED AT 15" A.F.F., UON. REFER TO ARCHITECTURAL PLANS FOR EXACT LOCATION AND MOUNTING HEIGHT.
10. THIS CONTRACTOR IS TO NOTIFY ENGINEER/ARCHITECT OF ANY CONTRADICTIONS FOUND ON THE DESIGN DOCUMENTS AND BASE THE BID ON THE MORE "STRINGENT & EXPENSIVE" CONDITIONS.
11. ELECTRONIC AS-BUILT DRAWINGS, SHOWING CONDUIT RUNS AND CIRCUITING MUST BE GIVEN TO ARCHITECT, ENGINEER AND OWNER AT THE COMPLETION OF THE JOB.
12. THE CONTRACTOR SHALL REMOVE AND/OR RELOCATE ALL EXISTING ELECTRICAL WORK WHICH INTERFERES WITH THE NEW ARCHITECTURAL AND ELECTRICAL LAYOUTS. ALL WORK WHICH IS NO LONGER REQUIRED TO FUNCTION SHALL BE DE-ENERGIZED AND DISCONNECTED AT THE SOURCE OF POWER SUPPLY.
13. PANEL DIRECTORIES SHALL BE MODIFIED AND COMPLETELY FILLED IN AT COMPLETION OF JOB.
14. ANY EXISTING WORK NOT STATED FOR REMOVAL AND DAMAGED AS A RESULT OF PERFORMING THE WORK OF THIS CONTRACT SHALL BE REPAIRED OR REPLACED AS REQUIRED. MATERIAL AND FINISH TO MATCH EXISTING TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE.
15. CONNECT NEW WORK TO EXISTING WORK IN A NEAT AND ACCEPTABLE MANNER.
16. DISPOSE OF REMOVED RACEWAYS, WIRE, PANELS, ETC., AS DIRECTED BY CM & OWNER.
17. ALL ELECTRICAL WORK IN ADJOINING AREAS WHICH IS REQUIRED TO FUNCTION BUT IS AFFECTED BY THIS WORK SHALL BE RECONNECTED AND RESTORED TO ITS PRESENT FUNCTION AS PART OF THE ELECTRICAL SYSTEM OF THE BUILDING(S).
18. ALL RACEWAYS WHICH BECOME EXPOSED BEYOND FINISHED SURFACES BECAUSE OF THE ALTERATION WORK SHALL BE REMOVED AND RE-ROUTED BEHIND THE FINISHED SURFACES.
19. ANY FIRE SAFETY EQUIPMENT AND THIS ASSOCIATED CONDUIT AND WIRING SYSTEM SHALL NOT BE HARMED DURING DEMOLITION AND/OR CONSTRUCTION AND SHALL BE PROTECTED FROM ANY PHYSICAL DAMAGE.
20. ALL NEW VOICE AND DATA WIRING IN CEILING PLENUM SHALL BE TEFLON-COATED OR RUN IN EMT CONDUIT. NEW WALL OUTLETS SHALL RECEIVE 3/4" EMPTY CONDUIT STUB-UP WITH DRAG WIRE AND JUNCTION BOX.
21. EACH COMBINATION DATA/TELEPHONE AND DATA OUTLET SHALL UTILIZE 1" E.M.T. STUBBED UP TO HUNG CEILING FROM JUNCTION BOX.
22. ALL NEW TELEPHONE, ELECTRIC AND DATA OUTLETS TO BE INSTALLED ON AN EXISTING WALL SHOULD BE FLUSH MOUNTED WITH THE FINISHED WALL SURFACE.
23. CONTRACTOR SHALL COORDINATE ALL NEW TELEPHONE CONDUIT RUNS WITH TELECOM COMPANY REPRESENTATIVE BEFORE STARTING WORK.
24. CONTRACTOR TO PROVIDE AN EMPTY CONDUIT SYSTEM AND OUTLET BOXES FOR INSTALLATION OF NEW SECURITY SYSTEM. VERIFY EXACT REQUIREMENTS WITH SECURITY VENDOR.
25. ALL OPEN FLOOR OUTLETS, NOT USED, SHALL BE CAPPED.
26. ALL HOLES IN SLABS OR WALLS SHALL BE FIRE STOPPED VIA LISTED FIRE-STOPPING ASSEMBLIES. SUBMIT TO ENGINEER FOR APPROVAL.
27. PROVIDE A GROUND BUS IN NEW PANELS.
28. CONTRACTOR TO DE-RATE CONDUCTORS IN ACCORDANCE WITH APPLICABLE ELECTRICAL CODES WHEN INSTALLING MORE THAN THREE (3) CIRCUITS IN A 3/4"C HOMERUN AND OTHERWISE REQUIRED.

VOLTAGE DROP REQUIREMENTS

NOTE: FEEDERS ARE SIZED TO MEET 3% MAXIMUM VOLTAGE DROP FROM THE SEB TO THE LAST OCPD. CONTRACTOR MUST PROVIDE FEEDERS AS SIZED HERE AS A MINIMUM. IF CONTRACTOR FEEDER ROUTING INCREASES THEIR LENGTH, OR INCREASES VOLTAGE DROP FOR ANY OTHER REASON, CONTRACTOR SHALL INCREASE FEEDER SIZE AND/OR QUANTITY TO MEET 3% MAXIMUM FEEDER VOLTAGE DROP REQUIREMENTS. THE FEEDER VOLTAGE DROP IS THE SUM OF ALL FEEDER VOLTAGE DROPS FROM THE SERVICE POINT (SEB) TO THE FINAL OVER-CURRENT PROTECTIVE DEVICE OF A CIRCUIT. MAXIMUM BRANCH CIRCUIT VOLTAGE DROP IS 2%. REFER TO ADDITIONAL BRANCH CIRCUIT VOLTAGE DROP REQUIREMENTS IF SHOWN IN DETAIL ON E-500 SERIES DRAWING. ANY CHANGE REQUESTS SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL IN WRITING. CONTRACTOR SHALL MEASURE FEEDER LENGTHS AS FEEDERS ARE INSTALLED AND SUBMIT THIS DATA TO ENGINEER. INCLUDE TABLE OF FEEDER LENGTHS AND TABLE OF CALCULATED BRANCH CIRCUIT VOLTAGE DROPS (AS MAY BE REQUIRED PER E-500 SERIES DETAIL) IN CONTRACTOR'S AS-BUILT DRAWINGS.

DEMOLTION NOTES

1. THE CONTRACTOR SHALL INCLUDE ALL COSTS FOR REMOVALS AND RELOCATIONS IN THE CONTRACT. THESE COSTS SHALL INCLUDE WORK DESCRIBED IN THE SPECIFICATIONS AND SHOWN ON THE ELECTRICAL, ARCHITECTURAL, IT AND MECHANICAL DRAWING WITH ALLOWANCES FOR NORMAL UNFORESEEN DIFFICULTIES WHEN CONCEALED WORK HAS BEEN OPENED. NO CLAIMS FOR ADDITIONAL WORK ASSOCIATED WITH DEMOLITION WILL BE ACCEPTED, EXCEPT IN SPECIFIC CASES CONSIDERED JUSTIFIABLE BY THE ARCHITECT AND ENGINEER.
2. THE CONTRACTOR SHALL REMOVE AND/OR RELOCATE ALL EXISTING ELECTRICAL WORK WHICH INTERFERES WITH THE NEW ARCHITECTURAL AND ELECTRICAL EQUIPMENT LAYOUT. ALL ELECTRICAL CONDUITS, WIRING, OUTLETS, JUNCTION BOXES AND ANY OTHER ELECTRICAL/TELEPHONE WORKS PRESENTLY LOCATED IN THE PARTITIONS SCHEDULED FOR DEMOLITION SHALL BE DISCONNECTED AND REMOVED BACK TO THE SOURCE(S). ALL WORK WHICH IS NO LONGER REQUIRED TO FUNCTION SHALL BE DE-ENERGIZED AND DISCONNECTED AT THE SOURCE OF POWER SUPPLY PRIOR TO REMOVAL.
3. IN AREAS DESIGNATED FOR DEMOLITION BY THE ARCHITECTURAL DRAWINGS, IT IS THE INTENT OF THIS CONTRACT THAT THE CONTRACTOR SHALL DISCONNECT AND REMOVE ALL EXISTING ELECTRICAL, TELECOMMUNICATION, SECURITY AND AUDIO/VISUAL EQUIPMENT INCLUDING: POWER AND LIGHTING PANELBOARDS (WHERE INDICATED) AND ASSOCIATED FEEDERS, TRANSFORMERS, PULLBOXES, LIGHT FIXTURES, FLOOR RECEPTACLES, POWER AND TEL./DATA DOGHOUSE OUTLETS, WALL MOUNTED RECEPTACLES, TELEPHONE/DATA OUTLETS, CONTROL DEVICES AND LIGHT SWITCHES, POWER OUTLETS, BOXES, WIRING, RACEWAYS, CONDUITS AND CABLE TRAYS, AND ALL OTHER EQUIPMENT UNLESS OTHERWISE NOTED. WHICH IS MOUNTED ON WALLS OR PARTITIONS THAT WILL BE TAKEN OUT. REMOVE BRANCH CIRCUITRY BACK TO NEAREST DEVICE SCHEDULED TO REMAIN AND SAFETY TERMINATE ALL CONNECTIONS -- MAINTAIN CONTINUITY OF ALL EXISTING FEEDERS AND BRANCH CIRCUITRY TO EXISTING AREAS NOT BEING AFFECTED BY THIS DEMOLITION-ALL WORK TO BE DONE IN AN APPROVED MANNER.
4. ALL ELECTRICAL WORK IN ADJOINING AREAS OR FLOORS WHICH IS REQUIRED TO FUNCTION BUT IS AFFECTED BY DEMOLITION WORK SHALL BE RECONNECTED AND RESTORED TO ITS PRESENT FUNCTION AS PART OF THE ELECTRICAL SYSTEM OF THE BUILDING(S).
5. ALL PRESENT ELECTRICAL MATERIAL AND EQUIPMENT WHICH ARE TO BE REMOVED UNDER THIS CONTRACT SHALL BE REMOVED BY THE ELECTRICAL CONTRACTOR AND SHALL BECOME THE PROPERTY OF BUILDING MANAGEMENT, U.O.N. ALL ELECTRICAL EQUIPMENT TO BE REMOVED SHALL BE DISPOSE BY THE CONTRACTOR. THE BUILDING MANAGEMENT SHALL INSTRUCT THE CONTRACTOR WHICH EQUIPMENT SHALL BE DELIVERED BY THE CONTRACTOR TO THE MANAGEMENT AND STORE AS DIRECTED.
6. ALL RACEWAYS WHICH BECOME EXPOSED BEYOND FINISHED SURFACES BECAUSE OF THE ALTERATION WORK SHALL BE REMOVED AND REROUTED BEHIND THE FINISHED SURFACES, U.O.N. ALL REROUTED FEEDER/BRANCH CIRCUITRY SHALL BE PROVIDED WITH NEW FEEDER/ BRANCH CIRCUITRY EXTENSIONS, PULL BOXES, ETC.. WHERE REQUIRED. NEW FEEDER EXTENSIONS SHALL MATCH EXISTING ONES IN ALL RESPECTS, CONDUCTOR CAPACITY, CONDUIT SIZE, ETC
7. PORTIONS OF FEEDER LINES THAT HAVE TO BE REMOVED OR ABANDONED AS A RESULT OF DEMOLITION WORK BUT ARE REQUIRED TO CONTINUE TO FUNCTION SHALL BE CUT AT CONVENIENT LOCATIONS, REROUTED AND RECONNECTED FOR CONTINUATION OF THEIR PRESENT FUNCTION. NEW FEEDER EXTENSIONS SHALL MATCH EXISTING ONES IN ALL RESPECTS, CONDUCTOR CAPACITY, CONDUITS SIZE, ETC.
8. DISPOSE OF REMOVED RACEWAYS, WIRES, PANELS, ETC., AS DIRECTED BY BUILDING MANAGEMENT.
9. ALL UNUSED WIRES SHALL BE REMOVED WHERE DEMOLITION IS TO TAKE PLACE IN THE AREA OF THE BUILDING.
10. ANY DAMAGE TO EXISTING PARTITIONS, FLOORS, CEILINGS OR ANY PART OF THE BUILDING OR EQUIPMENT CAUSED BY THE WORK OF THIS CONTRACT SHALL NOT BE ADDITIONAL EXPENSE TO OWNER.
11. REMOVE ALL ABANDONED ELECTRICAL EQUIPMENT, PANELS, CONDUITS, WIRING, JUNCTION AND PULL BOXES, SUPPORTS, ETC., UNLESS OTHERWISE NOTED.
12. ALL HOLES IN SLABS OR WALLS SHALL BE SEALED WITH APPROVED FIRE RATED MATERIALS, FIRE STOPPED WITH UL LISTED FIRE STOPPING MATERIALS.
13. DISCONNECT LOAD AND LINE END OF CONDUCTORS FEEDING EXISTING EQUIPMENT TO BE RELOCATED OR REMOVED.
14. REMOVE CONDUCTORS FROM EXISTING RACEWAYS TO BE REWIRED.
15. CAP ABANDONED OUTLETS AND RACEWAYS. NO ABANDONED WIRING IS ALLOWED, ALL WIRING INCLUDING LOW TENSION WIRING SHALL BE REMOVED BACK TO SOURCE UNLESS OTHERWISE FIELD DIRECTED BY BUILDING MANAGEMENT.
16. DISCONNECT ALL OBSOLETE FLOOR BOXES AND WIRING BACK TO SOURCE.
17. ALL PORTIONS OF FEEDERS THAT REQUIRE RELOCATION IN THE CORE AREA SHALL BE LOCATED PER BUILDING MANAGEMENT DIRECTIONS. NO RELOCATION SHALL BE DONE WITHOUT PRIOR APPROVAL FROM THE BUILDING MANAGEMENT.
18. ALL EXISTING DEVICES AND COMPONENTS THAT ARE NOT IN ACCORDANCE WITH APPLICABLE CODES SHALL BE REPLACED.
19. COORDINATE WITH MECHANICAL AND PLUMBING CONTRACTORS FOR THE SCOPE OF WORK. REFER TO CORRESPONDING HVAC AND PLUMBING DEMO DRAWINGS.
20. THE DEMOLITION NOTES AND DRAWINGS ARE DIAGRAMMATIC DESCRIPTION OF THE REMOVAL AND RELOCATION SCOPE OF WORK. THE CONTRACTOR, BY SITE INVESTIGATION, SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT SCOPE OF THE WORK INVOLVED, PRIOR TO SUBMITTING HIS BID. COORDINATE WITH ARCHITECT AND BUILDING MANAGEMENT BEFORE ANY WORK.
21. WHERE DEMOLITION IS TO TAKE PLACE IN THE AREA OF THE BUILDING, FIRE SAFETY EQUIPMENT SUCH AS ALARMS, SPEAKERS, SMOKE DETECTORS, FLOOR WARDEN STATIONS, ETC., BUILDING MANAGEMENT MUST BE NOTIFIED FIVE (5) WORKING DAYS PRIOR TO THE START OF DEMOLITION SO THE EQUIPMENT MAY BE PROTECTED OR REMOVED. PROTECTION OF DEVICES AND EQUIPMENT IS THE RESPONSIBILITY OF CONTRACTOR, U.O.N.
22. THIS FLOOR MUST REMAIN IN A STATE OF SAFE CONDITIONS WITH REGARD TO FIRE SAFETY FOR PERSONNEL WORKING ON THE FLOOR. ALL FIRE STAIRS, ALARMS, SPEAKERS, ETC., MUST REMAIN ACCESSIBLE AND OPERABLE AT ALL TIMES
23. REFER TO ARCHITECTURAL DEMOLITION NOTES FOR ADDITIONAL INFORMATION.
24. ALL ELECTRIC POWER MUST BE DISCONNECTED BEFORE STARTING DEMOLITION. TEMPORARY LIGHTING FOR ALL TRADES MUST BE INSTALLED.
25. ELECTRICAL CONTRACTOR SHALL COORDINATE HIS WORK WITH OTHER TRADES AND CONFER WITH THE ARCHITECT.
26. WHEN REMOVING WALL MOUNTED RECEPTACLES WITH CONDUIT IN FLOORS OR WALLS, ALL CONDUITS IS TO BE REMOVED (CHOPPING AND PATCHING OF CONCRETE FLOOR INCLUDED) AND WIRE IS TO BE PULLED BACK TO THE TRENCH HEADER DUCT AND CAPPED. IF SEPARATE CIRCUIT WIRE IS TO BE PULLED BACK TO PANEL BOX AND REMOVE FROM BREAKER.
27. THE BUILDING FIRE ALARM SYSTEM INTEGRITY SHALL BE MAINTAINED AT ALL TIMES (BEFORE, DURING AND AFTER DEMOLITION AND/OR CONSTRUCTION). ALL FIRE ALARM DEVICES SHALL REMAIN IN PLACE DURING ALL PHASES OF DEMOLITION AND CONSTRUCTION. TEMPORARILY, SUPPORT ALL DEVICES LOCATED ON WALLS OR CEILINGS TO BE DEMOLISHED. IF THE EXISTING SYSTEM IS FOUND TO BE INOPERABLE, PROVIDE A TEMPORARY SYSTEM DURING CONSTRUCTION IF REQUIRED. PROVIDE A FIRE WATCH IF REQUIRED BY LOCAL OFFICIALS.
28. PROVIDE TEMPORARY LIGHTING AND POWER FOR ALL TRADES DURING DEMOLITION AND CONSTRUCTION -- WHEN USING TEMPORARY LIGHTING, THE CONTRACTOR SHALL CLEARLY LABEL PANELS AND BREAKERS USED FOR LIGHTING. LOCATION OF PANELS TO BE SHOWN ON FLOOR PLAN POSTED AT ENTRANCE TO WORK AREA. PROPER TEMPORARY LIGHTING AND POWER MUST BE INSTALLED AND MAINTAINED IN ALL WORK AREAS. TEMPORARY LIGHT AND POWER STRINGERS SHALL UTILIZE C-TAP TERMINATIONS, LAMPHOLDERS SHALL HAVE LEFT HANDED SCREW SHELL LAMP HOLDERS AND NON-METALLIC LAMP GUARDS. CONNECTIONS TO EXISTING STAIRWELL AND EXIT LIGHT SYSTEMS ARE NOT PERMITTED.
29. ELECTRIC PANELS' COVERS ARE NOT TO BE LEFT OFF AT ANY TIME, UNLESS MEN ARE WORKING ON SAME. COVERS SHALL BE REPLACED EACH NIGHT BEFORE LEAVING JOB SITE.
30. BRANCH CIRCUITRY AND CONTROL WIRING FOR MECHANICAL EQUIPMENT AND DEVICES TO BE REMOVED SHALL BE DISCONNECTED AND REMOVED -- COORDINATE WITH MECHANICAL CONTRACTOR THESE REMOVALS. RELOCATE ANY CONTROL DEVICES TO TEMPORARY LOCATIONS IF REQUIRED. FOR EXISTING A/C UNITS TO BE REMOVED, DISCONNECT AND REMOVE STARTERS, DISCONNECT SWITCHES, JUNCTION BOXES, POWER AND CONTROL WIRING BACK TO SOURCE. CONTINUITY SHALL BE MAINTAINED ON ALL ELECTRICAL CIRCUITS FEEDING POWER TO A/C UNITS OR MECHANICAL EQUIPMENT NOT BEING REMOVED.
31. ALL ELECTRICAL DEVICES REMOVED AND TO BE REINSTALLED SHALL BE CLEANED. ALL OTHER DEVICES THAT ARE REMOVED AND MADE SURPLUS SHALL BE REMOVED FROM THE SITE. CONTRACTOR MUST OBTAIN OWNER'S APPROVAL FOR DISPOSITION. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR PROPER DISPOSAL OF ALL ELECTRICAL EQUIPMENT NOT DEEMED SALVAGEABLE BY OWNER.
32. THE CONTRACTOR SHALL MAINTAIN CONTINUITY OF SERVICE ON ALL CIRCUITS AFFECTED BY THIS DEMOLITION. WHENEVER IT IS REQUIRED THAT AN EXISTING CIRCUIT BE REVISED, DISCONNECTED OR REMOVED, IT SHALL BE UNDERSTOOD THAT THE CIRCUIT SHALL BE RECONNECTED AND SERVICE REESTABLISHED IN THE REMAINING PORTION OF THE CIRCUIT AFFECTED BY THIS ALTERATION.
33. IN CONNECTION WITH THE ALTERATIONS TO THE EXISTING BUILDING, THERE WILL BE CERTAIN REMOVALS AND RELOCATIONS OF THE EXISTING ELECTRICAL WORK NECESSARY FOR THE SATISFACTORY PERFORMANCE OF THE GENERAL WORK. THESE CHANGES CANNOT BE COMPLETELY DETAILED ON THE DRAWINGS, BUT SHOULD BE TAKEN INTO CONSIDERATION BY THE CONTRACTOR IN PREPARING THIS PROPOSAL FOR THIS WORK.
34. DURING DEMOLITION PROCEDURES, PROVIDE ALL NECESSARY PROTECTION FOR EXISTING ELECTRICAL WORK REQUIRED FOR REUSE.
35. ALL POWER WIRING IN AREAS TO BE DEMOLISHED SHALL BE THOROUGHLY TRACED OUT TO DETERMINE THE DEVICES BEING FED FROM IT. ALL OBSOLETE WIRING AND CONDUIT SHALL BE REMOVED BACK TO THEIR RESPECTIVE PANELS UPON COMPLETION OF DEMOLITION, AN ACCURATE COUNT OF ALL SPARE CIRCUITS IN ALL PANELS SHALL BE MADE BY THE CONTRACTOR AND FURNISHED TO THE ARCHITECT AND ELECTRICAL ENGINEER. INFORMATION SHALL INCLUDE PANEL NAME, PANEL LOCATION, NUMBER OF SPARE CIRCUIT BREAKERS OF EACH SIZE AND TYPE. NUMBER OF EMPTY SPACES FOR FUTURE BREAKERS IN EACH PANEL.
36. ALL DEMOLISHING WORK, WHICH CREATES DISTURBING NOISE, SHALL BE PERFORM AS PER OWNER'S INSTRUCTIONS. THE REMOVAL OF DEBRIS AND EQUIPMENT MUST BE ARRANGED TO AVOID ANY INCONVENIENCE TO OWNER.
37. ALL FLOOR CELLS MUST BE COMPLETELY CLEANED OUT AS A PART OF DEMOLITION. ALL FLOOR MONUMENTS SHALL BE REMOVED AND ALL UNUSED OPENING SHALL BE SEALED WITH MANUFACTURED BLANK OFF PLATES. PENETRATIONS SHALL BE PATCHED AND FLASHED WITH CONCRETE SO THAT THEY ARE FLUSH WITH SURROUNDING FLOOR AREAS.

LIGHTING & DRIVER NOTES

SEE LIGHTING FIXTURE SCHEDULES AND DETAILS ON DRAWINGS E-000 AND E-500 SERIES DRAWINGS.

1. FOR EXACT LOCATION AND MOUNTING HEIGHTS OF ALL LIGHTING FIXTURES, SWITCHES AND JUNCTION BOXES SEE ARCHITECTURAL, FURNITURE AND LIGHTING DRAWINGS.
2. CIRCUITS ARE DESIGNATED BY THE NUMBER SHOWN ADJACENT TO EACH LIGHTING FIXTURE OR JUNCTION BOX. WIRING IS SHOWN ONLY UNDER SPECIAL CIRCUMSTANCES. PROVIDE ALL CONDUIT, WIRE AND BOXES AS WELL AS CEILING OUTLETS AND WHIPS REQUIRED TO ENERGIZE LIGHTING FIXTURES AS SHOWN.
3. LIGHTING FIXTURES DESIGNATED AS EMERGENCY, "NIGHT LIGHT" AND EXIT LIGHTS SHALL BE UN-SWITCHED, UON.
4. FOR LIGHTING FIXTURE SPECIFICATIONS REFER TO ARCHITECTURAL & LIGHTING CONSULTANT LIGHTING FIXTURE SCHEDULES, CUT-SHEETS.
5. FOR ADDITIONAL LIGHTING REQUIREMENTS SEE ARCHITECTURAL, LIGHTING, TECHNOLOGY, LIGHTING CONTROLS, AND EQUIPMENT MANUFACTURER'S DOCUMENTATION.
6. DRIVERS SHALL BE USED FOR LED LIGHTING.
7. OCCUPANCY, VACANCY AND DAYLIGHT SENSOR LOCATIONS AND QUANTITIES SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC. CONTRACTOR SHALL PROVIDE SENSORS AS REQUIRED TO MEET ALL CODE REQUIREMENTS AND AS PER THE SEQUENCE OF OPERATIONS IN THE CONTROLS NARRATIVE.

LIGHT FIXTURES AND CONTROLS

IN ADDITION TO THE WORK SHOWN IN THESE ELECTRICAL DRAWINGS, THE ELECTRICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE, FURNISH AND INSTALL ALL WORK, LABOR, MATERIALS, FIXTURES, HARDWARE, CABLING AND OTHER COMPONENTS AS SHOWN ON THE ARCHITECTURAL LIGHTING DRAWINGS, INCLUDING ALL LIGHT FIXTURES. SEE ARCHITECTURAL LIGHTING DRAWINGS FOR THESE REQUIREMENTS AND WORK. ELECTRICAL CONTRACTOR IS ALSO RESPONSIBLE TO PROVIDE, FURNISH AND INSTALL ALL CONDUIT, RACEWAY, BACKBOXES AND ASSOCIATED LABOR, HARDWARE AND MATERIALS NECESSARY FOR THE INSTALLATION OF SAME, AND FOR THE INSTALLATION OF DIMMING & OTHER LIGHTING CONTROLS. REFER TO THE ELECTRICAL SPECIFICATIONS AND DRAWINGS OF OTHER TRADES FOR ADDITIONAL WORK, SUCH AS RELATED TO MECHANICAL, PLUMBING AND FIRE ALARM SYSTEMS, AND NOTES REGARDING SEPARATION OF TRADES.

LIGHTING CONTROL SUBMISSION NOTE

1. AS A PART OF THE WORK OF THIS CONTRACT, THE ELECTRICAL CONTRACTOR, IN CONSENT WITH THE SELECTED LIGHTING CONTROL VENDOR, SHALL PREPARE A DETAILED PLAN AND APPLICABLE DETAILS SHOWING ALL CONTROL DEVICES, SWITCHES, RELAY AND RELATED EQUIPMENT TO SATISFY THE LIGHTING CONTROL REQUIREMENTS OF THE PROJECT MATRIX SHOWN ON THE 'COMCHECK' PLAN.
2. OCCUPANCY, VACANCY AND DAYLIGHT SENSOR LOCATIONS AND QUANTITIES SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC. CONTRACTOR SHALL PROVIDE SENSORS AS REQUIRED TO MEET ALL CODE REQUIREMENTS AND AS PER THE SEQUENCE OF OPERATIONS IN THE CONTROLS NARRATIVE.
3. THIS SHALL BE SUBMITTED AS A PROJECT SHOP DRAWING FOR REVIEW BY THIS ENGINEER.
4. IN AREAS OF HUNG CEILLINGS, THE LOW VOLTAGE CONTROL WIRING MAY BE RUN WITHOUT A RACEWAY, HOWEVER, PLENUM RATED CABLE IS REQUIRED FOR THIS APPLICATION.
5. PROVIDE ALL DAYLIGHT CONTROL FUNCTIONALITY AND INSTALLATION AS REQUIRED BY 2020 NYCECC.
6. PROVIDE ALL LIGHTING CONTROL FUNCTIONALITY AND INSTALLATION AS REQUIRED BY 2020 NYCECC. FOR LEGEND OF LIGHTING CONTROL DEVICES REFER TO LIGHTING CONTROL NARRATIVE ON EN DRAWINGS.

LIGHT FIXTURES AND CONTROLS

IN ADDITION TO THE WORK SHOWN IN THESE ELECTRICAL DRAWINGS, THE ELECTRICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE, FURNISH AND INSTALL ALL WORK, LABOR, MATERIALS, FIXTURES, HARDWARE, CABLING AND OTHER COMPONENTS AS SHOWN ON THE ARCHITECTURAL LIGHTING DRAWINGS, INCLUDING ALL LIGHT FIXTURES. SEE ARCHITECTURAL LIGHTING DRAWINGS FOR THESE REQUIREMENTS AND WORK. ELECTRICAL CONTRACTOR IS ALSO RESPONSIBLE TO PROVIDE, FURNISH AND INSTALL ALL CONDUIT, RACEWAY, BACKBOXES AND ASSOCIATED LABOR, HARDWARE AND MATERIALS NECESSARY FOR THE INSTALLATION OF SAME, AND FOR THE INSTALLATION OF DIMMING & OTHER LIGHTING CONTROLS. REFER TO THE ELECTRICAL SPECIFICATIONS AND DRAWINGS OF OTHER TRADES FOR ADDITIONAL WORK, SUCH AS RELATED TO MECHANICAL, PLUMBING AND FIRE ALARM SYSTEMS, AND NOTES REGARDING SEPARATION OF TRADES. ANY LATER CLAIMS MADE WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS REQUIRED DUE TO LACK OF SHOP DRAWINGS OR COORDINATION WITH LIGHTING MANUFACTURER AND FACTORY AUTHORIZED REPRESENTATIVE.

IF GC INSTALLS ANY UNDIMENSIONED DEVICES WITHOUT ARCHITECT'S APPROVAL, THEY WILL BEAR COST OF RELOCATING THOSE DEVICES.

USE OF MC CABLES IS NOT ALLOWED IN ELECTRICAL AND MECHANICAL ROOMS. ALL BRANCH CIRCUIT WIRING SHALL BE ROUTED IN EMT CONDUIT FROM PANELBOARDS TO A PULLBOX OUTSIDE OF THE ELECTRICAL ROOM AND FROM ELECTRICAL CLOSET TO THE MECHANICAL ROOM

POWER NOTES

1. FOR EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER, TEL/DATA OUTLETS AND MECHANICAL EQUIPMENTS COORDINATE WITH ALL TRADES AND ARCHITECTURAL DRAWINGS.
2. ALL BRANCH CIRCUIT WIRING SHALL BE RUN CONCEALED IN WALLS AND ABOVE HUNG CEILING. UNLESS OTHERWISE NOTED.
3. No. 12 AWG (THHN) SHALL BE THE MINIMUM SIZE AND SHALL BE USED FOR ALL 15A & 20A BRANCH CIRCUIT WIRING, UNLESS OTHERWISE NOTED. CONTRACTOR SHALL ADJUST SIZE FOR VOLTAGE DROP AND OTHER DE-RATING FACTORS AS PER CODE REQUIREMENTS.
4. 3/4" CONDUIT SHALL BE THE MINIMUM TRADE SIZE OF CONDUIT.
5. CIRCUITS ARE DESIGNATED BY THE NUMBER SHOWN ADJACENT TO EACH RECEPTACLE, ETC. WIRING IS SHOWN ONLY FOR UNDER SPECIAL CIRCUMSTANCES. PROVIDE CONDUITS, WIRES, ARMORED CABLES AND BOXES REQUIRED TO ENERGIZE THE EQUIPMENT AS SHOWN.
6. ALL COMMUNICATIONS, SECURITY WORKS ARE A SEPARATE CONTRACT, UON. EC TO PROVIDE ALL CONDUIT, RACEWAY, BACK-BOXES.
7. FOR ADDITIONAL NOTES REFER TO ARCHITECTURAL DRAWINGS.
8. CONDUIT RUNS THAT ARE SHOWN ARE DIAGRAMMATICAL AND SHOW POTENTIAL ROUTING OF CONDUITS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE RUNS WITH ALL TRADES.

MECH./PLUMBING EQUIP. NOTES

1. INTENT OF DRAWING IS TO SHOW LAYOUT OF MECHANICAL/PLUMBING EQUIPMENT AND RESPECTIVE ELECTRICAL CONNECTIONS WITH ASSOCIATED DEVICES. FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF ALL MECHANICAL/PLUMBING EQUIPMENT AND RESPECTIVE CONTROLS REFER TO MECHANICAL/PLUMBING DRAWINGS. USE THIS DRAWING FOR CIRCUITING PURPOSES ONLY.
2. CONSTRUCTION MANAGER (CM) SHALL DETERMINE WHICH CONTRACTOR'S SCOPE IT IS TO PROVIDE DISCONNECT SWITCHES AND/OR CONTROL PANELS FOR MECHANICAL/PLUMBING EQUIPMENT. COORDINATE WITH CM PRIOR TO INCLUDING COSTS FOR SAME IN BID. DISCONNECT SWITCHES AND CONTROL PANELS SHALL BE INSTALLED INSTALLED/WIRED BY ELECTRICAL CONTRACTOR U.O.N. COORDINATE WITH MECHANICAL/PLUMBING CONTRACTORS FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR TO INSTALL & WIRE THERMOSTATS AND ASSOCIATED BACKBOXES FOR ALL EQUIPMENT INCLUDING INDIVIDUAL HEATPUMPS. THERMOSTATS PROVIDED BY MECHANICAL CONTRACTOR. REFER TO MECHANICAL SCHEDULES & SPECS FOR A LIST OF EQUIPMENT AND ASSOCIATED THERMOSTATS. COORDINATE LOCATION OF ALL THERMOSTATS WITH ARCHITECT.

ELECTRICAL CONTRACTOR NOTE: IT, SECURITY, AND AV

AS PART OF THE WORK OF THIS CONTRACT, THE ELECTRICAL CONTRACTOR SHALL INCLUDE THE COST OF ALL JUNCTION BOXES, CONDUIT RUNS, PULL CORDS, POWER SUPPLIES, RACEWAYS, BACKBOXES AND EMPTY CONDUIT SYSTEMS SHOWN ON THE IT/AV CONSULTANTS DOCUMENTS FOR IT, SECURITY AND A/V AND OTHER CONSULTANTS DRAWINGS TO FACILITATE THE LOW VOLTAGE SYSTEMS INSTALLATION AND BE INCLUDED IN THE ELECTRICAL CONTRACTORS BID FORM FOR THIS WORK.

ALL EQUIPMENT AND RELATED INSTALLATION OF THOSE SYSTEMS ARE NOT TO BE INCLUDED IN THE ELECTRICAL CONTRACTORS BID PROPOSAL.

REFER TO ELEVATIONS ON ARCHITECTURAL AND AV DRAWINGS PRIOR TO INSTALLATION. ANY LATER CLAIMS MADE WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS REQUIRED DUE TO LACK OF SHOP DRAWINGS OR COORDINATION WITH THE IT, AV AND SECURITY CONSULTANTS PRIOR TO INSTALLATION.

ELECTRICAL CONTRACTOR SHALL CAREFULLY REVIEW IT, AV AND SECURITY SYSTEM DRAWINGS AND SPECIFICATIONS TO INCLUDE ALL NECESSARY SCOPE IN BID PRICE REGARDLESS OF WHETHER OR NOT THESE MATTERS ARE REFLECTED ON ELECTRICAL DRAWINGS. ALL IT, AV AND SECURITY LOW VOLTAGE WIRING SHALL BE FURNISHED AND INSTALLED BY THE RESPECTIVE LOW VOLTAGE VENDOR. THIS CONTRACTOR SHALL PROVIDE ALL RACEWAYS AND POWER OUTLETS.

TELEPHONE, COMMUNICATION, SECURITY & OTHER LOW-VOLTAGE SYSTEM NOTES:

1. PROVIDE TELEPHONE, COMMUNICATION, SECURITY AND OTHER LOW-VOLTAGE EQUIPMENT BACK-BOXES & EMPTY CONDUIT SYSTEMS FOR LOW-VOLTAGE WIRING AND CABLING. (UON, WIRING & CABLING IS UNDER SEPARATE CONTRACT.) LOCATION AND SIZE OF CONDUIT SHALL BE AS SPECIFIED ON THE DRAWINGS OR AS REQUIRED. THE MANNER OF INSTALLING CONDUIT SHALL BE THE SAME AS SPECIFIED HEREIN FOR LIGHT AND POWER WIRING SYSTEM AND IN ACCORDANCE WITH THE REQUIREMENTS OF THE TELECOM COMPANY AND OTHER COMMUNICATION SYSTEMS VENDORS.
2. THE TELEPHONE COMMUNICATION, SECURITY AND OTHER LOW-VOLTAGE SYSTEMS SHALL CONSIST OF EMPTY RACEWAYS, JUNCTION BOXES, PULL BOXES, ETC., LEFT IN READINESS FOR WIRING TO BE PROVIDED UNDER SEPARATE CONTRACT, UON. PROVIDE DRAG LINE IN ALL EMPTY CONDUITS.
3. ALL TELEPHONE/DATA/SECURITY/LOW VOLTAGE INSTALLATIONS SHALL BE COORDINATED WITH THE RESPECTIVE VENDORS.
4. CONDUITS & BOXES SHALL BE AS SPECIFIED IN ELECTRICAL SPECIFICATIONS. RACEWAYS SHALL HAVE NO MORE THAN THE EQUIVALENT OF TWO 90 DEGREE BENDS WITHOUT INTERMEDIATE PULL BOXES OR ACCESS POINTS.
5. REFER TO ARCHITECTURAL, TELECOM, INFORMATION TECHNOLOGY, SECURITY AND OTHER DRAWINGS FOR ADDITIONAL REQUIREMENTS.

ALL FIRE ALARM CIRCUITS AND LOW VOLTAGE WIRING SHALL BE RUN IN EMT CONDUIT IN EXPOSED CEILING AREAS

ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF BUILDING STANDARDS AND PROCEDURE FOR TENANT CONSTRUCTION AND ALTERATIONS.

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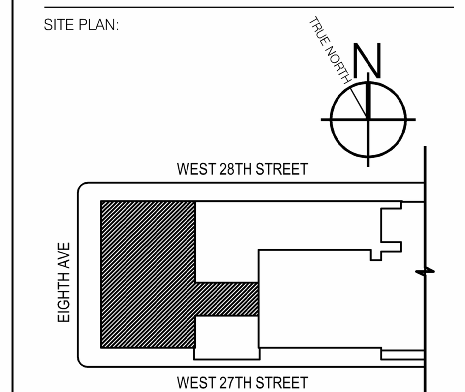
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DRAWN BY: IAN CHECKED BY: CTD

SCALE: NTS PROJECT#: 8969.109

SHEET TITLE: ELECTRICAL NOTES

SHEET NUMBER: **E-002.00**



KEY NOTES:

1. EXISTING PANELBOARD AP-A3B. THIS PANELBOARD MUST BE RELOCATED AND REPLACE WITH NEW TO THE NEW ELECTRICAL ROOM. THE EXISTING LINE-SIDE FEEDERS (CDT AND WIRING) MUST BE SPLICED AND EXTENDED TO NEW LOCATION. CONTRACTOR MUST CIRCUIT TRACE ALL BRANCH CIRCUITS FED BY THIS PANELBOARD TO DETERMINE WHICH CIRCUITS FEED EQUIPMENT IN AREAS OUTSIDE THE AREA OF WORK. REFER TO DRAWING E-201FOR ADDITIONAL INFORMATION.
2. AREA OF WORK. ALL EXISTING LA3 EQUIPMENT FROM THE 8TH FLOOR SHALL BE RELOCATED TO THESE ROOMS. ALL RECEPTACLES, LIGHTING, AND SWITCHES LOCATED ON WALLS TO BE DEMOLISHED SHALL BE REMOVED, INCLUDING WIRING AND CONDUIT / CABLING, BACK TO SOURCE.
3. IN CORRIDOR A301 ALL EMERGENCY HEADS, LIGHTING FIXTURES, AND KEY SWITCHES LOCATED ON WALLS TO BE DEMOLISHED SHALL BE REMOVED, INCLUDING WIRING AND CONDUIT / CABLING, BACK TO SOURCE.
4. IN CORRIDOR A308 ALL LIGHTING FIXTURES TO BE DEMOLISHED. PROTECT AND PRESERVE EXISTING LIGHTING CIRCUITS, EXIT SIGNS CIRCUITS, EMERGENCY LIGHTS AND KEY SWITCHES LOCATED ON WALLS FOR THE NEW WORK.

1 3RD FLOOR PLAN
1/8"=1'-0"

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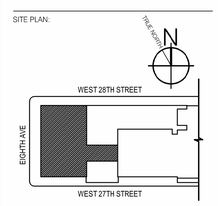
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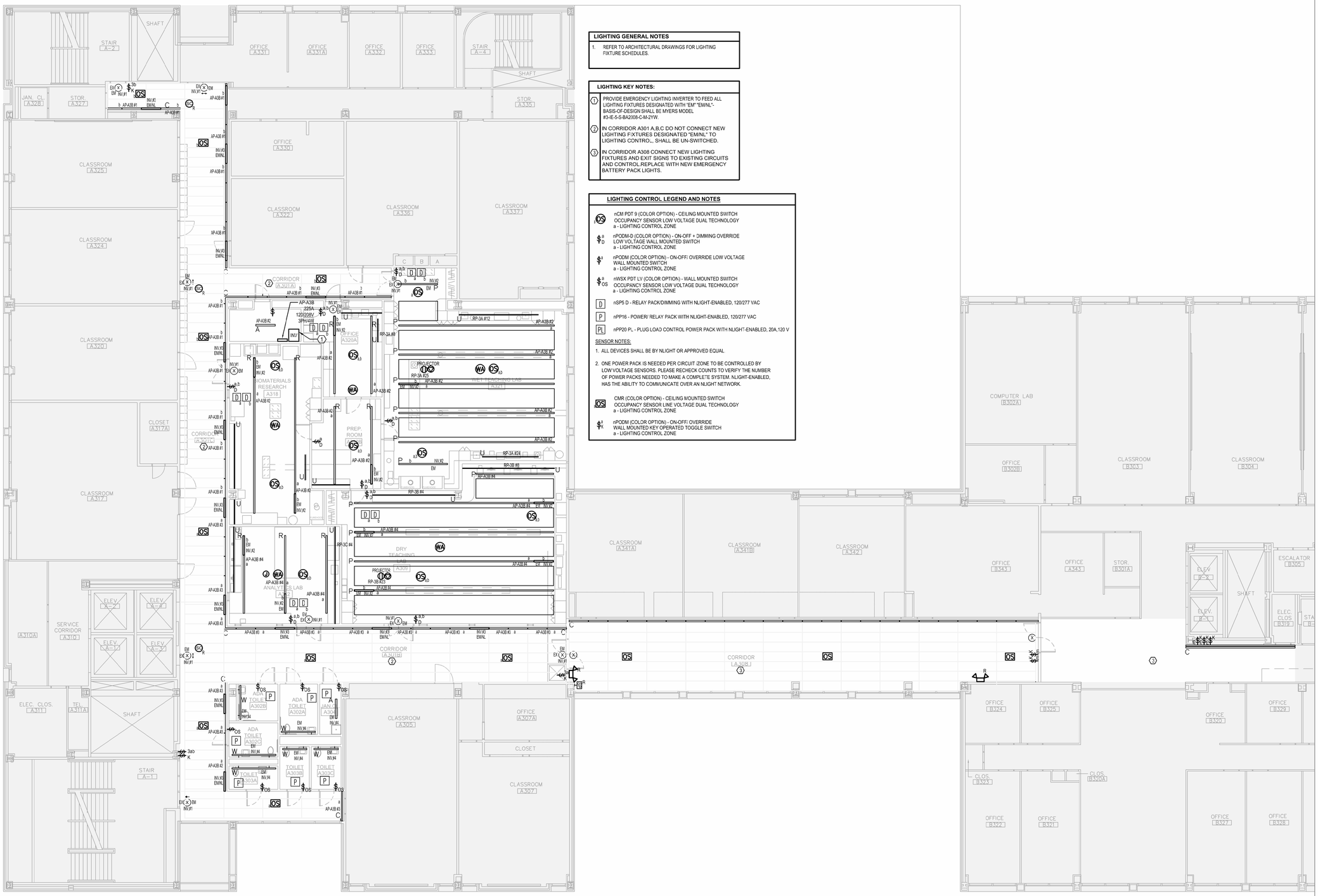
PROJECT#: 8969.109

SHEET TITLE:

3RD FLOOR ELECTRICAL DEMOLITION PLAN

SHEET NUMBER:

E-011.00



1 3RD FLOOR PLAN
1/8"=1'-0"

LIGHTING GENERAL NOTES

1. REFER TO ARCHITECTURAL DRAWINGS FOR LIGHTING FIXTURE SCHEDULES.

LIGHTING KEY NOTES:

1. PROVIDE EMERGENCY LIGHTING INVERTER TO FEED ALL LIGHTING FIXTURES DESIGNATED WITH "EM" "EM/NL"- BASIS-OF-DESIGN SHALL BE MYERS MODEL #3-IE-5-S-BA2008-C-M-2YW.
2. IN CORRIDOR A301 A,B,C DO NOT CONNECT NEW LIGHTING FIXTURES DESIGNATED "EM/NL" TO LIGHTING CONTRO_, SHALL BE UN-SWITCHED.
3. IN CORRIDOR A308 CONNECT NEW LIGHTING FIXTURES AND EXIT SIGNS TO EXISTING CIRCUITS AND CONTROL REPLACE WITH NEW EMERGENCY BATTERY PACK LIGHTS.

LIGHTING CONTROL LEGEND AND NOTES

- OS — nCM PDT 9 (COLOR OPTION) - CEILING MOUNTED SWITCH OCCUPANCY SENSOR LOW VOLTAGE DUAL TECHNOLOGY a - LIGHTING CONTROL ZONE
- $D — nPODM-D (COLOR OPTION) - ON-OFF + DIMMING OVERRIDE LOW VOLTAGE WALL MOUNTED SWITCH a - LIGHTING CONTROL ZONE
- $ — nPODM (COLOR OPTION) - ON-OFF/ OVERRIDE LOW VOLTAGE WALL MOUNTED SWITCH a - LIGHTING CONTROL ZONE
- $OS — nWSX PDT LV (COLOR OPTION) - WALL MOUNTED SWITCH OCCUPANCY SENSOR LOW VOLTAGE DUAL TECHNOLOGY a - LIGHTING CONTROL ZONE
- D — nSP5 D - RELAY PACK/DIMMING WITH NLIGHT-ENABLED, 120/277 VAC
- P — nPP16 - POWER/ RELAY PACK WITH NLIGHT-ENABLED, 120/277 VAC
- PL — nPP20 PL - PLUG LOAD CONTROL POWER PACK WITH NLIGHT-ENABLED, 20A,120 V

SENSOR NOTES:

1. ALL DEVICES SHALL BE BY NLIGHT OR APPROVED EQUAL
2. ONE POWER PACK IS NEEDED PER CIRCUIT /ZONE TO BE CONTROLLED BY LOW VOLTAGE SENSORS. PLEASE RECHECK COUNTS TO VERIFY THE NUMBER OF POWER PACKS NEEDED TO MAKE A COMPLETE SYSTEM. NLIGHT-ENABLED, HAS THE ABILITY TO COMMUNICATE OVER AN NLIGHT NETWORK.

- OS — CMR (COLOR OPTION) - CEILING MOUNTED SWITCH OCCUPANCY SENSOR LINE VOLTAGE DUAL TECHNOLOGY a - LIGHTING CONTROL ZONE
- $X — nPODM (COLOR OPTION) - ON-OFF/ OVERRIDE WALL MOUNTED KEY OPERATED TOGGLE SWITCH a - LIGHTING CONTROL ZONE

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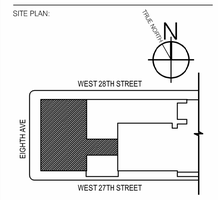
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SHEET TITLE:

3RD FLOOR ELECTRICAL LIGHTING PLAN

SHEET NUMBER:

E-101.00

- OF -



KEY NOTES:

1. CONTRACTOR SHALL INSTALL A 400A, 3-POLE, CIRCUIT BREAKER WITHIN SWITCHBOARD MSB-2 SPACE #12.
2. EMT WITH 4 #500MCM + 1#3G IN 3"C ROUTED AS SHOWN TO FEED NEW PANEL DP-A33 IN THE AREA OF WORK ON THE THIRD FLOOR. REFER TO DWG E-201 FOR ADDITIONAL INFORMATION. CONDUITS SHALL BE SUPPORTED BY STRUCTURAL CEILING. PROVIDE PULLBOXES IN ACCESSIBLE LOCATIONS AS REQUIRED. FINAL ROUTING MUST BE FIELD VERIFIED PRIOR TO INSTALLATION.

1 CELLAR FLOOR PLAN
1/8"=1'-0"

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THIS PROPERTY IS A HISTORIC BUILDING LISTED ON THE NATIONAL REGISTRY OF HISTORIC PLACES. IN ACCORDANCE WITH SECTION C501.6 OF THE 2020 NEW YORK CITY ENERGY CONSERVATION CONSTRUCTION CODE (NYCECC), NO PROVISIONS OF THE NYCECC CODE RELATING TO THE CONSTRUCTION, REPAIR, ALTERATION, RESTORATION, AND CHANGE OF OCCUPANCY SHALL BE MANDATORY FOR HISTORIC BUILDING.

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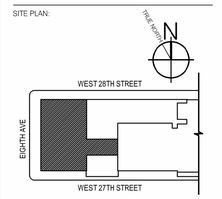
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	100% BID DOCUMENTS	2026.10.28

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DRAWN BY: --
CHECKED BY: --
SCALE: 1/8=1'-0"
PROJECT#: 8969.109

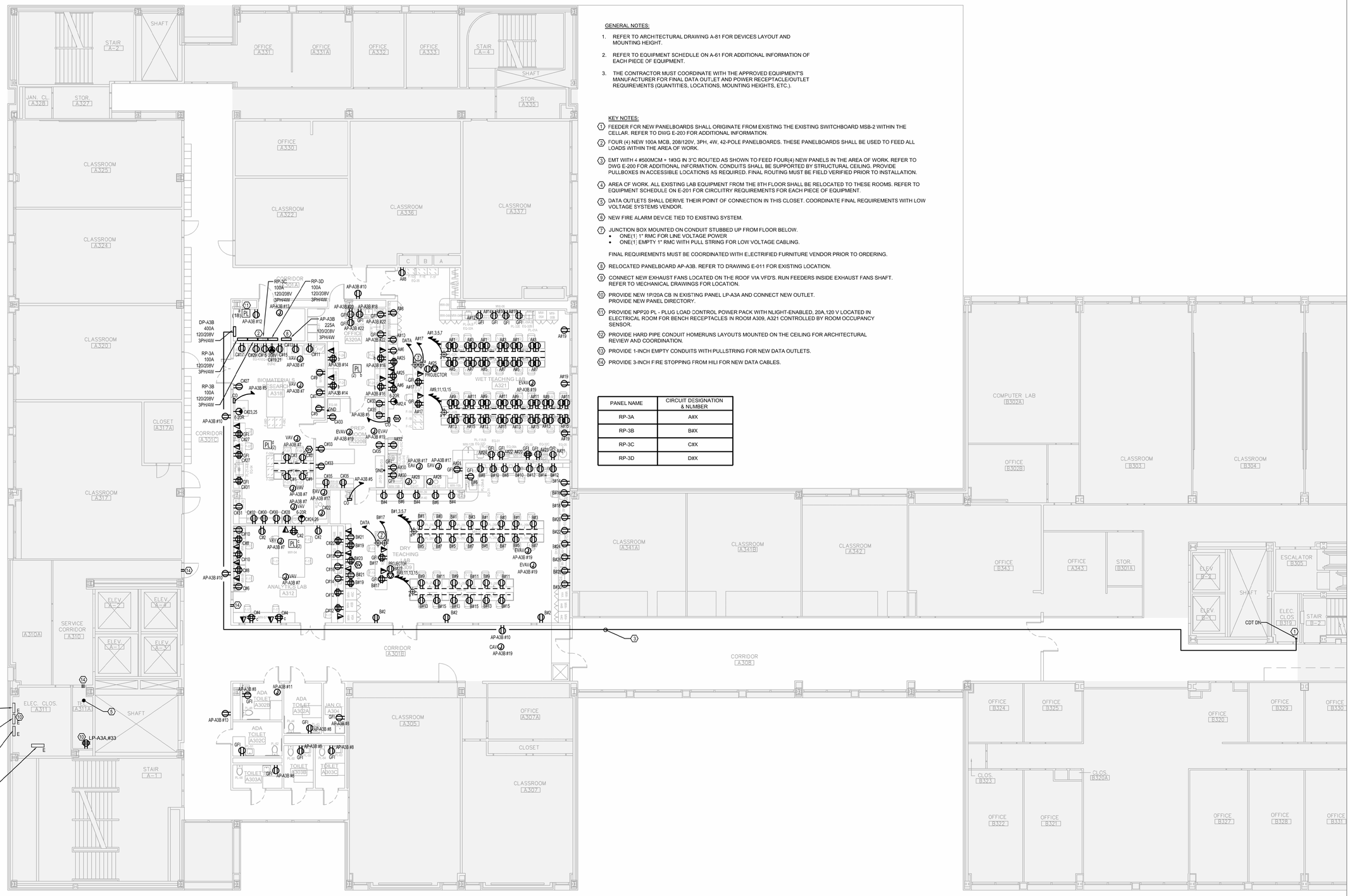
SHEET TITLE:

CELLAR ELECTRICAL POWER PLAN

SHEET NUMBER:

E-200.00

- OF -



1 3RD FLOOR PLAN
1/8"=1'-0"

GENERAL NOTES:

1. REFER TO ARCHITECTURAL DRAWING A-81 FOR DEVICES LAYOUT AND MOUNTING HEIGHT.
2. REFER TO EQUIPMENT SCHEDULE ON A-61 FOR ADDITIONAL INFORMATION OF EACH PIECE OF EQUIPMENT.
3. THE CONTRACTOR MUST COORDINATE WITH THE APPROVED EQUIPMENT'S MANUFACTURER FOR FINAL DATA OUTLET AND POWER RECEPTACLE/OUTLET REQUIREMENTS (QUANTITIES, LOCATIONS, MOUNTING HEIGHTS, ETC.).

KEY NOTES:

1. FEEDER FOR NEW PANELBOARDS SHALL ORIGINATE FROM EXISTING THE EXISTING SWITCHBOARD MSB-2 WITHIN THE CELLAR. REFER TO DWG E-203 FOR ADDITIONAL INFORMATION.
2. FOUR (4) NEW 100A MCB, 208/120V, 3PH, 4W, 42-POLE PANELBOARDS. THESE PANELBOARDS SHALL BE USED TO FEED ALL LOADS WITHIN THE AREA OF WORK.
3. EMT WITH 4 #500MCM + 1#3G IN 3"C ROUTED AS SHOWN TO FEED FOUR(4) NEW PANELS IN THE AREA OF WORK. REFER TO DWG E-200 FOR ADDITIONAL INFORMATION. CONDUITS SHALL BE SUPPORTED BY STRUCTURAL CEILING. PROVIDE PULLBOXES IN ACCESSIBLE LOCATIONS AS REQUIRED. FINAL ROUTING MUST BE FIELD VERIFIED PRIOR TO INSTALLATION.
4. AREA OF WORK. ALL EXISTING LAB EQUIPMENT FROM THE 8TH FLOOR SHALL BE RELOCATED TO THESE ROOMS. REFER TO EQUIPMENT SCHEDULE ON E-201 FOR CIRCUITRY REQUIREMENTS FOR EACH PIECE OF EQUIPMENT.
5. DATA OUTLETS SHALL DERIVE THEIR POINT OF CONNECTION IN THIS CLOSET. COORDINATE FINAL REQUIREMENTS WITH LOW VOLTAGE SYSTEMS VENDOR.
6. NEW FIRE ALARM DEVICE TIED TO EXISTING SYSTEM.
7. JUNCTION BOX MOUNTED ON CONDUIT STUBBED UP FROM FLOOR BELOW.
   - ONE(1) 1" RMC FOR LINE VOLTAGE POWER
   - ONE(1) EMPTY 1" RMC WITH PULL STRING FOR LOW VOLTAGE CABLING.

   FINAL REQUIREMENTS MUST BE COORDINATED WITH ELECTRIFIED FURNITURE VENDOR PRIOR TO ORDERING.
8. RELOCATED PANELBOARD AP-A3B. REFER TO DRAWING E-011 FOR EXISTING LOCATION.
9. CONNECT NEW EXHAUST FANS LOCATED ON THE ROOF VIA VFD'S. RUN FEEDERS INSIDE EXHAUST FANS SHAFT. REFER TO MECHANICAL DRAWINGS FOR LOCATION.
10. PROVIDE NEW 1P/20A CB IN EXISTING PANEL LP-A3A AND CONNECT NEW OUTLET. PROVIDE NEW PANEL DIRECTORY.
11. PROVIDE NPP20 PL - PLUG LOAD CONTROL POWER PACK WITH NLIGHT-ENABLED, 20A,120 V LOCATED IN ELECTRICAL ROOM FOR BENCH RECEPTACLES IN ROOM A309, A321 CONTROLLED BY ROOM OCCUPANCY SENSOR.
12. PROVIDE HARD PIPE CONDUIT HOMERUNS LAYOUTS MOUNTED ON THE CEILING FOR ARCHITECTURAL REVIEW AND COORDINATION.
13. PROVIDE 1-INCH EMPTY CONDUITS WITH PULLSTRING FOR NEW DATA OUTLETS.
14. PROVIDE 3-INCH FIRE STOPPING FROM HILI FOR NEW DATA CABLES.

PANEL NAME	CIRCUIT DESIGNATION & NUMBER
RP-3A	A#X
RP-3B	B#X
RP-3C	C#X
RP-3D	D#X

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FIT Science Lab Renovation

Project No. 2449

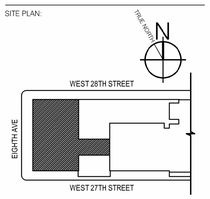
344 8TH AVE
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NEW YORK NY 10018
212.564.7002
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LIGHTING DESIGNER
JEFFREY NASH LIGHTING DESIGN
150 WEST 28TH STREET, SUITE 1603
NEW YORK, NY 10001
212.206.8355

SITE PLAN:



SUBMITTAL:

100% Construction Documents

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No.	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2026.03.31
	100% CONSTRUCTION DOCUMENT	2026.08.19
	ISSUED FOR DOB FILING	2026.10.21
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SEAL & SIGNATURE:

DRAWN BY: EGV CHECKED BY: EGV

SCALE: 1/8"=1'-0"

PROJECT#: 8969.109

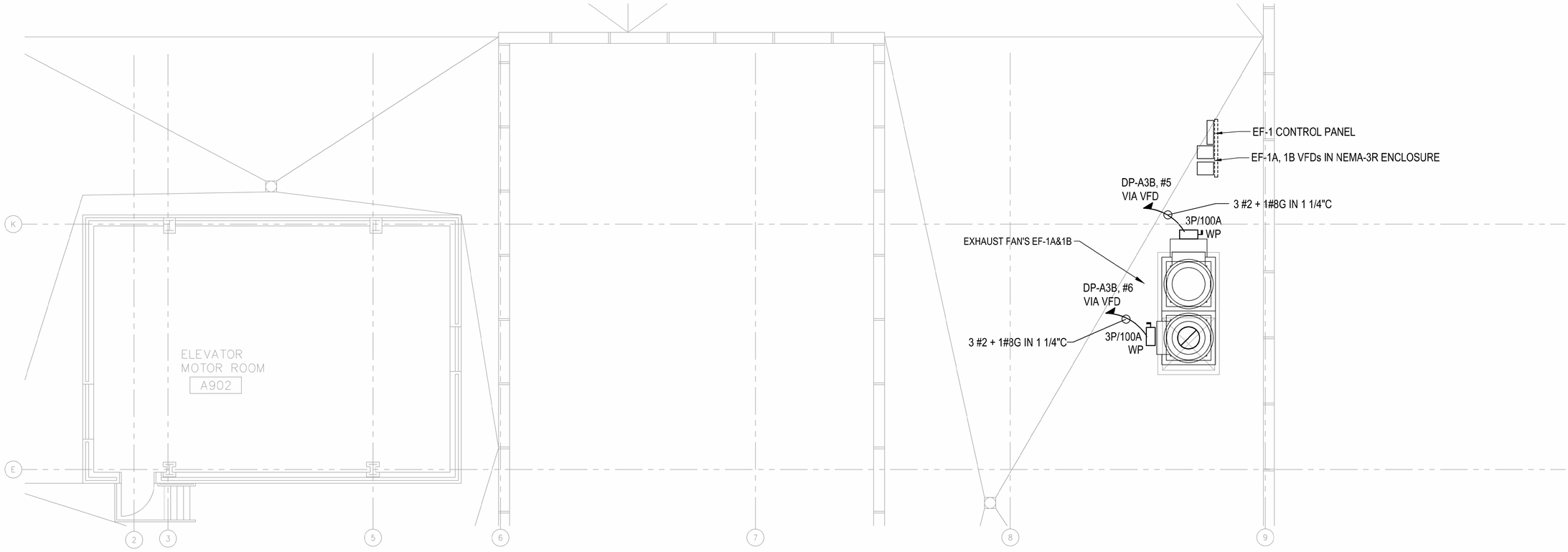
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3RD FLOOR ELECTRICAL POWER PLAN

SHEET NUMBER:

E-201.00

- OF -



1 ROOF PART PLAN
1/4"=1'-0"

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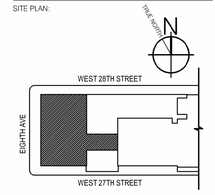
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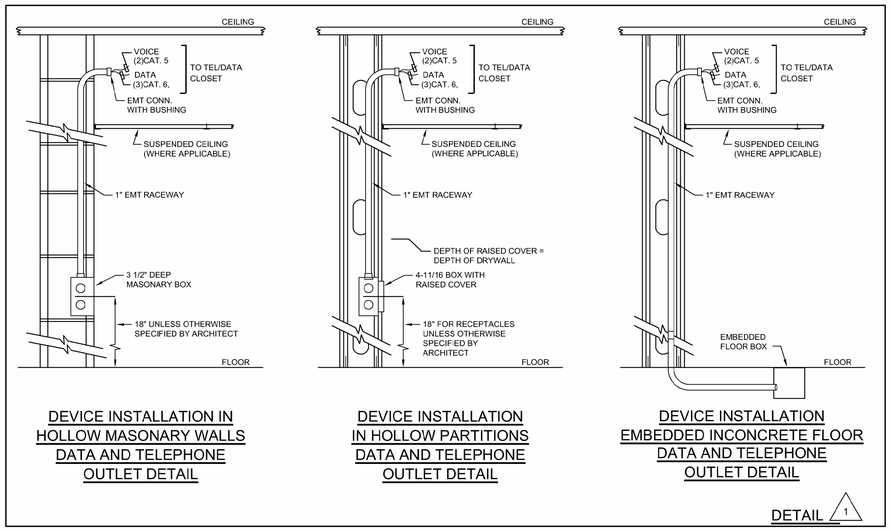
ROOF ELECTRICAL PLAN

DOB NOW JOB#

SHEET NUMBER:

E-202.00

- OF -

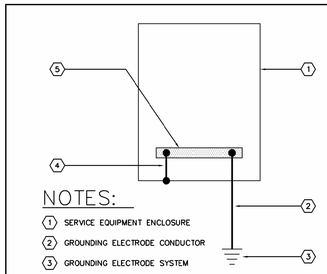


DEVICE INSTALLATION IN HOLLOW MASONARY WALLS DATA AND TELEPHONE OUTLET DETAIL

DEVICE INSTALLATION IN HOLLOW PARTITIONS DATA AND TELEPHONE OUTLET DETAIL

DEVICE INSTALLATION EMBEDDED INCONCRETE FLOOR DATA AND TELEPHONE OUTLET DETAIL

DETAIL 1



NOTES:

1. SERVICE EQUIPMENT ENCLOSURE
2. GROUNDING ELECTRODE CONDUCTOR
3. GROUNDING ELECTRODE SYSTEM
4. BOND TO ENCLOSURE
5. NEUTRAL BUS

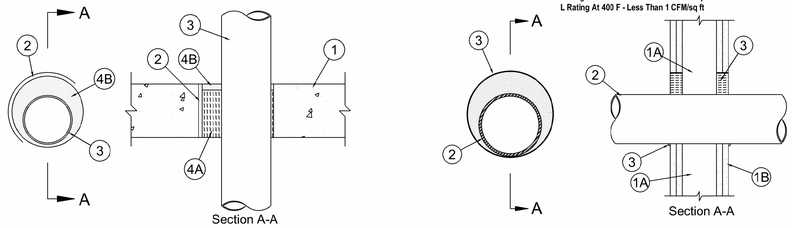
BASIC SYSTEM GROUNDING

DETAIL 7

System No. C-AJ-1319
F-Rating - 3 Hr
T-Rating - 0 Hr

Guide XHEZ
Through-Penetration Firestop Systems

System No. W-L-1079
F Rating - 2 Hr
T Rating - 0 Hr
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft



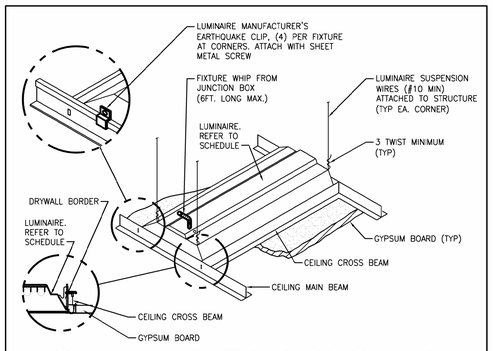
1. Floor or wall assembly -- min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. floor may also be constructed of any ul classified hollow core precast concrete units*. wall may also be constructed of any ul classified concrete blocks*. max diam of opening is 6 in.
see concrete blocks (cazt) and precast concrete units (clty) categories in the fire resistance directory for names of manufacturers.
2. Nonmetallic sleeve -- (optional) -- nom 6 in. diam (or smaller) schedule 40 polyvinyl chloride pipe sleeve cast or grouted into concrete flush with both surfaces of floor or wall.
3. Through penetrant -- one metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. the annular space between the pipe, conduit or tubing and the periphery of the opening shall be min 1/4 in. to max 1-3/4 in. pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. the following types and sizes of metallic pipes, conduits or tubing may be used:
A. Steel pipe -- nom 4 in. diam (or smaller) schedule 10 (or heavier) steel pipe.
B. Iron pipe -- nom 4 in. diam (or smaller) cast or ductile iron pipe.
C. Conduit -- nom 4 in. diam (or smaller) rigid steel conduit, nom 4 in. diam (or smaller) steel electrical metallic tubing or nom 1 in. diam (or smaller) flexible steel conduit.
D. Copper tubing -- nom 4 in. diam (or smaller) type t (or heavier) copper tubing.
E. Copper pipe -- nom 4 in. diam (or smaller) regular (or heavier) copper pipe.
4. Firestop system -- the firestop system shall consist of the following:
A. Packing material -- min 4 in. thickness of 4 pcf mineral wool batt insulation compressed and firmly packed into opening as permanent form. packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material. in floors constructed of hollow-core precast concrete units. mineral wool packing material to extend below exposed cores in precast concrete units.
B. Fill, void or cavity material*--sealant -- min 1/2 in. thickness of fill material applied within the annulus flush with top surface of floor or with both surfaces of wall. Specified technologies inc -- specseal series sss sealant or specseal lci sealant
*Bearing the ul classification mark

1. Wall assembly -- the 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual u300 or u400 series wall or partition design in the ul fire resistance directory and shall include the following construction features:
A. Studs -- wall framing may consist of either wood studs or steel channel studs. wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. oc. steel studs to be min 3-5/8 3-1/2 in. wide and spaced max 24 in. oc. when steel studs are used and the diam of opening exceeds the width of stud cavity, the opening shall be framed on all sides using lengths of steel stud installed between the vertical studs and screw-attached to the steel studs at each end. the framed opening in the wall shall be 4 to 6 in. wider and 4 to 6 in. higher than the diam of the penetrating item such that, when the penetrating item is installed in the opening, a 2 to 3 in. clearance is present between the penetrating item and the framing on all four sides.
B. Gypsum board* -- 5/8 in. thick, 4 ft wide with square or tapered edges. the gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual u300 or u400 series design in the ul fire resistance directory. max diam of opening is 26 in. for steel stud walls. max diam of opening is 14-1/2 in. for wood stud walls.
the hourly f rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. Through penetrant -- one metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. pipe, conduit or tubing may be installed at an angle not greater than 45 degrees from perpendicular. the annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. (point contact) to max 2 in. pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. the following types and sizes of metallic pipes, conduits or tubing may be used:
A. Steel pipe -- nom 24 in. diam (or smaller) schedule 10 (or heavier) steel pipe.
B. Iron pipe -- nom 24 in. diam (or smaller) cast or ductile iron pipe.
C. Conduit -- nom 4 in. diam (or smaller) steel electrical metallic tubing, nom 6 in. diam (or smaller) steel conduit or nom 1 in. diam (or smaller) flexible steel conduit.
D. Copper tubing -- nom 6 in. diam (or smaller) type t (or heavier) copper tubing.
E. Copper pipe -- nom 6 in. diam (or smaller) regular (or heavier) copper pipe.
3. Fill, void or cavity material* -- sealant -- min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall. at the point contact location between through penetrant and gypsum board, a min 3/8 in. diam bead of fill material shall be applied at the gypsum board/through penetrant interface on both surfaces of wall.
Specified technologies inc -- specseal series sss sealant or specseal lci sealant
*Bearing the ul classification mark

TYPICAL FIRE STOPPING FOR ALL FLOOR PENETRATIONS AND FIRE RATED GYPSUM WALLS

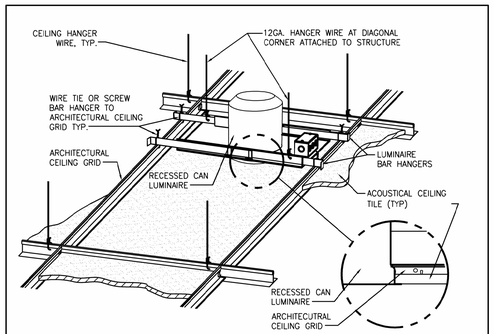
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DETAIL 9



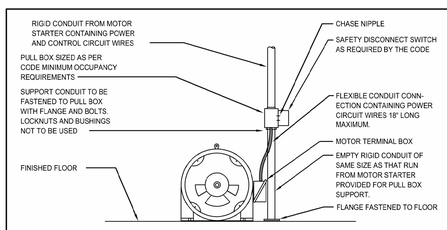
2 LUMINAIRE MOUNTING - GYPBOARD CEILING

NTS



3 DOWNLIGHT MOUNTING - LAY-IN CEILING

NTS



DETAIL SHOWING METHOD OF CONNECTION TO FLOOR MOUNTED MOTORS (INCLUDING MOUNTING OF CONTROL DEVICES IF REQUIRED)

NO SCALE

DETAIL 5



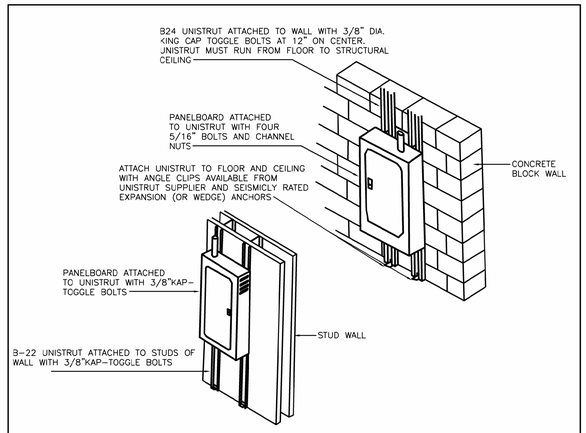
NOTES:

1. PROVIDE GENERIC ARC-FLASH LABELS AS SHOWN ON ALL ELECTRIC LOAD CENTERS, PANELBOARDS, SWITCHBOARDS, SWITCHGEAR, MOTOR CONTROLLERS, VFDS, ATS, ENCLOSED SWITCHES AND CIRCUIT BREAKERS, CONTROL PANELS, SPLICE BOXES AND ALL OTHER ELECTRICAL SERVICE & DISTRIBUTION EQUIPMENT.
2. LABELS TO COMPLY WITH NFPA 70, NFPA 70E, 29 CFR 1910.144, 29 CFR 1910.145 (OSHA) AND ANSI Z535 (COLORS, SYMBOLS, ETC.)
3. LABELS SHALL BE SELF-ADHESIVE, POLYESTER OR VINYL FILM LABELS; PREPRINTED, 6-MIL-THICK, FLEXIBLE LABEL LAMINATED WITH A CLEAR, WEATHERPROOF, UV-RESISTANT, CHEMICAL RESISTANT COATING. MINIMUM LETTER HEIGHT SHALL BE 3/8 INCH.
4. INSTALL IDENTIFICATION MATERIALS AND DEVICES AT LOCATIONS FOR MOST CONVENIENT VIEWING WITHOUT INTERFERENCE WITH OPERATION AND MAINTENANCE OF EQUIPMENT. APPLY TO EXTERIOR OF DOOR, COVER, OR OTHER ACCESS.

Arc Flash Label

Not to Scale

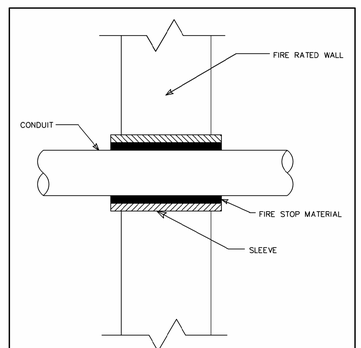
DETAIL 4



DETAILS FOR INSTALLATION OF PANEL

N.T.S.

DETAIL 6

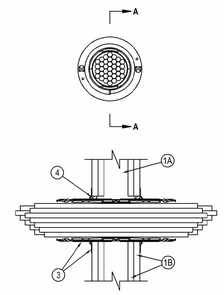


CONDUIT PENETRATION THRU FIRE RATED WALL

NOT TO SCALE

DETAIL 8

System No. W-L-3334
F Ratings — 1 and 2 Hr (See Item 1)
T Ratings — 0, 1, 1-3/4 and 2 Hr (See Items 2 and 3)
L Ratings at Ambient — Less Than 1 CFM/sq ft, 5 CFM/sq ft and 9 CFM/sq ft (See Item 2)
L Rating at 400F — Less Than 1 CFM/sq ft, 1 CFM/sq ft and 10 CFM/sq ft (See Item 2)

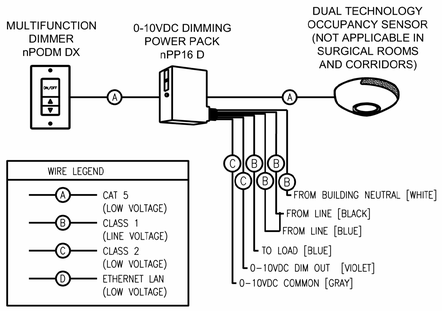


1. Wall Assembly -- The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner described within the individual U300, U400 or V400 Series Wall or Partition Designs in the UL Fire Resistance Directory and shall incorporate the following construction features:
A. Studs -- Wall framing shall consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced max 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.
B. Gypsum Board* -- Nom 5/8 in. thick gypsum board as specified in the individual Wall and Partition Design. Opening in gypsum board to be max 2-1/2 in. diam for 2" device and max 4-1/2 in. diam for 4" device. The hourly F Rating of the firestop system is dependent upon the hourly rating of the wall in which it is installed.
2. Cables -- Within the loading area for each firestop device, the cables may represent o to 100 percent visual fill. Cables to be tightly bundled within the device and rigidly supported on both sides of wall assembly. Any combination of the following types of cables may be used:
A. Max 100 pair No. 24 AWG (or smaller) copper conductor telecommunication cable with polyvinyl chloride (PVC) jacketing and insulation.
B. Max 7/C No. 12 AWG copper conductor control cable with PVC or XLPE jacket and insulation.
C. Max 4/0 AWG Type RHH ground cable.
D. Max 4 pr No. 22 AWG Cat 5 or Cat 5 computer cables.
E. Max RG 6/U coaxial cable with fluorinated ethylene insulation and jacketing.
F. Fiber optic cable with polyvinyl chloride (PVC) or polyethylene (PE) jacket and insulation having a max diam of 1/2 inches.
G. Max 20/C No. 22 AWG shielded printer cable with PVC jacket.
H. Through-Penetrating Product* -- Two copper conductors No. 18 AWG (or smaller) Power or Non Power Limited Fire Alarm Cable with or without a jacket under a metal armor.
AFC CABLE SYSTEMS INC
I. Max. 1/4 in. diameter S-Video Cable consisting of 2 max 24 AWG 75 ohm coax or twisted pair cable with PE insulation and PVC jacket.
J. Max 3/C No 12 AWG MC Cable.
K. Through Penetrating Product* -- Any cables, Armored Cable+ or Metal Clad Cable+ currently Classified under the Through Penetrating Product category. See Through Penetrating Product (XHJY) category in the Fire Resistance Directory for names of manufacturers. For openings with cables, when the hourly rating of the wall assembly is 1 hr, the T Rating is 0 hr. For openings with cables, when the hourly rating of the wall assembly is 2 hr, the T Rating is 1-3/4 hr except that when Item 2C, 2G, 2I 2J or 2K is used, the T Rating is 1 hr for 2C, 2 OR 2I and the T Rating is 1/2 hr for 2J or 2 K (see Item 3 also). L Ratings apply only when device flanges and CP 606 or FS-One Sealant is used. For blank (no cables) openings, the L Rating at Ambient and 400F is Less Than 1 CFM/sq ft (or Less Than 1 CFM/Unit). For openings with cables, the L Rating is 9 CFM/sq ft (or 1 CFM/Unit) at Ambient and 10 CFM/sq ft (or 1 CMF/Unit) at 400F. For openings with Cat 5 or 6 cables only (Item 2D), the L Rating is 5 CFM/sq ft (or Less T an 1 CFM/Unit) at Ambient and 1 CFM/sq ft (or Less Than 1 CFM/Unit) at 400F.
3. Firestop Device* -- Firestop device consists of a corrugated steel tube with an inner plastic housing, intumescent material rings and twisted inner fabric smoke seal. Firestop device to be installed in accordance with the accompanying installation instructions. As an option, the inner fabric seal may remain open except that, to attain the L Rating, the inner fabric seal shall be twisted to completely close off the opening within device. Device slid into wall such that ends project an equal distance from the approximate centerline of the wall assembly. The annular space between the device and the periphery of the opening shall be min 0 in. (point contact). Device provided with flanges that are spun clockwise onto device threads, butting tightly to both sides of wall. Device flanges are optional. When the device flanges are not used, the T Rating for the firestop system is 0 hr. For blank openings (no cables), the T Rating for the firestop system equals the F Rating only when the device flanges are used. HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC -- CP 653 2" Speed Sleeve and CP 653 4" Speed Sleeve
4. Fill, Void or Cavity Material* - Sealant -- Min 1/2 in. thickness of fill material applied within the annulus between firestop device and wall, flush with both surfaces of wall, and an additional 1/4 in. bead applied around periphery of device. When device flanges are used, gypsum drywall compound may be used in place of the fill material.
HILTI CONSTRUCTION CHEMICALS, DIV OF HILTI INC -- FS-ONE or CP 606 Sealant
*Bearing the UL Classification Mark

TYPICAL FIRE STOPPING FOR ALL FIRE RATED GYPSUM WALLS

NO SCALE

DETAIL 10



nLIGHT TYPICAL LIGHTING CONTROL WIRING DIAGRAM

DETAIL 11

NEW YORK CITY ENERGY CONSERVATION CODE

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FIT Science Lab Renovation

Project No. 2449

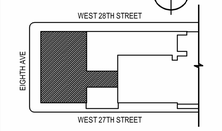
344 8TH AVE
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SITE PLAN:



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SEAL & SIGNATURE:

DRAWN BY: IAN CHECKED BY: CTD

SCALE: NTS

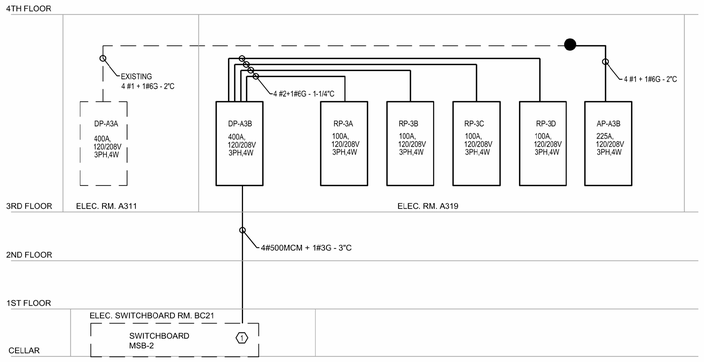
PROJECT#: 8969.109

SHEET TITLE:

ELECTRICAL DETAILS

SHEET NUMBER:

E-501.00



KEY NOTES:

1. CONTRACTOR SHALL INSTALL A 400A, 3-POLE, CIRCUIT BREAKER WITHIN SWITCHBOARD MSB-2 SPACE #12.

JOB NUMBER	8969-109											
DISTRIBUTION PANEL	**DP-A3B**			NEW								
VOLTAGE	208											
BUS SIZE	**400**			10		LOCATION:	3rd fl Elec room					
PROT. DEVICE	2	(FU=1, TR=2)				MOUNTING:	Wall					
MAIN OVERCURRENT DEVICE						AIC:	65000					
					PROTECTIVE DEVICE				FEEDER			
CKT No	NAME	HP	KVA	AMP	POLE	SWITCH FRAME	FUSE TRIP	WIRE PER/SET	SETS	SIZE	COND	NEUTR SIZE
1	RP-3A			80	3	100	100	4	1	2	1.25	2
2	RP-3B			80	3	100	100	4	1	2	1.25	2
3	RP-3C			80	3	100	100	4	1	2	1.25	2
4	RP-3D			80	3	100	100	4	1	2	1.25	2
5	EF-1A VFD			80	3	100	100	3	1	2	1.25	2
6	EF-1B VFD			-80	3	100	100	3	1	2	1.25	2
7	SPACE			0	0	0	0	0	#N/A	#N/A	#N/A	#N/A
8	SPACE			0	0	0	0	0	#N/A	#N/A	#N/A	#N/A
9	SPACE			0	0	0	0	0	#N/A	#N/A	#N/A	#N/A
10	SPACE			0	0	0	0	0	#N/A	#N/A	#N/A	#N/A
TOTAL KVA				144								
TOTAL AMP				400								
SPARE (DECIMAL)				0.1								
DEM. ((DECIMAL)				0.5								
FEEDER DEM AMP				240								
NUMBE OF SETS				1								
FEEDER SIZE				350								
CONDUIT SIZE				2.5								
PROTECTION (FU=1, TR=2)				2								
SWITCH OR FRAME				400								
FUSE OR TRIP				300								
FILE NAME:	8969-109			DP-A3E								

JOB: 8969-109 PANEL CODE- 1(120/208V)
PANEL: AP-A3B NEW 2(277/480V)
PANEL CODE: 1 3(265/460V)
PHASE: 3
WIRE: 4
MAINS AMP: 225 MAIN CB AMP: AIC 22,000

CIRCUIT NO	CIRCUIT BKR	LOAD DESIGNATION	LOAD VA	A	PHASES B	C	LOAD VA	LOAD DESIGNATION	CIRCUIT BKR	CIRCUIT NO
1	20	Lighting Corridor	1100	2200			1100	Lighting	20	2
3	20	Lighting Corridor	1100		2200		1100	Lighting	20	4
5	20	CO Control Panel	800			1900	1100	Lighting	20	6
7	20	VAVS	800	1900			1100	Toilets receptacles	20	8
9	20	EXH. Fan Control Panel	1100		2200		1100	Corridor receptacles	20	10
11	20	Heat Trace	1100			2200	1100	Receptacles Elec Rm.	20	12
13	20	Leak Detector	800	1900			1100	Receptacles Office.	20	14
15	20	CO Detectors	800		1900		1100	Receptacles Office.	20	16
17	20	EAV	800			1900	1100	Receptacles Office.	20	18
19	20	EVAV	800	1900			1100	Receptacles Office.	20	20
21	20	Existing Loads	800		1900		1100	Receptacles Office.	20	22
23	20	Existing Loads	800			1600	800	Existing Loads	20	24
25	20	Existing Loads	800	1600			800	Existing Loads	20	26
27	20	Existing Loads	800		1600		800	Existing Loads	20	28
29	20	Existing Loads	800			1600	800	Existing Loads	20	30
31		SPACE						SPACE		32
33		SPACE						SPACE		34
35		SPACE						SPACE		36
37	SP/	LIGHTING INVERTER	1000	1000				SPACE		38
39	30	3#10+1#10G IN 3/4"C	1000		1000			SPACE		40
41	30		1000			1000		SPACE		42
			TOTAL	10500	10800	10200	TOT. KVA	31.5		
							TOT. AMP	87.5		
				DEM. DECIMAL		0.7	DEM.KVA	25.2		
				SPARE DECIMAL		0.1	DEM.AMP	70.0		

JOB: 8969-109 PANEL CODE- 1(120/208V)
PANEL: RP-3A NEW 2(277/480V)
PANEL CODE: 1 3(265/460V)
PHASE: 3
WIRE: 4
MAINS AMP: 100 MAIN CB AMP: AIC 22,000

CIRCUIT NO	CIRCUIT BKR	LOAD DESIGNATION	LOAD VA	A	PHASES B	C	LOAD VA	LOAD DESIGNATION	CIRCUIT BKR	CIRCUIT NO
1	20	Recep. Room A321	900	1800			900	Recep. Room A321	2P/	2
3	20	Recep. Room A321	900		1800		900		20	4
5	20	Recep. Room A321	900			1800	900	Recep. Room A321	20	6
7	20	Recep. Room A321	900	1800			900	Recep. Room A321	20	8
9	20	Recep. Room A321	900		1800		900	Recep. Room A321	20	10
11	20	Recep. Room A321	900			1800	900	Recep. Room A321	20	12
13	20	Recep. Room A321	900	1800			900	Recep. Room A321	20	14
15	20	Recep. Room A321	900		1800		900	Recep. Room A321	20	16
17	20	Recep. Room A321	900			1800	900	Recep. Room A321	20	18
19	20	Recep. Room A321	900	1800			900	Recep. Room A321	20	20
21	20	Recep. Room A321	900		1800		900	Recep. Room A321	20	22
23	20	Recep. Room A321	900			1800	900	Recep. Room A321	20	24
25	20	Recep. Room A321	900	1800			900	Recep. Room A321	20	26
27	20	SPARE			900		900	Recep. Room A321	20	28
29	20	SPARE				900	900	Recep. Room A321	20	30
31	20	SPARE		900			900	Recep. Room A321	20	32
33		SPACE						SPACE		34
35		SPACE						SPACE		36
37		SPACE						SPACE		38
39		SPACE						SPACE		40
41		SPACE						SPACE		42
			TOTAL	9900	8100	8100	TOT. KVA	26.1		
							TOT. AMP	72.5		
				DEM. DECIMAL		0.7	DEM.KVA	20.9		
				SPARE DECIMAL		0.1	DEM.AMP	58.0		

JOB: 8969-109 PANEL CODE- 1(120/208V)
PANEL: RP-3C NEW 2(277/480V)
PANEL CODE: 1 3(265/460V)
PHASE: 3
WIRE: 4
MAINS AMP: 100 MAIN CB AMP: AIC 22,000

CIRCUIT NO	CIRCUIT BKR	LOAD DESIGNATION	LOAD VA	A	PHASES B	C	LOAD VA	LOAD DESIGNATION	CIRCUIT BKR	CIRCUIT NO
1	20	Recep. Room A318	900	1800			900	Recep. Room A312	20	2
3	20	Recep. Room A318	900		1800		900	Recep. Room A312	20	4
5	20	Recep. Room A318	900			1800	900	Recep. Room A312	20	6
7	20	Recep. Room A318	900	1800			900	Recep. Room A312	20	8
9	20	Recep. Room A318	900		1800		900	Recep. Room A312	20	10
11	20	Recep. Room A318	900			1800	900	Recep. Room A312	20	12
13	20	Recep. Room A318	900	1800			900	Recep. Room A312	20	14
15	20	Recep. Room A318	900		1800		900	Recep. Room A312	20	16
17	20	Recep. Room A318	900			1800	900	Recep. Room A312	20	18
19	20	Recep. Room A318	900	1800			900	Recep. Room A312	20	20
21	20	Recep. Room A318	900		1800		900	Recep. Room A318	20	22
23	2P/	Recep. Room A318	900			1800	900	Recep. Room A318	2P/	24
25	20		900	1800			900		20	26
27	20	Recep. Room A318	900		1800		900	Recep. Room A318	20	28
29	20	Recep. Room A318	900			1800	900	Recep. Room A318	20	30
31	20	Recep. Room A318	900	900			900	SPACE		32
33	20	Recep. Room A320B	900		900		900	SPACE		34
35	20	Recep. Room A320B	900			900	900	SPACE		36
37		SPACE						SPACE		38
39		SPACE						SPACE		40
41		SPACE						SPACE		42
			TOTAL	9900	9900	9900	TOT. KVA	29.7		
							TOT. AMP	82.5		
				DEM. DECIMAL		0.7	DEM.KVA	23.8		
				SPARE DECIMAL		0.1	DEM.AMP	66.0		

JOB: 8969-109 PANEL CODE- 1(120/208V)
PANEL: RP-3B NEW 2(277/480V)
PANEL CODE: 1 3(265/460V)
PHASE: 3
WIRE: 4
MAINS AMP: 100 MAIN CB AMP: AIC 22,000

CIRCUIT NO	CIRCUIT BKR	LOAD DESIGNATION	LOAD VA	A	PHASES B	C	LOAD VA	LOAD DESIGNATION	CIRCUIT BKR	CIRCUIT NO
1	20	Recep. Room A309	900	1800			900	Recep. Room A309	20	2
3	20	Recep. Room A309	900		1800		900	Recep. Room A309	20	4
5	20	Recep. Room A309	900			1800	900	Recep. Room A309	20	6
7	20	Recep. Room A309	900	1800			900	Recep. Room A309	20	8
9	20	Recep. Room A309	900		1800		900	Recep. Room A309	20	10
11	20	Recep. Room A309	900			1800	900	Recep. Room A309	20	12
13	20	Recep. Room A309	900	1800			900	Recep. Room A309	20	14
15	20	Recep. Room A309	900		1800		900	Recep. Room A309	20	16
17	20	Recep. Room A309	900			1800	900	Recep. Room A309	20	18
19	20	Recep. Room A309	900	1800			900	Recep. Room A309	20	20
21	20	Recep. Room A309	900		1800		900	Recep. Room A309	20	22
23	20	Recep. Room A309	900			1800	900	Recep. Room A309	20	24
25	20	SPARE		900			900	Recep. Room A309	20	26
27	20	SPARE			900		900	Recep. Room A309	20	28
29	20	SPARE				900	900	Recep. Room A309	20	30
31		SPACE						SPACE		32
33		SPACE						SPACE		34
35		SPACE						SPACE		36
37		SPACE						SPACE		38
39		SPACE						SPACE		40
41		SPACE						SPACE		42
			TOTAL	8100	8100	8100	TOT. KVA	24.3		
							TOT. AMP	67.5		
				DEM. DECIMAL		0.7	DEM.KVA	19.4		
				SPARE DECIMAL		0.1	DEM.AMP	54.0		

JOB: 8969-109 PANEL CODE- 1(120/208V)
PANEL: RP-3D NEW 2(277/480V)
PANEL CODE: 1 3(265/460V)
PHASE: 3
WIRE: 4
MAINS AMP: 100 MAIN CB AMP: AIC 22,000

CIRCUIT NO	CIRCUIT BKR	LOAD DESIGNATION	LOAD VA	A	PHASES B	C	LOAD VA	LOAD DESIGNATION	CIRCUIT BKR	CIRCUIT NO
1	20	SPARE						SPARE	20	2
3	20	SPARE						SPARE	20	4
5	20	SPARE						SPARE	20	6
7	20	SPARE						SPARE	20	8
9	20	SPARE						SPARE	20	10
11	20	SPARE						SPARE	20	12
13	20	SPARE						SPARE	20	14
15	20	SPARE						SPARE	20	16
17	20	SPARE						SPARE	20	18
19	20	SPARE						SPARE	20	20
21	20	SPARE						SPARE	20	22
23	20	SPARE						SPARE	20	24
25	20	SPARE						SPARE	20	26
27	20	SPARE						SPARE	20	28
29	20	SPARE						SPARE	20	30
31		SPACE						SPACE		32
33		SPACE						SPACE		34
35		SPACE						SPACE		36
37		SPACE						SPACE		38
39		SPACE						SPACE		40
41		SPACE						SPACE		42
			TOTAL				TOT. KVA			
							TOT. AMP			
				DEM. DECIMAL		0.7	DEM.KVA			
				SPARE DECIMAL		0.1	DEM.AMP			

NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2025 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT Science Lab Renovation

Project No. 2449

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212.643.9055

LIGHTING DESIGNER
JEFFREY NASH LIGHTING DESIGN
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SITE PLAN:

SUBMITTAL:

100% Construction Documents

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2026.03.31
	100% CONSTRUCTION DOCUMENT	2026.08.19
	ISSUED FOR DOB FILING	2026.10.21
	100% BID DOCUMENTS	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: IAN CHECKED BY: EGV

SCALE: NTS

PROJECT#: 8969.109

SHEET TITLE:

ELECTRICAL PARTIAL RISER DIAGRAM AND PANEL SCHEDULES

SHEET NUMBER:

E-601.00

PROGRESS INSPECTIONS FOR ENERGY CODE COMPLIANCE COMMERCIAL BUILDINGS

	INSPECTION/TEST	PERIODIC (MINIMUM)	REFERENCE STANDARD (SEE ECC CHAPTER 6) OR OTHER CRITERIA	ECC OR OTHER CITATION
IIB MECHANICAL AND SERVICE WATER HEATING INSPECTIONS				
IIB6	DUCT LEAKAGE TESTING, INSULATION AND DESIGN: FOR DUCT SYSTEMS DESIGNED TO OPERATE AT STATIC PRESSURES IN EXCESS OF 3 INCHES W.G. (747 PA), REPRESENTATIVE SECTIONS, AS DETERMINED BY THE PROGRESS INSPECTOR, TOTALING AT LEAST 25% OF THE DUCT AREA, MUST BE TESTED TO VERIFY THAT ACTUAL AIR LEAKAGE IS BELOW ALLOWABLE AMOUNTS. INSTALLED DUCT INSULATION MUST BE VISUALLY INSPECTED TO VERIFY PROPER INSULATION PLACEMENT AND VALUES. JOINTS, LONGITUDINAL AND TRANSVERSE SEAMS AND CONNECTIONS IN DUCTWORK MUST BE VISUALLY INSPECTED FOR PROPER SEALING.	AFTER INSTALLATION AND SEALING AND PRIOR TO CLOSING SHAFTS, CEILINGS AND WALLS.	APPROVED CONSTRUCTION DOCUMENTS; SMACNA HVAC AIR DUCT LEAKAGE TEST MANUAL; SMACNA DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE	C403.11;
IIC ELECTRICAL POWER AND LIGHTING SYSTEMS				
IIC3	INTERIOR LIGHTING POWER: INSTALLED LIGHTING MUST BE VERIFIED FOR COMPLIANCE WITH THE LIGHTING POWER ALLOWANCE BY VISUAL INSPECTION OF FIXTURES, LAMPS, BALLASTS AND TRANSFORMERS.	PRIOR TO FINAL ELECTRICAL AND CONSTRUCTION INSPECTION	APPROVED CONSTRUCTION DOCUMENTS	C405.3, C406;
IIC5	LIGHTING CONTROLS: EACH TYPE OF REQUIRED LIGHTING CONTROLS, INCLUDING: x OCCUPANT SENSORS x MANUAL INTERIOR LIGHTING CONTROLS x LIGHT-REDUCTION CONTROLS x AUTOMATIC LIGHTING SHUT-OFF ☐ DAYLIGHT ZONE CONTROLS ☐ SLEEPING UNIT CONTROLS ☐ EXTERIOR LIGHTING CONTROLS ☐ EGRESS ILLUMINATION CONTROLS MUST BE VERIFIED BY VISUAL INSPECTION AND TESTED FOR FUNCTIONALITY AND PROPER OPERATION.	PRIOR TO FINAL ELECTRICAL AND CONSTRUCTION INSPECTION	APPROVED CONSTRUCTION DOCUMENTS, INCLUDING CONTROL SYSTEM NARRATIVES	C405.2, C406;
IIC6	ELECTRIC MOTORS AND ELEVATORS: WHERE REQUIRED BY THE CONSTRUCTION DOCUMENTS FOR ENERGY CODE COMPLIANCE, MOTOR LISTING OR LABELS BE VISUALLY INSPECTED TO VERIFY THAT THEY COMPLY WITH THE RESPECTIVE ENERGY REQUIREMENTS IN THE CONSTRUCTION DOCUMENTS. ELEVATORS AND ESCALATORS MUST BE INSPECTED FOR COMPLIANCE WITH REGENERATIVE DRIVE REQUIREMENTS.	PRIOR TO FINAL ELECTRICAL AND CONSTRUCTION INSPECTION.	APPROVED CONSTRUCTION DOCUMENTS.	C403.8, C405.6, C405.7, C405.8, C405.9;
IID OTHER				
IID1	MAINTENANCE INFORMATION: MAINTENANCE MANUALS FOR MECHANICAL, SERVICE HOT WATER AND ELECTRICAL EQUIPMENT AND SYSTEMS REQUIRING PREVENTIVE MAINTENANCE MUST BE REVIEWED FOR APPLICABILITY TO INSTALLED EQUIPMENT AND SYSTEMS BEFORE SUCH MANUALS ARE PROVIDED TO THE OWNER. LABELS REQUIRED FOR SUCH EQUIPMENT OR SYSTEMS MUST BE INSPECTED FOR ACCURACY AND COMPLETENESS.	PRIOR TO SIGN-OFF OR ISSUANCE OF FINAL CERTIFICATE OF OCCUPANCY.	APPROVED CONSTRUCTION DOCUMENTS, INCLUDING ELECTRICAL DRAWINGS WHERE APPLICABLE, ASHRAE GUIDELINE 4; PREPARATION OF OPERATING AND MAINTENANCE DOCUMENTATION FOR BUILDING SYSTEMS.	C408.11, C408.2.5.2, C408.3.2;

NYC 2025 ENERGY CODE COMPLIANCE

ENERGY ANALYSIS (DUCTWORK INSULATION)

ITEM DESCRIPTION	PROPOSED DESIGN VALUE	CODE PRESCRIBED VALUE
ALL SUPPLY AND RETURN DUCTWORK AND ACCESSORIES	R-VALUE ≥ 6	R-VALUE ≥ 6

NOTES:

1. ALL SEALING TAPE SHALL CONFORM TO UL-181A OR UL-181B WHEN USED AS A PRIMARY SEALANT.
2. WHEN LOCATED WITHIN A BUILDING ENVELOPE ASSEMBLY, THE DUCT OR PLENUM SHALL BE SEPARATED FROM THE BUILDING EXTERIOR OR UNCONDITIONED OR EXEMPT SPACES BY A MINIMUM OF R-8 INSULATION.

ENERGY ANALYSIS (PIPING INSULATION)

ITEM DESCRIPTION	PROPOSED DESIGN VALUE		CODE PRESCRIBED VALUE	
	NOMINAL PIPE DIAMETER ≤ 1"	NOMINAL PIPE DIAMETER > 1.5"	NOMINAL PIPE DIAMETER ≤ 1"	NOMINAL PIPE DIAMETER > 1.5"
200° F HOT WATER	1-1/2	-	1-1/2	-

NOTES:

1. INSULATION SHALL HAVE A CONDUCTIVITY (k) NOT EXCEEDING 0.27 BTUs PER IN/H*SQFT**F.

2025 NYCECC TABULAR ANALYSIS
COMMERCIAL BUILDING IN COMPLIANCE WITH ECC

NYCECC Citation	Provision	Item Description	Code Prescriptive Value (ECC)	Proposed Design Value	Supporting Documentation
C403.1.1	**Calculation of heating and cooling loads (Mandatory)**	*Load calculations for HVAC systems*	*Determined in accordance with ANSI/ASHRAE/ACCA Standard 183 HVAC Systems and Equipment Handbook*	*Design loads are determined in accordance with the procedures described in the ANSI/ASHRAE/ACCA Standard183.*	*Signed and sealed statement from Engineer certifying compliance with Energy Code*
C403.2.2	**Ventilation (Mandatory)**	*Ventilation cfm and Outdoor air control*	*Where mechanical ventilation is provided, systems shall be capable of reducing outdoor air to the minimum requirements from Chapter 4 of the NYC MC*	*Motorized dampers shall have ability to operate at minimum required ventilation rates*	*See mechanical floor plans M-101, mechanical schedules M-701, and mechanical control drawings M-802*
C403.8.1, TABLES C403.8.1(1) & C403.8.1(2)	**Allowable Fan Horsepower (Mandatory)**	*EF-1A, EF-1B*	*Total system fan hp shall not exceed limits in Table C403.8.1(1)*	*Total Fan power = 12.87 bhp*	*See mechanical schedule M-701*
C403.11.1	**Duct and plenum insulation and sealing (Mandatory)**	*All ductwork*	*Supply and return ducts and plenums in shall have a minimum of R-6 where located in unconditioned spaces and R-8 minimum where located outside the building. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8.*	*Unconditioned spaces: R-6 Conditioned spaces: None, exterior wall insulated >R-8*	*See mechanical drawing M-101*
C403.11.2	**Duct Construction (Mandatory)**	*Ductwork*	*Shall be constructed and erected in accordance with the NYCMC*	*Ductwork must be constructed and erected in accordance with the NYCMC*	*See mechanical drawing M-101*
C403.11.2.1	**Low-Pressure Duct Systems (Mandatory)**	*Low Pressure Ductwork*	*All low pressure ducts, operating at 2" of W.G. or less shall be properly sealed with approved methods*	*All low pressure ducts properly sealed as per requirements*	*See mechanical drawing M-101*
C403.11.2.2	**Medium-Pressure Duct Systems (Mandatory)**	*Medium Pressure Ductwork*	*Ducts operating between 2" and 3" W.G. shall be insulated and sealed per C403.11.1 and must be clearly indicated on the construction documents in accordance with NYCMC*	*All medium pressure ducts sealed as per requirements and insulated to R-XX*	*See mechanical drawing M-101*
TABLE C403.11.3	**Minimum Piping Insulation Thickness**	*40% Glycol water piping insulation: 1½ - 2 inches Refrigerant insulation: 1.5 inches Cold water make up insulation: 1 inch*	*Refrigerant insulation: <40F, 1.5 inches*	*Refrigerant insulation: 1.5 inches*	*See mechanical specifications*
C405.2	**Lighting Controls**	*Occupancy Sensor, Dimming, Manual Switches*	*Required occupancy sensor, time clock, and manual switches provided.*	Provided	See EN-002, A-011
C405.3.2	Interior Lighting Power Allowance	Space by Space Method: Corridor, Toilets, Labs	See Table C405.3.2(2)	See "Lighting Power Density Calculation" table	See EN-002, A-011
C408.2	**Mechanical, renewable energy, and service water heating systems commissioning and completion requirements**	*Commissioning*	*Mechanical systems shall be commissioned and completed in accordance with Section C408*	*Commissioning is required for this project per requirements*	*See mechanical drawing M-802*

LIGHTING POWER DENSITY CALCULATION

ROOM	TYPE	AREA (SF)	L.P.D. ALLOWED (W/SF)	POWER (W)	POWER ALLOWED
CORRIDORS	CORRIDOR	4500	0.44	2540.4	1980
TOILETS	TOILET	500	0.74	200	370
LABS	LAB	4,800	1.04	3642.7	4992
TOTAL		9800	0.74	6383.1	7252

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2025 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT Science Lab Renovation

Project No. 2449

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LIGHTING DESIGNER
JEFFREY NASH LIGHTING DESIGN
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SITE PLAN:



SUBMITTAL:

100% Construction Documents

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2026.03.31
	100% CONSTRUCTION DOCUMENT	2026.08.19
	ISSUED FOR DOB FILING	2026.10.21
	100% BID DOCUMENTS	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: SC CHECKED BY: SB

SCALE: NTS PROJECT#: 8969.109

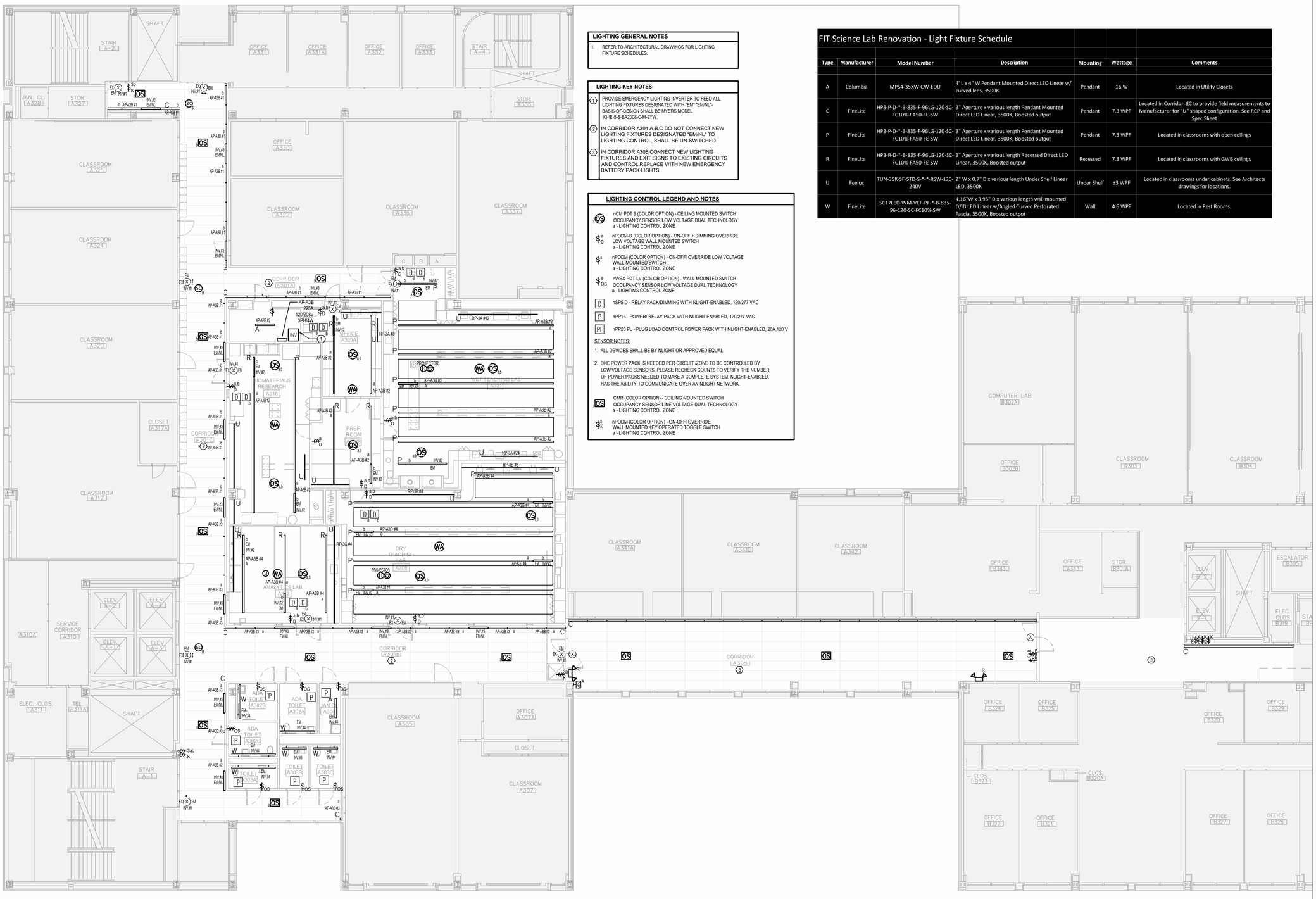
SHEET TITLE:

ENERGY COMPLIANCE SHEET #1

DOB NOW:# EN-M01470747-S1

SHEET NUMBER:

EN-001.00



1 **3RD FLOOR PLAN**
1/8"=1'-0"

LIGHTING GENERAL NOTES

1. REFER TO ARCHITECTURAL DRAWINGS FOR LIGHTING FIXTURE SCHEDULES.

LIGHTING KEY NOTES:

1. PROVIDE EMERGENCY LIGHTING INVERTER TO FEED ALL LIGHTING FIXTURES DESIGNATED WITH "EM" "EM/NL"- BASIS-OF-DESIGN SHALL BE MYERS MODEL #3-IE-5-S-BA2008-C-M-2YW.
2. IN CORRIDOR A301 A,B,C DO NOT CONNECT NEW LIGHTING FIXTURES DESIGNATED "EM/NL" TO LIGHTING CONTRO_, SHALL BE UN-SWITCHED.
3. IN CORRIDOR A308 CONNECT NEW LIGHTING FIXTURES AND EXIT SIGNS TO EXISTING CIRCUITS AND CONTROL REPLACE WITH NEW EMERGENCY BATTERY PACK LIGHTS.

LIGHTING CONTROL LEGEND AND NOTES

- nCM PDT 9 (COLOR OPTION) - CEILING MOUNTED SWITCH OCCUPANCY SENSOR LOW VOLTAGE DUAL TECHNOLOGY a - LIGHTING CONTROL ZONE
- nPODM-D (COLOR OPTION) - ON-OFF + DIMMING OVERRIDE LOW VOLTAGE WALL MOUNTED SWITCH a - LIGHTING CONTROL ZONE
- nPODM (COLOR OPTION) - ON-OFF/ OVERRIDE LOW VOLTAGE WALL MOUNTED SWITCH a - LIGHTING CONTROL ZONE
- nWSX PDT LV (COLOR OPTION) - WALL MOUNTED SWITCH OCCUPANCY SENSOR LOW VOLTAGE DUAL TECHNOLOGY a - LIGHTING CONTROL ZONE
- D nSP5 D - RELAY PACK/DIMMING WITH NLIGHT-ENABLED, 120/277 VAC
- P nPP16 - POWER/ RELAY PACK WITH NLIGHT-ENABLED, 120/277 VAC
- PL nPP20 PL - PLUG LOAD CONTROL POWER PACK WITH NLIGHT-ENABLED, 20A, 120 V

SENSOR NOTES:

1. ALL DEVICES SHALL BE BY NLIGHT OR APPROVED EQUAL
2. ONE POWER PACK IS NEEDED PER CIRCUIT /ZONE TO BE CONTROLLED BY LOW VOLTAGE SENSORS. PLEASE RECHECK COUNTS TO VERIFY THE NUMBER OF POWER PACKS NEEDED TO MAKE A COMPLETE SYSTEM. NLIGHT-ENABLED, HAS THE ABILITY TO COMMUNICATE OVER AN NLIGHT NETWORK.

- CMR (COLOR OPTION) - CEILING MOUNTED SWITCH OCCUPANCY SENSOR LINE VOLTAGE DUAL TECHNOLOGY a - LIGHTING CONTROL ZONE
- nPODM (COLOR OPTION) - ON-OFF/ OVERRIDE WALL MOUNTED KEY OPERATED TOGGLE SWITCH a - LIGHTING CONTROL ZONE

FIT Science Lab Renovation - Light Fixture Schedule

Type	Manufacturer	Model Number	Description	Mounting	Wattage	Comments
A	Columbia	MPS4-35XW-CW-EDU	4' L x 4" W Pendant Mounted Direct LED Linear w/ curved lens, 3500K	Pendant	16 W	Located in Utility Closets
C	FineLite	HP3-P-D-*-B-835-F-96LG-120-SC-FC10%-FAS0-FE-SW	3" Aperture x various length Pendant Mounted Direct LED Linear, 3500K, Boosted output	Pendant	7.3 WPF	Located in Corridor. EC to provide field measurements to Manufacturer for "U" shaped configuration. See RCP and Spec Sheet
P	FineLite	HP3-P-D-*-B-835-F-96LG-120-SC-FC10%-FAS0-FE-SW	3" Aperture x various length Pendant Mounted Direct LED Linear, 3500K, Boosted output	Pendant	7.3 WPF	Located in classrooms with open ceilings
R	FineLite	HP3-R-D-*-B-835-F-96LG-120-SC-FC10%-FAS0-FE-SW	3" Aperture x various length Recessed Direct LED Linear, 3500K, Boosted output	Recessed	7.3 WPF	Located in classrooms with GWB ceilings
U	Feelux	TUN-35K-SF-STD-S-*-*-RSW-120-240V	2" W x 0.7" D x various length Under Shelf Linear LED, 3500K	Under Shelf	±3 WPF	Located in classrooms under cabinets. See Architects drawings for locations.
W	FineLite	SC17LED-WM-VCF-PF-*-B-835-96-120-SC-FC10%-SW	4.16"W x 3.95" D x various length wall mounted D/ID LED Linear w/Angled Curved Perforated Fascia, 3500K, Boosted output	Wall	4.6 WPF	Located in Rest Rooms.

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NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2025 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT Science Lab Renovation

Project No. 2449

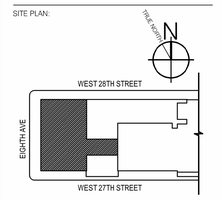
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212.206.8355

SITE PLAN:



SUBMITTAL:

100% Construction Documents

ISSUE / REVISION:

No.	DESCRIPTION	DATE
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SEAL & SIGNATURE:

DRAWN BY: GV CHECKED BY: GV

SCALE: 1/8"=1'-0"

PROJECT#: 8969.109

SHEET TITLE:

ENERGY COMPLIANCE SHEET #2

DOB NOW# EN-M01470747-S1

SHEET NUMBER:

EN-002.00

PLUMBING SYMBOLS

	DOMESTIC COLD WATER PIPING
	DOMESTIC HOT WATER PIPING (120°)
	DOMESTIC HOT WATER RETURN PIPING (120°)
	VENT PIPING
	SOIL, WASTE OR SANITARY PIPING
	BURIED PIPING
L	LEADER PIPING OR STORM (ST)
140°	DOMESTIC HOT WATER PIPING (140°)
85°	HOT WATER TEPID (85°)
CW(S)	DOMESTIC WATER STREET PRESSURE OR INCOMING SERVICE
HW(S)	DOMESTIC HOT WATER STREET PRESSURE
CW(S)	DOMESTIC WATER STREET PRESSURE
G	GAS PIPING (LOW PRESSURE)
AV	ACID VENT PIPING
AVR	ACID RELIEF VENT PIPING
AW	ACID WASTE PIPING
IW	INDIRECT WASTE PIPING
	CLEAN OUT/PLUGGED OUTLET
	CAPPED OUTLET
	CLEAN-OUT DECK PLATE (FLOOR PLAN)
	P-TRAP (FLOOR PLAN)
	HOSE BIB (W/VB)
	VALVE ON VERTICAL
	ELBOW TURNED UP
	ELBOW TURNED DOWN
	BOTTOM PIPE CONNECTION
	TOP PIPE CONNECTION
	SLOPE CHANGE IN PIPE ELEVATION (ROLL DOWN)
OPEN CLOSED	GATE VALVE
	GLOBE VALVE
	CHECK VALVE
	FIXTURE STOP VALVE
	PRESSURE REDUCING VALVE (PRV)
OPEN CLOSED	OUTSIDE SCREW & YOKE (OS & Y) VALVE

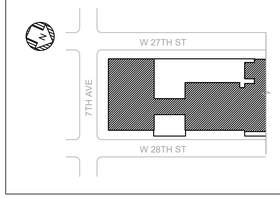
	THERMOSTATIC MIXING/3 WAY VALVE
OPEN CLOSED	BALL VALVE
	ARROW INDICATES DIRECTION OF FLOW
	CAPPED PIPE WITH SHUT-OFF VALVE
	TRAP (RISER DIAGRAM)
	VENT THRU ROOF (RISER DIAGRAM)
P.D/F.D R.D P.D	FLOOR/AREA/ROOF OR PLENUM DRAIN (PLAN VIEW)
P.D/F.D R.D P.D	FLOOR, AREA ROOF DRAIN (RISER DIAGRAM)
RPZ	REDUCED PRESSURE ZONE BACKFLOW
	HOUSE TRAP/RUNNING TRAP
PLAN = RISER	DUPLEX WATER SUPPLY PUMPS
PLAN = RISER	TRIPLEX WATER SUPPLY PUMPS
PLAN RISER	DUPLEX SUBMERSIBLE PUMPS
PLAN RISER	SIMPLEX SUBMERSIBLE PUMP
P # PLUMBING (CW, HW, S, V) RISER	RISER SERVICE RISER NUMBER
G # GAS RISER DESIGNATION	RISER SERVICE RISER NUMBER
L # LEADER RISER DESIGNATION	RISER SERVICE RISER NUMBER
# C-###/ DETAIL	DETAIL DRAWING LOCATION
# P-## SECTION	DETAIL DRAWING LOCATION
#	REVISION NUMBER
	CONNECT NEW WORK TO EXISTING
	DISCONNECT EXISTING WORK & CAP

PLUMBING ABBREVIATIONS

AC	AIR CONDITIONING	FIN	FINISH(ED)	OF	OVERFLOW
AD	ACCESS DOOR	FIN FL	FINISH(ED) FLOOR	PAN	PANEL
ADJ	ADJUSTABLE	FIN GR	FINISH(ED) GRADE	PLBG	PLUMBING
AFF	ABOVE FINISHED FLOOR	FL	FLOOR	PRV	PRESSURE REDUCING VALVE
AP	ACCESS PANEL	FU	FIXTURE UNITS	PSIG	POUNDS PER SQUARE INCH (GAUGE)
AV	ACID VENT	FT	FEET	PTN	PARTITION
AVR	ACID RELIEF VENT	FXT	FIXTURE	PVDF	POLYVINYLIDENE FLUORIDE
AVTR	ACID VENT THRU ROOF	GA	GAUGE	RCV	RISER CONTROL VALVE
AW	ACID WASTE	GC/CM	GENERAL CONTRACTOR/CONST. MANAGER	RD	ROOF DRAIN
BFP	BACKFLOW PREVENTER	GAL	GALLONS	REQT'S	REQUIREMENTS
BLDG	BUILDING	GALV	GALVANIZED	REV	REVISED
BOP	BOTTOM OF PIPE	GPM	GALLONS PER MINUTE	RPM	REVOLUTIONS PER MINUTE
BR	BRANCH	HB	HOSE BIBB	RPZ	REDUCED PRESSURE ZONE BACKFLOW PREVENTER
BSMT	BASEMENT	HGT	HEIGHT	RV	RELIEF VALVE
CF	CUBIC FEET	HORIZ	HORIZONTAL	S	SANITARY/SOIL
CI	CAST IRON	HP	HORSEPOWER/HIGH POINT	SA	SHOCK ABSORBER
CLG	CEILING	HR	HOUR	SCHED	SCHEDULE
CO	CAPPED OUTLET	HVAC	HEATING, VENTILATION, & AIR CONDITIONING	SD	SUMP DISCHARGE
CODP	CLEANOUT DECK PLATE	HW	HOT WATER	SECT	SECTION
COL	COLUMN	HWC	HOT WATER CIRCULATION	SH	SHOWER
CONC	CONCRETE	HWH	HOT WATER HEATER	SHT	SHEET
CONN	CONNECTION	HZ	HIGH ZONE	SK	SINK
CONST	CONSTRUCTION	ID	INSIDE DIAMETER	SLV	SLEEVE
CONT	CONTINUATION	IE	INVERT ELEVATION	SIM	SIMILAR (TO)
CORR	CORRIDOR	INSUL	INSULATION	SS	STAINLESS STEEL
COWP	CLEANOUT WALL PLATE	IW	INDIRECT WASTE	SQ	SQUARE
CS	CUP SINK	JC	JANITOR'S CLOSET	SQ.FT.	SQUARE FOOT (#/#)
CV	CHECK VALVE	L	LEADER	SP	STREET PRESSURE
CW	COLD WATER	LAB	LABORATORY	STD	STANDARD
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY	LAV	LAVATORY	STOR	STORAGE
DET	DETAIL	LP	LOW POINT	STRUCT	STRUCTURAL
DF	DRINKING FOUNTAIN	LZ	LOW ZONE	SUSP	SUSPENDED
DIA	DIAMETER	MAX	MAXIMUM	TDH	TOTAL DYNAMIC HEAD
DIAG	DIAGONAL	MECH	MECHANICAL	TEMP	TEMPORARY
DIAM	DIAMETER	MEMB	MEMBRANE	THRU	THROUGH
DIM	DIMENSION	MER	MECHANICAL EQUIPMENT ROOM	TOS	TOP OF SLAB
DN	DOWN	MEZZ	MEZZANINE	TP	TRAP PRIMER
DR	DRAIN	MFR	MANUFACTURER	TTB	TIGHT TO BEAM
DWG	DRAWING	MH	MANHOLE	TYP.	TYPICAL
EA	EACH	MIN	MINIMUM	UON	UNLESS OTHERWISE NOTED
EL	ELEVATION	MISC	MISCELLANEOUS	UR	URINAL
ELEC	ELECTRICAL	MTD	MOUNTED	V	VENT
EMER	EMERGENCY	MTL	METAL	VB	VACUUM BREAKER
EMR	ELEVATOR MACHINE ROOM	NC	NORMALLY CLOSED	VERT	VERTICAL
ENTR	ENTRANCE	NIC	NOT IN CONTRACT	VTR	VENT THROUGH ROOF
EQUIP	EQUIPMENT	No	NUMBER	W	WASTE
ES	EMERGENCY SHOWER	NO	NORMALLY OPEN	W/	WITH
EW	EMERGENCY EYEWASH	NOM	NOMINAL	WC	WATER CLOSET
EWH	ELECTRIC WATER HEATER	NTS	NOT TO SCALE	WH	WALL HYDRANT
EXIST	EXISTING	NFWH	NON FREEZE WALL HYDRANT	WP	WATER PROOFING / WATER PROOFED
FAI	FRESH AIR INTAKE	NFGH	NON FREEZE GROUND HYDRANT	WSFU	WATER SERVICE FIXTURE UNITS
FD	FLOOR DRAIN	OC	ON CENTER		
FF	FINISH FLOOR	OD	OVERFLOW DRAIN		

PLOT PLAN AND ZONING DATA

PROJECT ADDRESS: 344 8TH AVE NEW YORK, NY 10001
TAX BLOCK: 777
TAX LOT: 37



NYC DOB SPECIAL INSPECTION NOTES

1. AN INDEPENDENT SPECIAL INSPECTOR SHALL BE RETAINED TO PERFORM SPECIAL INSPECTIONS AS WELL AS FILE FORM TR-1 FOR PLUMBING SYSTEM DESIGN AS DOCUMENTED ON THESE PLANS IN ACCORDANCE WITH THE NYC BUILDING CODE.
2. SPECIAL INSPECTION REQUIRED FOR FIRE-RESISTANT PENETRATIONS AND JOINTS PER 2022 NYCBC 1705.17.
3. SPECIAL INSPECTION REQUIRED FOR POST-INSTALLED ANCHORS PER 2022 NYCBC 1705.37.
4. ENERGY CODE COMPLIANCE INSPECTION REQUIRED PER 2022 NYCBC 110.3.5.

NYC FLOOD HAZARD AREA NOTES

- FEMA FLOOD MAPS OBTAINED FROM FEMA FLOOD MAP SERVICE CENTER WEBSITE. DESIGN APPLICANT MAKES NO CLAIM AS TO THEIR ACCURACY.
- PROPERTY IS NOT IN SPECIAL FLOOD HAZARD AREA PER EFFECTIVE 2007 FIRM.

2022 NYC PLUMBING NOTES

THE PLUMBING SYSTEMS (SANITARY, WASTE, STORM, VENT, GAS, WATER DISTRIBUTION) AND ALL ASSOCIATED EQUIPMENT WILL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE FULL REQUIREMENTS OF THE 2022 BUILDING CODE OF THE CITY OF NEW YORK AS CITED IN CHAPTER 29, THE 2022 NEW YORK CITY PLUMBING CODE AND THE 2022 FUEL GAS CODE.

1. THE SANITARY SYSTEM SHALL BE PROVIDED IN FULL ACCORDANCE WITH THE GENERAL PROVISIONS OF CHAPTER 7.
2. THE MATERIALS USED IN THE PLUMBING SYSTEM SHALL BE PROVIDED IN FULL ACCORDANCE WITH CHAPTER 3.
3. EQUIPMENT HOOK-UP AND THE JOINING OF PIPING SHALL BE IN FULL COMPLIANCE WITH CHAPTER 4.
4. THE INSTALLATION OF FIXTURES SHALL BE IN FULL ACCORDANCE WITH SECTION PC CHAPTER 4.
5. TRAPS FOR FIXTURES AND DRAIN LINES SHALL BE PROVIDED AND CLEANOUTS INSTALLED IN FULL COMPLIANCE WITH CHAPTER 10 AND CLEANOUTS INSTALLED IN FULL COMPLIANCE WITH CHAPTER 7.
6. VERTICAL AND HORIZONTAL PIPING SHALL BE HUNG AND SUPPORTED AS DIRECTED IN SPECIFICATIONS AND WITH THE FULL COMPLIANCE WITH SECTION CHAPTER 3.
7. THE WATER SUPPLY SYSTEMS SHALL BE INSTALLED AND MAINTAINED IN FULL COMPLIANCE WITH CHAPTER 6.
8. THE SANITARY DRAINAGE SYSTEM SHALL BE SIZED AND INSTALLED IN FULL COMPLIANCE WITH SECTIONS CHAPTER 7.
9. THE VENT PIPING FOR THE SANITARY DRAINAGE SYSTEM SHALL BE INSTALLED IN FULL COMPLIANCE WITH CHAPTER 9.
10. THE STORM DRAINAGE SYSTEM AND PIPING SHALL BE INSTALLED IN FULL COMPLIANCE WITH CHAPTER 11.
11. RODENT PROOFING SHALL BE IN ACCORDANCE WITH SECTION PC 304.
12. TEMPORARY TOILET FACILITIES SHALL BE PROVIDED FOR WORKMAN AS PER SECTION PC 311.
13. ALL TRENCHING SHALL BE DONE IN ACCORDANCE WITH SECTION PC 306.

PLUMBING DEMOLITION NOTES

1. THE CONTRACTOR SHALL INCLUDE IN HIS PRICE ALL COSTS ASSOCIATED WITH REMOVALS AND RELOCATIONS OF PLUMBING WORK AS DESCRIBED ON THE DRAWINGS AND IN THE SPECIFICATIONS WITH ALLOWANCES FOR EXPECTED OR UNFORESEEN DIFFICULTIES WHEN CONCEALED WORK HAS BEEN EXPOSED. NO CLAIMS FOR ADDITIONAL WORK ASSOCIATED WITH DEMOLITION WILL BE ACCEPTED, EXCEPT IN CERTAIN CASES CONSIDERED JUSTIFIABLE BY THE ARCHITECT.
2. THE CONTRACTOR SHALL REMOVE AND/OR RELOCATE ALL EXISTING PLUMBING WORK WHICH INTERFERES WITH THE NEW ARCHITECTURAL LAYOUTS. ALL SYSTEMS WHICH ARE NO LONGER REQUIRED TO FUNCTION SHALL BE REMOVED BACK TO ACTIVE LINES AND SHALL BE CAPPED/PLUGGED OR VALVED OFF AS NEEDED.
3. THE CONTRACTOR SHALL PERFORM DEMOLITION AND REMOVAL WORK WITH MINIMUM INTERFERENCE TO FUNCTIONING PLUMBING SYSTEMS. ALL AFFECTED SYSTEMS SHALL BE RECONNECTED AND RESTORED.
4. DEMOLITION AND REMOVAL WORK SHALL BE PERFORMED IN A NEAT AND WORKMANLIKE MANNER. THE CONTRACTOR SHALL PATCH, REPAIR, OR OTHERWISE RESTORE ANY DAMAGED INTERIOR OR EXTERIOR BUILDING SURFACE TO ITS ORIGINAL CONDITION.
5. THE CONTRACTOR SHALL REMOVE ALL PIPING SUPPORTS, ETC. FROM PARTITIONS THAT ARE TO BE REMOVED. WHERE THE REMOVAL OF THESE ITEMS DISRUPTS EXISTING PIPING THAT IS TO REMAIN, THE CONTRACTOR SHALL INSTALL AND PROVIDE BYPASS CONNECTIONS AS NECESSARY.
6. ALL PIPING WHICH BECOMES EXPOSED DURING THE ALTERATION WORK SHALL BE REMOVED AND REROUTED CONCEALED BEHIND FINISHED SURFACES.
7. PORTIONS OF MAINS TO BE REMOVED OR ABANDONED AS A RESULT OF DEMOLITION WORK, BUT ARE REQUIRED TO REMAIN ACTIVE, SHALL BE CUT AT CONVENIENT LOCATIONS, REROUTED AND RECONNECTED.
8. THE CONTRACTOR SHALL NOTIFY THE OWNER AT THE APPROPRIATE TIME OF THE PROJECTED DEMOLITION AND PHASING SCHEDULE SO THAT REMOVAL OR RELOCATION OF AFFECTED UTILITIES MAY BE CARRIED OUT IN COORDINATION WITH THE PROJECT REQUIREMENTS.
9. ALL EXISTING MATERIAL AND EQUIPMENT IN USABLE CONDITION, WHICH IS TO BE REMOVED UNDER THIS CONTRACT SHALL REMAIN THE PROPERTY OF THE OWNER OR SHALL BE DISPOSED OF BY THE PLUMBING CONTRACTOR, AS DIRECTED BY THE OWNER.
10. ARRANGE TO WORK CONTINUOUSLY, INCLUDING OVERTIME, IF REQUIRED, TO ASSURE THAT SYSTEMS WILL BE SHUT DOWN ONLY DURING TIME REQUIRED TO MAKE THE NECESSARY CONNECTIONS TO THE EXISTING SYSTEMS.
11. ALL PIPING TO BE REMOVED SHALL BE PROPERLY PLUGGED OR CAPPED SO THAT UPON COMPLETION OF ALL NEW WORK, ALL ABANDONED PIPING SHALL BE REMOVED FROM FINISHED AREAS.
12. NO DEAD ENDS SHALL BE LEFT ON ANY PIPING UPON COMPLETION OF THE PROJECT.
13. ALL EXISTING PLUMBING PIPING AND OTHER BUILDING COMPONENTS REQUIRED TO REMAIN, BUT INTERFERING WITH THE PROJECT, SHALL BE RELOCATED AND RECONNECTED USING MATERIALS AND PROCEDURES IN ACCORDANCE WITH THE APPLICABLE CODES AND STANDARDS OF THIS CONTRACT.

GENERAL PLUMBING NOTES

1. EACH BIDDER SHALL VISIT THE SITE AND BECOME INFORMED AS TO THE CONDITION OF THE PREMISES AND THE EXTENT AND CHARACTER OF WORK REQUIRED. NO ADDITIONAL COMPENSATION WILL BE APPROVED DUE TO THE FIELD CONDITIONS.
2. ALL EXISTING SYSTEMS SHALL BE LEFT IN PERFECT WORKING ORDER UPON COMPLETION OF ALL NEW WORK.
3. EXACT SIZES AND LOCATIONS OF ALL EXISTING PIPING SHALL BE VERIFIED ON THE SITE.
4. NO EXISTING OR REMOVED PIPING SHALL BE REUSED UNLESS OTHERWISE INDICATED.
5. THIS CONTRACTOR SHALL NOT INTERRUPT ANY OF THE SERVICES OF THE EXISTING BUILDING NOR INTERFERE WITH THE SERVICES IN ANY WAY WITHOUT THE EXPRESSED PERMISSION OF THE OWNER. SUCH INTERRUPTIONS AND INTERFERENCES SHALL BE MADE AS BRIEF AS POSSIBLE.
6. UNDER NO CIRCUMSTANCES WILL THIS CONTRACTOR OR HIS WORKMEN BE PERMITTED TO USE ANY PART OF THE BUILDING AS A SHOP, EXCEPT PART DESIGNATED BY THE OWNER FOR SUCH PURPOSES.
7. UNNECESSARY NOISE SHALL BE AVOIDED AT ALL TIMES AND NECESSARY NOISE SHALL BE REDUCED TO A MINIMUM.
8. WHERE THE WORK MAKES TEMPORARY SHUT DOWN OF SERVICES UNAVOIDABLE, THEY SHALL BE MADE AT NIGHT OR AT SUCH TIMES THAT WILL CAUSE THE LEAST INTERFERENCE WITH THE ESTABLISHED OPERATING ROUTINE OF THE BUILDING.
9. THIS CONTRACTOR SHALL ARRANGE ALL WORK CONTINUOUSLY, INCLUDING OVERTIME AS REQUIRED, TO ASSURE THAT SERVICES WILL BE SHUT DOWN AND CUT-INS ONLY DURING THE TIME ACTUALLY REQUIRED TO MAKE THE NECESSARY CONNECTION TO EXISTING WORK.
10. THIS CONTRACTOR SHALL GIVE AMPLE WRITTEN NOTICE IN ADVANCE TO THE OWNER OF ANY REQUIRED SHUT DOWNS.
11. ANY AND ALL REQUIRED DEMOLITION WORK TO BE PERFORMED ABOVE EXISTING SUSPENDED CEILINGS AND FURRED OUT WALLS SHALL BE DONE AT THE TIME WHEN THE EXISTING CEILINGS AND FURRED OUT WALLS ARE REMOVED BY THE GENERAL CONTRACTOR.
12. TO ENSURE CONTINUOUS OPERATION, MAKE ALL NECESSARY TEMPORARY CONNECTIONS BETWEEN NEW AND EXISTING WORK. ALL COST RESULTING FROM TEMPORARY SHUTDOWNS SHALL BE BORNE BY THIS CONTRACTOR.
13. ALL VENT, HOT WATER CIRCULATION, HOT AND COLD WATER PIPING ARE AT CEILING OR IN HUNG CEILING: EXCEPT IN PIPE CHASES OR OTHERWISE NOTED.
14. CONTRACTOR SHALL CHECK AND VERIFY THE EXACT LOCATION OF ALL PIPE PENETRATIONS, PIPE ELEVATIONS, DRAINS, ETC.
15. ACCESS DOORS SHALL BE PROVIDED FOR ALL CLEANOUTS, VALVES, FLUSH VALVES, AND ANY OTHER EQUIPMENT AND ACCESSORIES THAT MAY REQUIRE ACCESS FOR MAINTENANCE OR OPERATION WHICH ARE LOCATED BEHIND WALLS AND PARTITIONS OR CONCEALED IN HUNG CEILINGS. COORDINATE INSTALLATION WITH GENERAL CONTRACTOR.
16. THIS CONTRACTOR SHALL OBTAIN A COPY OF THE BUILDING RULES AND REGULATIONS AND PROVIDE ALL WORK AS REQUIRED TO CONFORM TO ALL REQUIREMENTS.
17. THIS CONTRACTOR SHALL PROVIDE ALL WORK AT THE CEILING OF THE FLOOR BELOW AS INDICATED ON THE DRAWINGS. COORDINATE EXACT ROUTING OF PIPING IN THE FIELD WITH EXISTING CONDITIONS AND WORK OF OTHER TRADES. ALL WORK SHALL BE SCHEDULED AND COORDINATED TO ACCOMMODATE TENANT AND BUILDING ENGINEER.
18. THIS CONTRACTOR SHALL PROVIDE CUTTING AND PATCHING OF ALL WORK AS REQUIRED INCLUDING WORK OUTSIDE OF THE GENERAL PROJECT LIMIT LINES (I.E. CEILING OF THE FLOOR BELOW).
19. THIS CONTRACTOR SHALL PROVIDE CAPPED/VALVED OUTLETS FOR FUTURE CONNECTIONS WHENEVER CONNECTING INTO AN EXISTING CAPPED/ VALVED OUTLET. SIZE OF NEW CAPPED/VALVED OUTLET SHALL MATCH EXISTING.

GENERAL PLUMBING FIXTURE NOTES

1. THIS CONTRACTOR SHALL PROVIDE ALL FIXTURES AS REQUIRED. REFER TO ARCHITECTURAL DOCUMENTS FOR PLUMBING FIXTURE SPECIFICATIONS.
2. ALL FIXTURES MUST COMPLY WITH THE NYC PLUMBING CODE INCLUDING MAXIMUM ALLOWABLE FLOW RATES AND WATERSENSE LABELING. NO CHANGE ORDERS WILL BE PERMITTED FOR WORK RELATED TO THE PURCHASE OR INSTALLATION OF NON-CODE COMPLIANT FIXTURES. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE CODE COMPLIANT PLUMBING FIXTURES.
3. THE EXACT LOCATION AND MOUNTING HEIGHTS OF ALL PLUMBING FIXTURES SHALL COMPLY WITH THE ARCHITECTURAL DRAWINGS.
4. ALL SINKS AND LAVATORIES THAT ARE HANDICAPPED ACCESSIBLE SHALL BE PROVIDED WITH THERMAL AND IMPACT INSULATION/SHIELDING KITS ON SUPPLIES, TRAPS, TAILPIECES AND WASTE OUTLETS.

PLUMBING DRAWING LIST

DWG No.	DRAWING NAME
P-001	PLUMBING NOTES, SYMBOLS, ABBREVIATIONS & DRAWING LIST
P-012	2ND FLOOR PLUMBING DEMOLITION PLAN
P-013	3RD FLOOR PLUMBING DEMOLITION PLAN
P-102	2ND FLOOR PLUMBING PLAN
P-103	3RD FLOOR PLUMBING PLAN
P-601	PLUMBING RISER DIAGRAMS
P-701	PLUMBING DETAILS & SCHEDULES

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FIT Science Lab Renovation

Project No. 2449

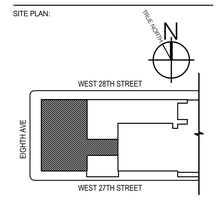
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SEAL & SIGNATURE:

DRAWN BY: --
CHECKED BY: --

SCALE: 1/8"=1'-0"

PROJECT#: 8969.109

SHEET TITLE:

PLUMBING NOTES, SYMBOLS, ABBREVIATIONS, & DRAWING LIST

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

P-001.00



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Project No. 2449

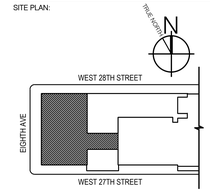
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SITE PLAN:



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PROJECT#: 8969.109

SHEET TITLE:

2ND FLOOR PLUMBING DEMOLITION PLAN

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

P-012.00

EX. 6" LDR
EX. 4" SAN
EX. 3" VENT
EX. 4" CW
EX. 2" HW
EX. 3/4" HWR

P 3

EX. 6" LDR
EX. 4" WASTE
EX. 3" VENT
EX. CW
EX. HW
EX. HWR

P 2

SHAFT
STAIR A-2
OFFICE A331
OFFICE A331A
OFFICE A332
OFFICE A333
STAIR A-4
SHAFT
JAN. CL. A326
STOR. A327
STOR. A339
OFFICE A330
CLASSROOM A325
EXISTING WASTE PIPING IN CEILING OF 3RD FLOOR
CLASSROOM A322
CLASSROOM A336
CLASSROOM A337
CLASSROOM A324
C B A
CLOSET
STORAGE A318
CLASSROOM A320
NN A319
CLASSROOM A321A
CLOSET A317A
CORRIDOR A301
DRESSING ROOM A321E
CLASSROOM A321
CLASSROOM A321B
SOUND STUDIO A321D
EXIST. SINK TO BE REMOVED. CUT PIPING BACK TO SOURCE.
EXIST. TO REMAIN
CW DN
HW DN
4" W DN
4" V. DN
4" G DN
CLASSROOM A317
STORAGE A316
EXIST. 2" W UP TO REMAIN
2"
2"
3"
EXIST. 2" W UP TO REMAIN
CLASSROOM A312
PATTERN MAKING LAB A309
EXIST. TO REMAIN
CW UP
HW UP
4" W UP
4" G. UP
CLASSROOM A341A
CLASSROOM A341B
CLASSROOM A342
EXISTING 4" G. UP & DN.
EX. 4" SAN
EX. 3" VENT
EX. CW
EX. HW
EX. HWR
P 1
A310A
SPECIAL CORRIDOR A310
ELEV. A-1
ELEV. A-2
ELEV. A-3
ELEV. A-4
STOR. A340
EXIST. TO REMAIN
CW UP
HW UP
CORRIDOR A301
EXIST. TO REMAIN
CW UP
HW UP
2" W UP
EXIST. 3" W UP & DN TO BE OFFSET AND RECONNECTED ON FLOOR BELOW
CORRIDOR A308
EXIST. 4" SAN UP & DN 3" V UP & DN
(2) EXIST 3/4" HWR
EXIST. 3" FD
(4) EXIST. WC
(2) EXIST. UR
(2) EXIST. LAV
(3) EXIST. LAV
EXIST. US
ELEC. CLOS. A311
TEL. A311A
SHAFT
STAIR A-1
M. TOILET A302
W. TOILET A303
CLASSROOM A305
OFFICE A307A
CLOSET
CLASSROOM A307
EXIST. PLUMBING FIXTURES AND ASSOCIATED PIPING TO BE REMOVED AND CAPPED AT THE CEILING OF THIS FLOOR AND THE CEILING OF THE FLOOR BELOW.
EXIST. W UP
EXIST. V DN
EXIST. CW UP, HW UP, CW DN, HW DN — TO REMAIN
EXIST. CW UP, HW UP, CW DN, HW DN — TO BE REMOVED
COMPUTER LAB B302A
OFFICE B302B
CLASSROOM B303
CLASSROOM B304
OFFICE B343
OFFICE A343
STOR. B301A
ELEV. B-X
ELEV. B-1
SHAFT
ESCALATOR B305
ELEC. CLOS. B319
OFFICE B324
OFFICE B325
OFFICE B329
OFFICE B320
CLOS. B323
CLOS. B320A
OFFICE B322
OFFICE B321
OFFICE B327
OFFICE B328

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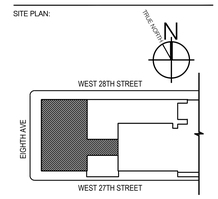
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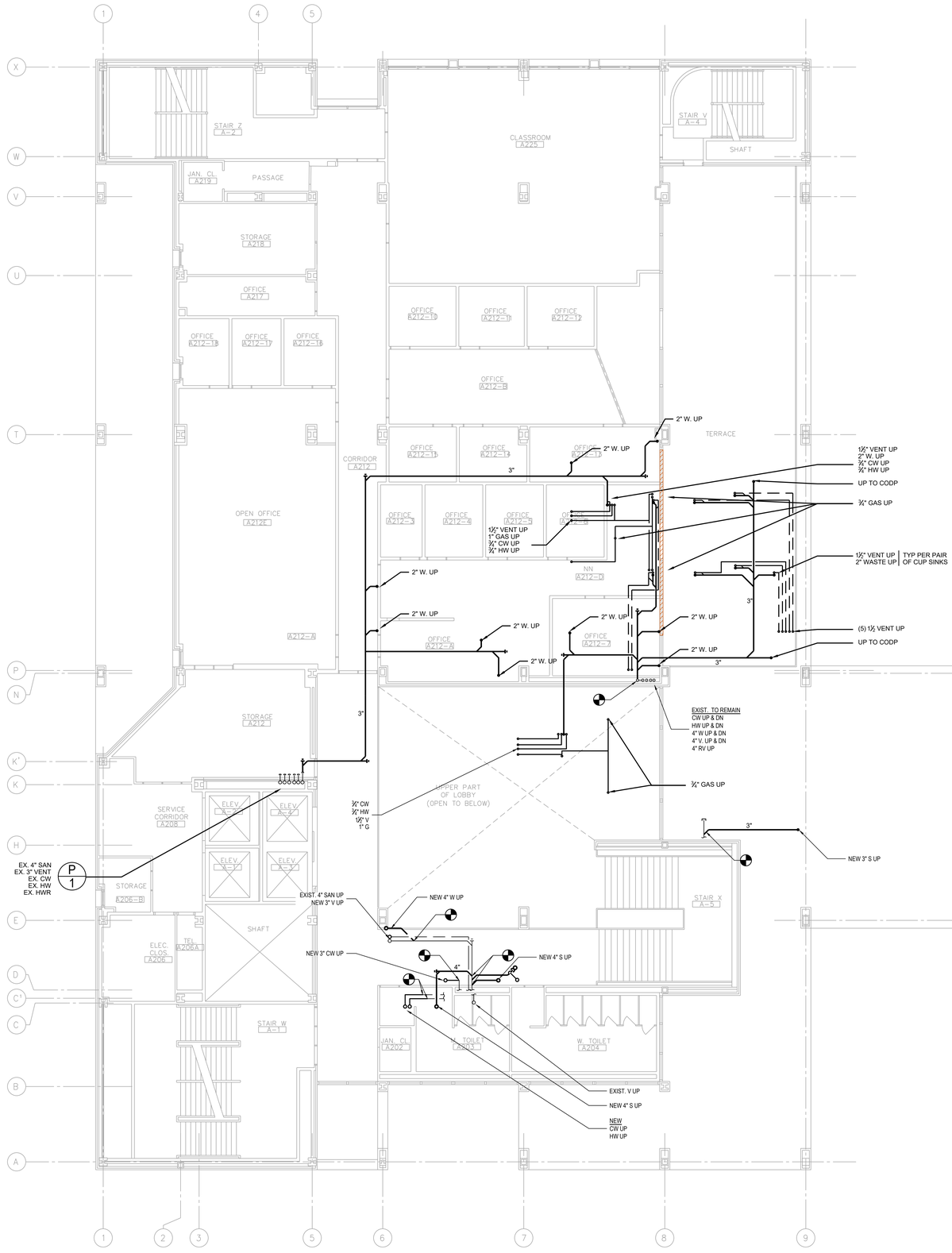
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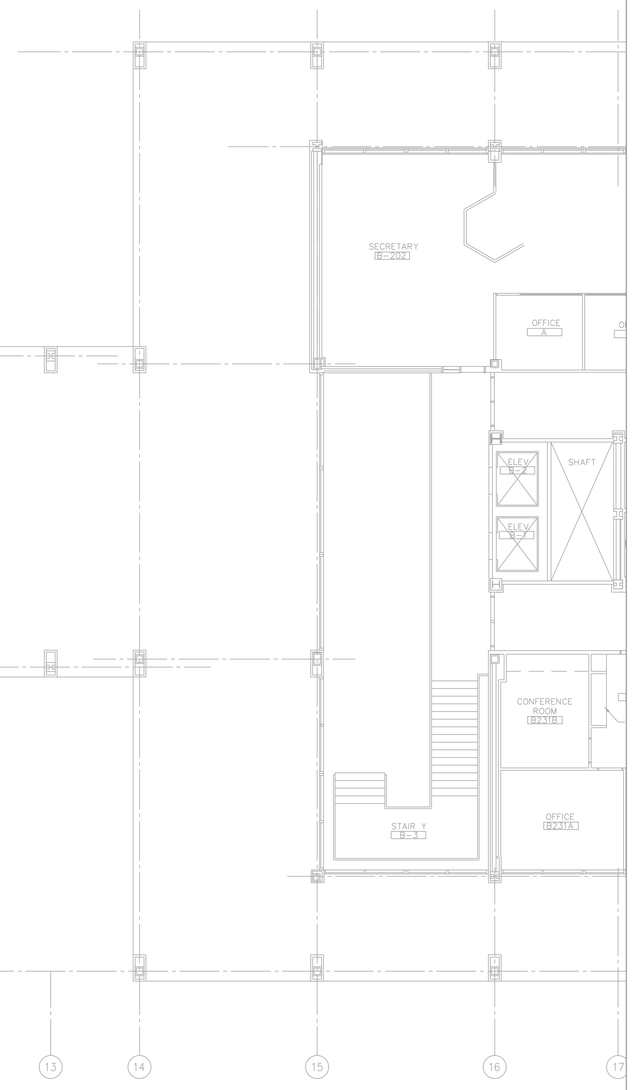
3RD FLOOR PLUMBING DEMOLITION PLAN

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

P-013.00





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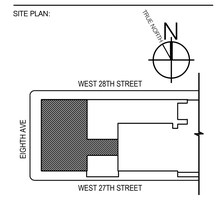
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PROJECT#: 8969.109

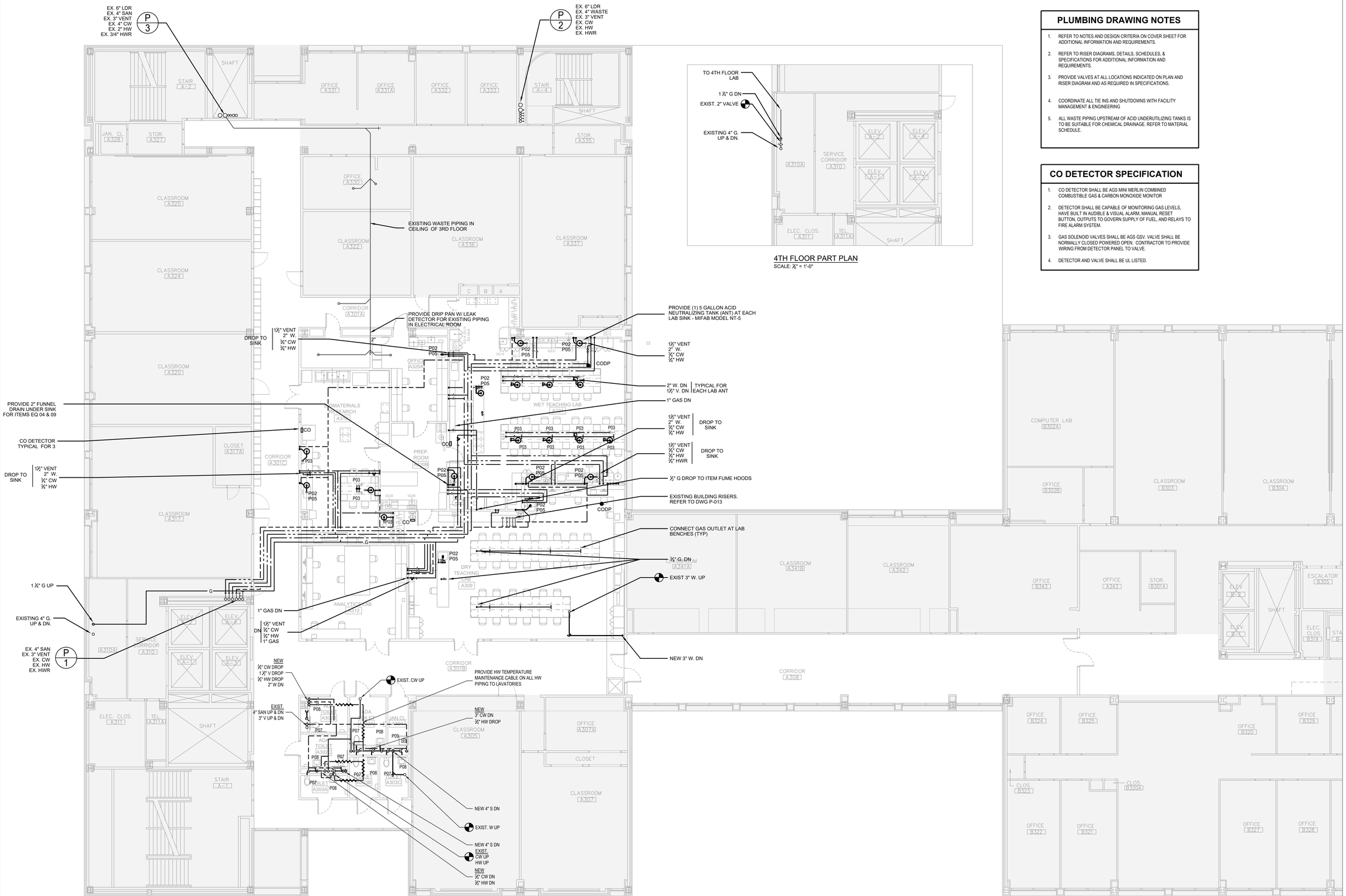
SHEET TITLE:

2ND FLOOR PLUMBING PLAN

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

P-102.00



4TH FLOOR PART PLAN
SCALE: ⅛" = 1'-0"

PLUMBING DRAWING NOTES

1. REFER TO NOTES AND DESIGN CRITERIA ON COVER SHEET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
2. REFER TO RISER DIAGRAMS, DETAILS, SCHEDULES, & SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
3. PROVIDE VALVES AT ALL LOCATIONS INDICATED ON PLAN AND RISER DIAGRAM AND AS REQUIRED IN SPECIFICATIONS.
4. COORDINATE ALL TIE INS AND SHUTDOWNS WITH FACILITY MANAGEMENT & ENGINEERING
5. ALL WASTE PIPING UPSTREAM OF ACID UNDERUTILIZING TANKS IS TO BE SUITABLE FOR CHEMICAL DRAINAGE. REFER TO MATERIAL SCHEDULE.

CO DETECTOR SPECIFICATION

1. CO DETECTOR SHALL BE AGS MINI MERLIN COMBINED COMBUSTIBLE GAS & CARBON MONOXIDE MONITOR
2. DETECTOR SHALL BE CAPABLE OF MONITORING GAS LEVELS, HAVE BUILT IN AUDIBLE & VISUAL ALARM, MANUAL RESET BUTTON, OUTPUTS TO GOVERN SUPPLY OF FUEL, AND RELAYS TO FIRE ALARM SYSTEM.
3. GAS SOLENOID VALVES SHALL BE AGS GSV. VALVE SHALL BE NORMALLY CLOSED POWERED OPEN. CONTRACTOR TO PROVIDE WIRING FROM DETECTOR PANEL TO VALVE.
4. DETECTOR AND VALVE SHALL BE UL LISTED.

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Project No. 2449

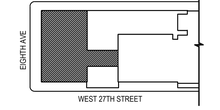
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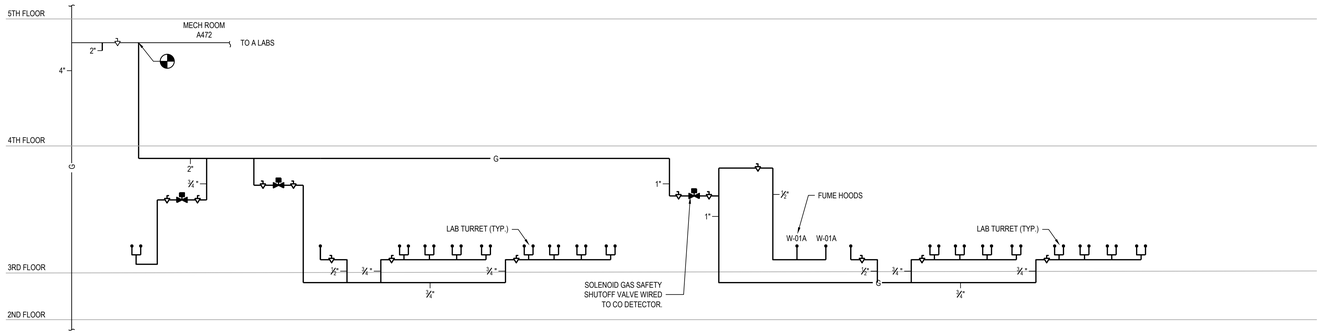
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3RD FLOOR PLUMBING PLAN

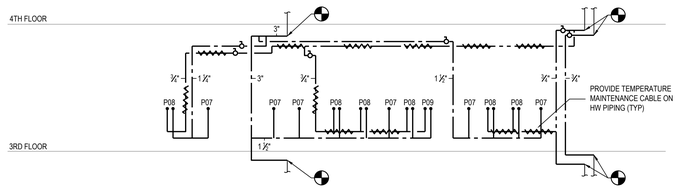
DOB NOW JOB# M01470747-S2

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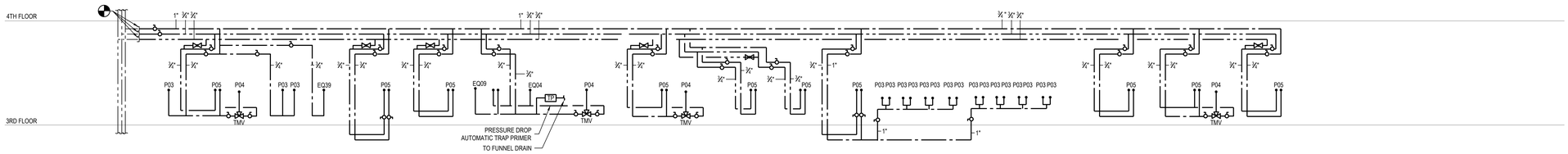
P-103.00



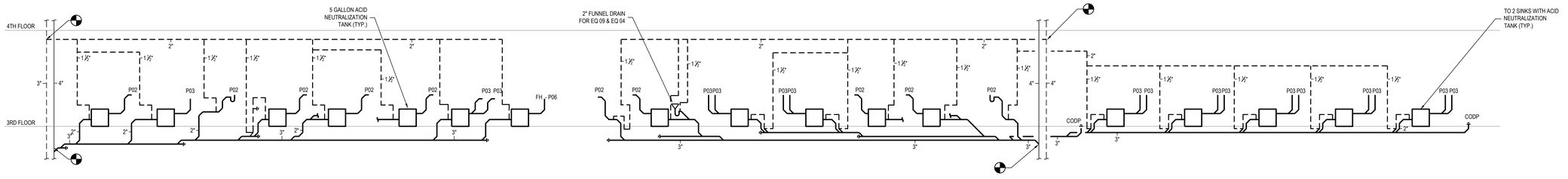
GAS PART RISER DIAGRAM



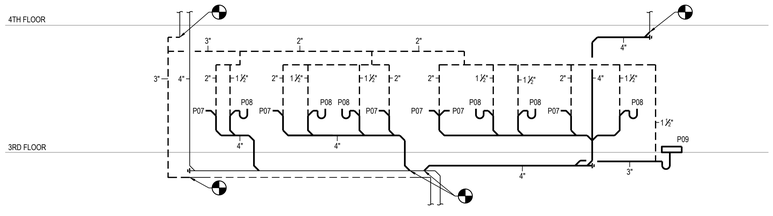
DOMESTIC WATER PART RISER DIAGRAM (TOILET ROOMS)



DOMESTIC WATER PART RISER DIAGRAM



SANITARY & VENT PART RISER DIAGRAM



SANITARY & VENT PART RISER DIAGRAM (TOILET ROOMS)

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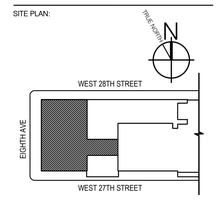
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PROJECT#: 8969.109

SHEET TITLE:

PLUMBING RISER DIAGRAMS

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

P-601.00

MATERIAL SCHEDULE

SYSTEMS	PIPE												FITTINGS																JOINTS					
	C.I.	STL SCHED. 40	DURION A.R.C.I.	SPENCER GALV. TUBE 16 GA.	GALVANIZED	C.T. "L"	C.T. "M"	D.I.W.P.	P.V.D.F.	STAINLESS STEEL	POLYPROPYLENE	P.V.C. SCHEDULE 80	C.I. NO-HUB	C.I. SOIL	C.I. DRAINAGE	STD C.I.-175# W.W.P.	DUCTILE IRON W/ GROOVED ENDS	COPPER	SS MECHANICAL FITTING	SCH 40 GALVANIZED STEEL	SOLDIER FITTINGS	P.V.C. SCHEDULE 80	P.V.D.F.	POLYPROPYLENE	BLACK	GALVANIZED	FUSEAL POLYPROPYLENE	THREADED	SOLDERED 95-5	SOCKET FUSED	BRAZED	NO HUB COUPLING	PUSH-ON JOINT - AWWA C11
C.W.						●																●							●					
H.W.						●																●							●					
H.W.R.						●																●							●					
SANITARY	●												●	●																		●		
SANITARY VENT	●												●	●																		●		
CHEMICAL LAB WASTE												●												●			●							
CHEMICAL LAB VENT												●												●			●							
INDIRECT WASTE						●																●												
LAB RO WATER									●														●							●				
COMPRESSED AIR						●												●													●			
VACUUM						●												●													●			
NATURAL GAS		●																										●						

ENERGY ANALYSIS FOR PLUMBING PIPING INSULATION, TABLE C404.4.1

DESCRIPTION	NOMINAL PIPE SIZE			
	< 1	1 TO < 1-1/2"	1-1/2 TO < 4	4 TO < 8
HOT WATER	1"	1"	1-1/2"	1-1/2"
COLD WATER	1/2"	1/2"	1"	1"

NOTE:
404.5 PIPE INSULATION. FOR AUTOMATIC CIRCULATING HOT WATER SYSTEMS, PIPING SHALL BE INSULATED WITH 1 INCH (25 MM) OF INSULATION HAVING A CONDUCTIVITY NOT EXCEEDING 0.27 BTU PER INCHH × FT2 × °F (1.53 W PER 25 MMM2 × K). THE FIRST 8 FEET (2438 MM) OF PIPING IN NONCIRCULATING SYSTEMS SERVED BY EQUIPMENT WITHOUT INTEGRAL HEAT TRAPS SHALL BE INSULATED WITH 0.5 INCH (12.7 MM) OF MATERIAL HAVING A CONDUCTIVITY NOT EXCEEDING 0.27 BTU PER INCHH × FT2 × °F (1.53 W PER 25 MMM2× K). SERVICE WATER HEATING EQUIPMENTS ARE PROVIDED WITH TEMPERATURE CONTROLLERS AS SPECIFIED ON NYC ENERGY CODE SECTION 504.3

TRAP PRIMER VALVES

MANUFACTURER	MODEL	POWER [V]	REMARKS
PPP	PR-500	N/A	INSTALL PER THE MANUFACTURERS INSTALLATION INSTRUCTIONS

* EACH DEVICE REQUIRING ELECTRICAL POWER TO BE COORDINATED WITH ELECTRICAL CONTRACTOR

PLUMBING FIXTURE CONNECTION SCHEDULE

NO.	FIXTURE	FINAL CONNECTION PIPE DIAMETER (IN)			
		CW	HW	DRAIN	VENT
SK	SINK	1/2"	1/2"	2"	1-1/2"
SS	SERVICE SINK	3/4"	3/4"	3"	2"
DF	DRINKING FOUNTAIN	1/2"	-	2"	1-1/2"
WC	WATER CLOSET	1-1/4"	-	4"	2"
UR	URINAL	3/4"	-	3"	2"
LAV	LAVATORY	1/2"	1/2"	1-1/2"	1-1/2"

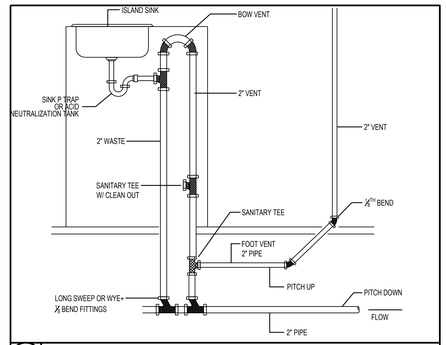
HOT WATER TEMPERATURE MAINTENANCE CABLE (HWAT)

HOT WATER TEMPERATURE MAINTENANCE CABLE SHALL BE CHROMALOX HWM HOT WATER MAINTENANCE HEAT TRACE CABLE. THE SYSTEM SHALL CONSIST OF THE SELF-REGULATING CABLE, CONNECTION KITS AND SPECIALIZED ELECTRONIC CONTROLS. THE WIRE SHALL BE TWIN 16 AWG COPPER BUSS WIRE. THE CABLE SHALL HAVE A SELF REGULATING COMPONENT THAT AUTOMATICALLY REGULATES THE ELECTRICAL RESISTANCE WITH VARYING TEMPERATURE. THE CABLE SHALL BE FLAME RETARDANT, CORROSION RESISTANT, AND FM APPROVED. PIPING AND CABLE SHALL BE INSULATED PER THE MANUFACTURERS REQUIREMENTS. THE CABLE SHALL BE CHROMALOX HWM10 -1CT (15 AMP -120V).

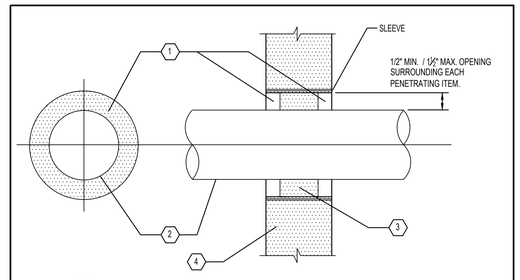
THE CABLE SHALL BE INSTALLED ON BRANCH HW PIPING FROM THE CONNECTION TO THE RISER AND EXTENDING TO THE LAST FIXTURE REQUIRING HOT WATER. THE HWAT HEATER, CONDUIT, WIRING, AND JUNCTION BOXES, INCLUDING ALL WIRING BACK TO PANELS SHALL BE PROVIDED BY THIS CONTRACTOR. GROUND FAULT CIRCUIT BREAKERS AND PANELS SHALL BE PROVIDED UNDER ANOTHER SECTION.

PLUMBING FIXTURE SCHEDULE

P01	UNDER MOUNT SINK - 1	REFER TO ARCHITECTS DOCUMENTS FOR SPECIFICATIONS
P02	UNDERMOUNT SINK - 2	
P03	CUP SINK W/ FAUCET	
P04	EYE WASH	
P05	FAUCET	
P06	RO FAUCET	
P07	WATER CLOSET	
P08	LAVATORY	
P09	JANITOR SINK	

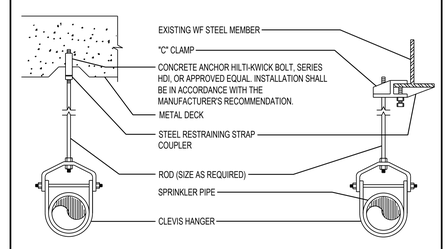


Island Sink Venting Installation
Not to Scale



NOTES:
1. FLAME SEAL PUTTY - MINIMUM OF 1" THICK
2. PIPE
3. STUFFED CERAMIC FIBER INSULATION
4. WALL OR FLOOR

Fire Stopping for Fire/Smoke Rated Wall/Floor Openings
Not to Scale



NOTES:
1. CLEVIS HANGERS REQUIRED ON PIPING LARGER THAN 1"

Typical Hanger Detail
Not to Scale

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NEW YORK CITY ENERGY CONSERVATION CODE

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Project No. 2449

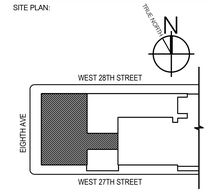
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SITE PLAN:



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100% Construction Documents

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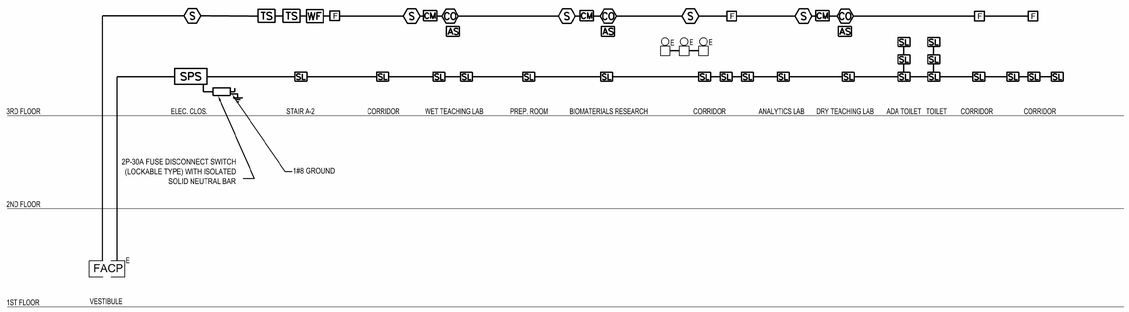
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SCALE: N.T.S
PROJECT#: 8969.109

SHEET TITLE:
PLUMBING DETAILS & SCHEDULES

DOB NOW JOB# M01470747-S2

SHEET NUMBER:
P-701.00



PARTIAL FIRE ALARM RISER DIAGRAM
N.T.S

FIRE ALARM NOTES:

1. PRIOR TO BID, CONTRACTOR SHALL CONTACT THE BUILDING FIRE ALARM MAINTENANCE CONTRACTOR TO OBTAIN PRICING FOR THE EQUIPMENT AND SERVICES LISTED BELOW WHICH MUST BE PROVIDED BY THAT CONTRACTOR.
2. ALL EQUIPMENT FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR AND SHALL BE PURCHASED FROM THE BUILDING FIRE ALARM MAINTENANCE CONTRACTOR TO TO ASSURE COMPATIBILITY WITH EXISTING FIRE ALARM SYSTEM.
3. REPROGRAMMING OF FIRE COMMAND STATION AND FINAL CONNECTIONS AT THE FIRE COMMAND STATION OR DATA GATHERING PANEL ARE BY BUILDING'S FIRE ALARM MAINTENANCE CONTRACTOR. INCLUDE PRICE FOR SAME IN BID PRICE.
4. INSTALL FIRE ALARM EQUIPMENT AT LOCATION INDICATED ON THE PLAN.
5. ALL CABLING SHALL BE TEFLON INSULATED RATED AT 150°C AND JACKETED, "NYC CERTIFIED", FIRE PROTECTION SERVICE APPROVED, WIRE GAUGE PER VENDOR'S REQUIREMENTS. PROVIDE SHIELD WIRING WHERE REQUIRED.
6. EXISTING BUILDING SYSTEM DEVICES SHOWN ARE TO REMAIN INTACT UNLESS OTHERWISE NOTED.
7. OBTAIN PERMISSION FROM BUILDING MANAGER PRIOR TO RUNNING WIRE FROM NEW FIRE ALARM DEVICES TO EXISTING FIRE COMMAND STATION OR DATA GATHERING PANELS.
8. ALL ROUTING OF CABLES TO FIRE COMMAND STATION SHALL BE DIRECTED AND APPROVED BY BUILDING MANAGER.
9. THE FIRE ALARM RISER DIAGRAM SHOWN IS AN INDICATION OF THE WORK REQUIRED AND SHALL BE USED AS GUIDE FOR DEVELOPING A COMPLETE SCOPE AND IS NOT A POINT-TO-POINT WIRING DIAGRAM. THE CONTRACTOR SHALL OBTAIN A POINT-TO-POINT WIRING DIAGRAM FROM THE BUILDING FIRE ALARM MAINTENANCE CONTRACTOR AND PERFORM ALL WORK IN ACCORDANCE WITH THAT DIAGRAM.
10. THE OPERATION OF THE FIRE ALARM INSTALLATION DOES NOT CONSTITUTE AN ACCEPTANCE OF THE WORK BY THE OWNER. FINAL ACCEPTANCE IS TO BE MADE AFTER THE CONTRACTOR HAS DEMONSTRATED THAT THE WORK FULFILLS THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS AND HAS FURNISHED ALL REQUIRED CERTIFICATES OF APPROVAL FROM THE STATE AUTHORITIES, MUNICIPAL AUTHORITIES AND UNDERWRITERS.
11. INCLUDE ALL FEES FOR FILING APPROVALS, AND FDNY INSPECTION AND RE-INPECTION OF THE FIRE ALARM INSTALLATION.
12. INSULATION OF FIRE ALARM CABLES SHALL BE MINIMUM 150° RATED AND SHALL BE UL APPROVED FOR USE IN N.Y.C..
13. ALL EXISTING FIRE ALARM DEVICES, WHETHER SHOWN ON PLANS OR NOT, SHALL REMAIN ACTIVE DURING DEMOLITION AND CONSTRUCTION.
14. DEVICES ARE TO BE MOUNTED PER MANUFACTURER'S INSTALLATION MANUAL.
15. THE INSTALLATION SHALL COMPLY WITH 2014 NYC CONSTRUCTION CODES AND NFPA 72 OF 2010. ALL ELECTRICAL WORK SHALL COMPLY WITH 2011 NYC ELECTRICAL CODE ARTICLE 760.
16. ALL EQUIPMENT/DEVICES USED SHALL BE APPROVED MANUFACTURERS THAT ARE LISTED FOR THEIR USE.
17. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED "SPECIAL INSPECTIONS" AND SHALL SUBMIT THE NAME AND QUALIFICATIONS OF THE INSPECTOR TO THE ENGINEER FOR REVIEW.
18. CONTRACTOR SHALL PROVIDE "AS-BUILT" DRAWINGS TO THE ENGINEER AT LEAST TWO WEEKS PRIOR TO FDNY INSPECTION. THESE DRAWINGS SHOULD BE BUBBLED TO INDICATE ALL CHANGES AND VARIATIONS FROM THE APPROVED DRAWINGS. THE ENGINEER SHALL PROVIDE THE REQUIRED AS-BUILT DRAWING FOR THE FDNY INSPECTION. THE FUNCTIONALITY STATEMENT SHALL BE SIGNED BY THE INSTALLING CONTRACTOR PRIOR TO THE ENGINEER SIGNING AND SEALING THE OVERALL DRAWING.
19. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL UNUSED OR ABANDONED FIRE ALARM CABLE, CONDUIT AND DEVICES. REPROGRAM THE SYSTEM FOR DEVICES REMOVED FROM SERVICE.
20. FIRE ALARM PLANS SHALL BE APPROVED BY THE FIRE DEPARTMENT PLAN EXAMINER PRIOR TO ANY INSTALLATION WORK.
21. PRIOR TO FDNY INSPECTION THE ENTIRE INSTALLATION SHALL BE COMPLETELY TESTED BY THE FIRE ALARM VENDOR AND INSTALLING ELECTRICIAN.
22. ALL LINE VOLTAGE ELECTRICAL WORK ASSOCIATED WITH FIRE ALARM SYSTEM (IF APPLICABLE) SHALL BE FILED FOR BY A LICENSED MASTER ELECTRICIAN WITH THE BUREAU OF ELECTRICAL CONTROL (FORM 16A).
23. EXACT LOCATION OF ALL DEVICES TO BE COORDINATED WITH THE ARCHITECT PRIOR TO INSTALLATION OF ANY ROUGH-IN, CONDUIT, WIRING OR DEVICES.
24. 24V POWER ON ALL FIRE ALARM DEVICES (RELAYS, SOUNDER BASES, ETC.) SHALL BE SUPERVISED BY THE FIRE ALARM SYSTEM.
25. PROVIDE REMOTE LED'S FOR DEVICES LOCATED IN CONCEALED SPACES. LED TO BE VISIBLE FROM UNCONCEALED SPACE IN THE VICINITY OF THE INSTALLED DEVICE TO INDICATE LOCATION/OPERATION.
26. IN OCCUPIED SPACES THAT HAVE NO OR OPEN CEILINGS, FIRE ALARM WIRING SHALL BE IN CONDUIT. COORDINATE WITH ARCHITECT.
27. ALL FIRE ALARM CABLES INSTALLED BELOW HUNG CEILING SHALL BE PROVIDED IN METAL RACEWAY.
28. ALL FIRE ALARM CABLES INSTALLED IN MECHANICAL SPACES, ELEVATOR MACHINE ROOMS AND LOADING DOCKS SHALL BE PROVIDED IN METAL RACEWAY PER NYC ELECTRICAL CODE ARTICLE 760.
29. WHEN RELOCATING FIRE ALARM DEVICE(S) IF EXISTING WIRING DOES NOT REACH NEW LOCATION, PROVIDE NEW WIRING AS REQUIRED. ALL WIRING MUST BE PROPERLY SUPPORTED PER CODE.
30. MAINTAIN CONTINUITY OF CIRCUITS WHEN CONNECTING TO EXISTING CIRCUITRY/DEVICES. TRACE OUT CIRCUITRY TO DETERMINE ACTIVE CIRCUITS TO REMAIN.
31. CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE INSTALLATION IN COMPLIANCE WITH BUILDING REGULATIONS AND STANDARDS.

EXISTING FIRE ALARM DEVICES NOTES:

THE FOLLOWING SHALL APPLY FOR ALL DEVICES IDENTIFIED AS EXISTING TO REMAIN.

1. EXISTING WIRING SHALL BE PROTECTED DURING DEMOLITION AND CONSTRUCTION SO THAT IT CAN BE REUSED AND RECONNECTED TO MAKE EXISTING DEVICES FULLY OPERATIONAL. EXISTING WIRING THAT HAS BEEN DAMAGED DURING DEMOLITION OR CONSTRUCTION SHALL BE REPLACED AT NO ADDITIONAL COST TO THE OWNER.
2. EXISTING FIRE ALARM DEVICES MUST REMAIN IN PLACE WITHOUT BEING ALTERED.
3. THE ABOVE DESCRIBED WORK SHALL BE INCLUDED IN THE CONTRACT PRICE.
4. EXISTING BASE BUILDING FIRE ALARM EQUIPMENT AND DEVICES MUST REMAIN IN SERVICE AT ALL TIMES DURING DEMOLITION AND CONSTRUCTION.

FIRE ALARM SYSTEM DIVISION OF WORK IS AS FOLLOWS:

1) FIRE ALARM VENDOR WILL PROVIDE THE FOLLOWING INSTALLATION PACKAGE UNDER THIS CONTRACT:

A) FURNISH A COMPLETE SUBMITTAL PACKAGE INCLUDING CATALOGUE CUT SHEETS, RISER DIAGRAM WITH SEQUENCE OF OPERATIONS, POINT-TO-POINT WIRING DIAGRAM AND TYPICAL HOOK-UP DIAGRAMS.

B) FURNISH ALL DRAWINGS, MATERIAL AND PROGRAM CHANGES.

C) FILE DRAWINGS WITH NYDOB & NYFD.

D) COORDINATE INSPECTIONS WITH NYFD.

E) PROVIDE BUILDING OWNER WITH A LETTER ATTESTING THAT SAID SYSTEM(S) ARE FULLY OPERATIONAL PRIOR TO TENANT MOVE IN.

2) ELECTRICAL CONTRACTOR SHALL:

A) PURCHASE EQUIPMENT, DRAWINGS AND FILING FROM BUILDING FIRE ALARM VENDOR.

B) INSTALL EQUIPMENT AND WIRE RUNS TO DESIGNATED POINTS PER VENDOR DRAWINGS.

C) FILE THE A-433 FORM FOR HIS WORK WITH THE NYFD.

D) PROVIDE A LETTER OF REQUEST FOR NYFD INSPECTION AND COORDINATE SAME WITH VENDOR.

E) CONTRACTOR SHALL BE AVAILABLE ON THE DATE OF ANY NYFD INSPECTION OR TEST OF SUCH SYSTEMS.

4) THE SYSTEM MUST BE KEPT ACTIVE WITHOUT INTERRUPTING NORMAL OPERATION OF THE BUILDING AND ITS TENANTS WHEN AN ALTERATION IS PERFORMED. THIS MAY REQUIRE INSTALLATION TO BE PERFORMED AFTER HOURS. COORDINATE WITH BUILDING MANAGEMENT.

FIRE ALARM SPECIFICATIONS

I. NEW FIRE ALARM SYSTEM WORK

A. CONTRACTORS SHALL BE HELD RESPONSIBLE FOR CONTACTING THE BUILDING FIRE ALARM SYSTEM VENDOR FOR ALL INTERCONNECTIONS OF NEW FIRE ALARM EQUIPMENT TO THE EXISTING BUILDING'S FIRE ALARM SYSTEM FOR REQUIRED POWER SUPPLIES, MODULES, RELAYS, ADDITIONAL CIRCUITRY, ETC. NO EXTRAS WILL BE ALLOWED FOR FAILURE TO COORDINATE THE EXTENT OF FIRE ALARM WORK WITH THE BUILDING VENDOR.

B. ALL NEW EQUIPMENT SHALL BE BUILDING STANDARD DEVICES AND BE IN COMPLIANCE WITH ALL LOCAL CODES.

II. EXISTING AND/OR NEW FIRE ALARM SYSTEM WORK

A. THE BUILDING MUST BE NOTIFIED WHEN ANY ALARM DEVICE ON A FLOOR IS DISARMED TEMPORARILY FOR CONSTRUCTION OR WHEN DEVICES ARE TEMPORARILY PROTECTED FROM DUST DURING DEMOLITION.

B. CONTRACTOR MUST FILE FORM A-433 APPLICATION FOR INSPECTION WITH THE FIRE DEPARTMENT. A WRITE-OFF MUST BE GIVEN TO THE BUILDING MANAGER AT THE COMPLETION OF THE JOB. . ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL FEES, INCLUDING NEW YORK FIRE DEPARTMENT INSPECTION.

FIRE ALARM VENDOR:

JOSEPH BONOMO
ACCOUNT REPRESENTATIVE | **SCUTUM**
(PREVIOUSLY KNOWN AS HIGH RISE FIRE AND SECURITY)
+1 (718) 369-3434 EXT. 180
+1 (917) 620-0968
JOSEPH.BONOMO@SCUTUM-NA.COM
144 21ST ST, BROOKLYN, NY 11232
HIGHRISEFIRE.COM

RISER NOTES:

1. ALL FIRE ALARM CABLING SHALL BE SUPPORTED FROM BUILDING STRUCTURE AND NOT DEPEND ON CEILING MEDIA, PIPES, DUCTS, CONDUITS OR EQUIPMENT FOR SUPPORT. CABLING SHALL BE SECURED IN PLACE AT INTERVALS NOT EXCEEDING 5 FEET ON CENTERS AND WITHIN 12" EVERY ASSOCIATED CABINET BOX OR FITTING.
2. MODIFY STROBE POWER SUPPLY AS REQUIRED BY FIRE ALARM VENDOR. SUPPLY ALL MODULES, HARDWARE AND SOFTWARE AS NECESSARY.
3. STROBES SHALL BE SYNCHRONIZED WHEN FLASHING SO THAT NO TWO OR MORE STROBES IN ANY FIELD OF VIEW SHALL FLASH AT DIFFERENT TIMES OR RATES.
4. CONTRACTOR SHALL INCLUDE IN BID PRICE THE COST OF 24VDC POWER SOURCE FOR CO DETECTOR SOUNDER BASES, AND SUPERVISION AS PER FIRE ALARM NOTE 24.
5. AMBER STROBE LIGHTS ASSOCIATED WITH CARBON MONOXIDE DETECTION SHALL BE SEPARATE AND DISTINCT FROM FIRE ALARM STROBES. PROVIDE SEPARATE 24V POWER AND SUPERVISION FOR AMBER STROBES.

SYMBOL LEGEND

FACP	FIRE ALARM CONTROL PANEL
SPS	STROBE POWER SUPPLY
F	MANUAL PULL STATION, MOUNTED NOT LESS THAN 42" AND NOT MORE THAN 48" ABOVE FINISH FLOOR.
S	AREA SMOKE DETECTOR EL – DENOTES ELEVATOR RELATED DEVICE D – DUCT SMOKE DETECTOR
CO	CARBON MONOXIDE DETECTOR WITH SOUNDER BASE
AS	AMBER STROBE LIGHT
TS	TAMPER SWITCH
WF	WATER FLOW SWITCH
XX SL	WALL MOUNTED, STROBE ONLY APPLIANCE XX – DENOTES CANDELA RATINGS (TYP.)
XX S	WALL MOUNTED, COMBINATION SPEAKER/STROBE APPLIANCE XX – DENOTES CANDELA RATINGS (TYP.)
	FIRE ALARM BELL
R FS	RELAY EL – DENOTES ELEVATOR RELATED DR – DENOTES DOOR RELEASE FS – DENOTES FAN SHUTDOWN FSD – DENOTES FIRE SMOKE DAMPER P – DENOTES PURGE ESV – DENOTES ELEVATOR SHAFT VENT SV – DENOTES STAIR SHAFT VENT DAMPER
CM	CONTROL MODULE
MM	MONITORING MODULE
	ABBREVIATIONS
E	EXISTING
R	RELOCATED
ER	EXISTING TO REMAIN
E/R	EXISTING TO RELOCATE
	LINE-TYPES
——	NEW
— —	EXISTING

SYSTEM OUTPUTS

SYSTEM INPUTS	FIRE ALARM CONTROL PANEL ANNUNCIATION				NOTIFICATION											FIRE SAFETY CONTROL						
	A: ACTUATE COMMON ALARM SIGNAL INDICATOR & LOCAL AUDIBLE ALARM SIGNAL AT THE FIRE ALARM CONTROL PANEL	B: VISUALLY ANNUNCIATE THE DEVICE IN ALARM AT THE FIRE ALARM CONTROL PANEL	C: ACTUATE COMMON TROUBLE SIGNAL INDICATOR & LOCAL AUDIBLE TROUBLE SIGNAL AT THE FIRE ALARM CONTROL PANEL	D: VISUALLY ANNUNCIATE THE DEVICE OR CIRCUIT IN TROUBLE AT THE FIRE ALARM CONTROL PANEL	E: ACTUATE ALL VISUAL DEVICES	F: ACTUATE THE 1ST ALARM BELL AT THE FIRE ALARM CONTROL PANEL	G: ACTUATE THE 1ST ALARM BELL AT THE FIRE ALARM CONTROL PANEL	H: ACTUATE THE 2ND TROUBLE BELL AT THE FIRE ALARM CONTROL PANEL	I: ACTUATE ALL AUDIBLE DEVICES TO SOUND FOUR ROUNDS OF THE INDIVIDUAL ZONE ALARM	J: ACTUATE ALL AUDIBLE DEVICES TO SOUND FOUR ROUNDS OF A 10-2 CODE	K: ACTUATE ALL AUDIBLE DEVICES TO SOUND FOUR ROUNDS OF A 10-1 CODE	L: TRANSMIT ALARM SIGNAL TO CENTRAL STATION	M: TRANSMIT TROUBLE SIGNAL TO CENTRAL STATION	N: TRANSMIT CARBON MONOXIDE ALARM SIGNAL TO CENTRAL STATION	O: ACTUATE BUILT-IN SOUNDER BASE	P: RECALL ELEVATORS TO THE DESIGNATED LEVEL	Q: CONTROL ALL AIR HANDLING UNITS 2000 CFM AND LARGER	R: CLOSE ALL REQUIRED FIRE/SMOKE DAMPERS	OPERATE ALL DOOR STRIKE RELEASE RELAYS TO OPEN LOCKED DOORS	OPERATE ALL DOOR HOLDER RELEASE RELAYS TO ALLOW DOORS TO CLOSE	SHUTDOWN ALL CO PRODUCING EQUIPMENTS LOCATED IN THE ROOM OF ALARM
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R			
1 MANUAL PULL STATION	●	●			●	●			●			●					●	●	●	●	
2 AREA SMOKE DETECTOR	●	●			●	●				●		●					●	●	●	●	
3 ELEVATOR RELATED SMOKE DETECTOR	●	●			●	●				●		●				●	●	●	●	●	
4 IN-DUCT SMOKE DETECTOR	●	●			●	●				●		●					●	●	●	●	
5 HEAT DETECTOR	●	●			●	●				●		●					●	●	●	●	
5 WATERFLOW SWITCH	●	●			●		●				●	●				●	●	●	●	●	
7 CARBON MONOXIDE DETECTOR														●	●						
8 CO PRODUCING EQUIPMENT ROOM CARBON MONOXIDE DETECTOR														●	●						●
9 TAMPER SWITCH			●	●				●					●								
10 TROUBLE CONDITIONS			●	●				●					●								

DESIGN NOTES:

1. AUDIBLE DEVICES SHALL PROVIDE ALARM SIGNALS THAT ARE EQUAL TO 15 DECIBELS ABOVE AMBIENT SOUND PRESSURE LEVEL FOR THE OCCUPANCY, BUSINESS OCCUPENCY HAS AMBIENT SOUND PRESSURE LEVEL 55 DECIBELS PER NFPA 72. THEREFORE, AUDIBLE DEVICES SHALL BE 70 DECIBELS OR MORE SOUND PRESSURE LEVEL. MECHANICAL SPACES SHALL PROVIDE MINIMUM SOUND PRESSURE LEVEL OF 90 DECIBELS.
2. ADDRESSABLE DEVICES SHALL BE WIRED CLASS B CIRCUIT & LEVEL 1 SURVIVABILITY.
   AUDIBLE AND VISUAL DEVICES SHALL BE WIRED CLASS B CIRCUIT & LEVEL 1 SURVIVABILITY.

ALL DEVICES SHOWN ARE NEW, U.O.N.

THERE IS NO DEDICATED LINE VOLTAGE FIRE ALARM POWER RISER AVAILABLE IN THIS BUILDING

MODIFY EXISTING CENTRAL OFFICE TRANSMITTER TO INCLUDE A SEPARATE SIGNAL FOR CARBON MONOXIDE ALARM. COORDINATE WITH CENTRAL STATION MONITORING PROVIDER.

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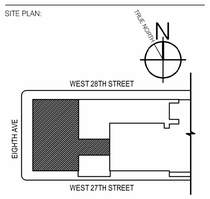
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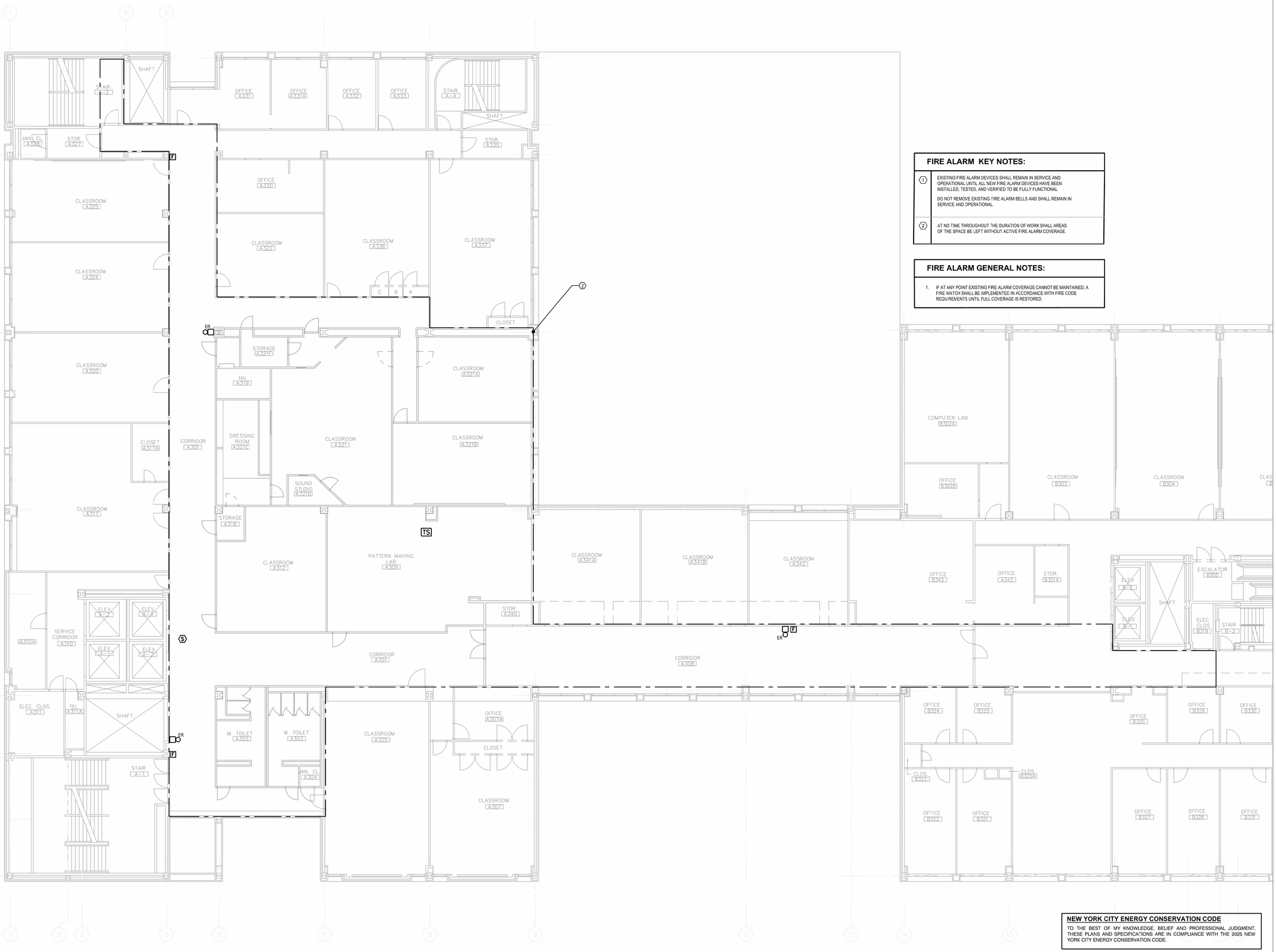
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SHEET TITLE:

FIRE ALARM NOTES, SYMBOLS LIST, AND RISER DIAGRAM

SHEET NUMBER:

FA-001.00



FIRE ALARM KEY NOTES:

1	EXISTING FIRE ALARM DEVICES SHALL REMAIN IN SERVICE AND OPERATIONAL UNTIL ALL NEW FIRE ALARM DEVICES HAVE BEEN INSTALLED, TESTED, AND VERIFIED TO BE FULLY FUNCTIONAL DO NOT REMOVE EXISTING FIRE ALARM BELLS AND SHALL REMAIN IN SERVICE AND OPERATIONAL.
2	AT NO TIME THROUGHOUT THE DURATION OF WORK SHALL AREAS OF THE SPACE BE LEFT WITHOUT ACTIVE FIRE ALARM COVERAGE.

FIRE ALARM GENERAL NOTES:

1. IF AT ANY POINT EXISTING FIRE ALARM COVERAGE CANNOT BE MAINTAINED, A FIRE WATCH SHALL BE IMPLEMENTED IN ACCORDANCE WITH FIRE CODE REQUIREMENTS UNTIL FULL COVERAGE IS RESTORED.

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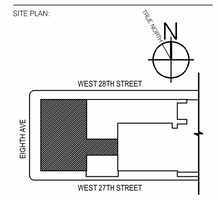
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3RD FLOOR FIRE ALARM DEMOLITION PLAN

SHEET NUMBER:

FA-011.00



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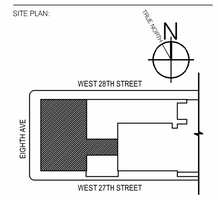
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SEAL & SIGNATURE:

DRAWN BY: --
CHECKED BY: --

SCALE: 1/8"=1'-0"

PROJECT#: 8969.109

SHEET TITLE:

3RD FLOOR FIRE ALARM PLAN

SHEET NUMBER:

FA-101.00

- OF -

FIRE PROTECTION SYMBOLS

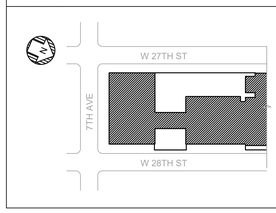
F(S)	FIRE PROTECTION INCOMING SERVICE/STREET PRESSURE PIPING
SP	SPRINKLER MAIN PIPING
	SPRINKLER BRANCH PIPING
DR	SPRINKLER DRAIN PIPING
	EXISTING PIPING (REFER TO LETTER DESIGNATION ABOVE)
	EXISTING PIPING TO BE REMOVED
	UPRIGHT/ PENDANT SPRINKLER HEAD
	CONCEALED SPRINKLER HEAD
	ELBOW TURNED UP
	ELBOW TURNED DOWN
	BOTTOM PIPE CONNECTION
	TOP PIPE CONNECTION
	SLOPE CHANGE IN PIPE ELEVATION (ROLL DOWN)
	ARROW INDICATES DIRECTION OF FLOW
	CAPPED OUTLET
	VALVE ON VERTICAL
	AUTOMATIC AIR VENT VALVE
	PRESSURE GAUGE AND COCK
OPEN CLOSED	GATE VALVE
	GLOBE VALVE
	CHECK VALVE
	CHECK VALVE W/ BALL DRIP
	DOUBLE CHECK VALVE
	ANGLE PRESSURE RELIEF VALVE
	OUTSIDE SCREW & YOKE (OS & Y) VALVE
OPEN CLOSED	BALL VALVE
	FIRE DEPT. CONNECTION (WALL MOUNTED)
	FIRE DEPT. CONNECTION (FREE STANDING)
F	SPRINKLER HEAD NODE TAG
#	SPRINKLER PIPING NODE TAG
SP/# SPRINKLER RISER DESIGNATION	RISER SERVICE RISER NUMBER
#/FP-1 DETAIL	DETAIL DRAWING LOCATION
A/FP-1 SECTION	DETAIL DRAWING LOCATION
#	REVISION NUMBER
	CONNECT NEW WORK TO EXISTING
	DISCONNECT EXISTING WORK & CAP

FIRE PROTECTION ABBREVIATIONS

ABD	AUTOMATIC BALL DRIP	ID	INSIDE DIAMETER
AFF	ABOVE FINISHED FLOOR	IN	INCH
ARCH	ARCHITECTURAL	JP	JOCKEY PUMP
BFP	BACKFLOW PREVENTER	LP	LOW POINT
BLDG	BUILDING	MAX	MAXIMUM
CLG	CEILING	MECH	MECHANICAL
COL	COLUMN	MER	MECHANICAL EQUIPMENT ROOM
CONN	CONNECTION	MIN	MINIMUM
CONST	CONSTRUCTION	MISC	MISCELLANEOUS
CONT	CONTINUATION	NIC	NOT IN CONTRACT
CV	CHECK VALVE	NTS	NOT TO SCALE
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY	OC	ON CENTER
DIA	DIAMETER	OS&Y	OUTSIDE SCREW AND YOKE GATE VALVE
DN	DOWN (THRU FLOOR SLAB)	PRV	PRESSURE REDUCING VALVE
DR	DRAIN	PSIG	POUNDS PER SQUARE INCH (GAUGE)
DWG	DRAWING	RCV	RISER CONTROL VALVE
EA	EACH	REV	REVISED / REVISION
EL	ELEVATION	RPM	REVOLUTIONS PER MINUTE
ELEC	ELECTRICAL	RPZ	REDUCED PRESSURE ZONE BACKFLOW PREVENTER
ELEV	ELEVATOR	SCHED	SCHEDULE
EMER	EMERGENCY	SP	SPRINKLER
EMR	ELEVATOR MACHINE ROOM	SQ.FT.	SQUARE FOOT (ft²)
EQUIP	EQUIPMENT	STD	STANDARD
EXIST	EXISTING	TCSP	TEMPORARY CORE SPRINKLER PROTECTION
FCVA	FLOOR CONTROL VALVE ASSEMBLY	TDH	TOTAL DYNAMIC HEAD
FD	FLOOR DRAIN	TEMP	TEMPORARY
FDC	FIRE DEPARTMENT CONNECTION	THRU	THROUGH
FF	FINISH(ED) FLOOR	TOS	TOP OF SLAB
FL	FLOOR	TYP	TYPICAL
FS	FIRE SERVICE PIPING	UON	UNLESS OTHERWISE NOTED
FT	FEET	UP	UP (THRU FLOOR SLAB)
GC	GENERAL CONTRACTOR	VIF	VERIFY IN FIELD
GAL	GALLONS	W/	WITH
GPM	GALLONS PER MINUTE	WFS	WATER FLOW SWITCH
GV	GATE VALVE		
HR	HOUR		

PLOT PLAN AND ZONING DATA

PROJECT ADDRESS: 344 8TH AVE NEW YORK, NY 10001
TAX BLOCK: 777
TAX LOT: 37



SPRINKLER HEAD SCHEDULE

SYMBOL	○	●	●W	▽W
SPRINKLER STYLE	UPRIGHT	CONCEALED PENDENT	WINDOW CONCEALED PENDENT	WINDOW VERTICAL SIDEWALL
RESPONSE	QUICK	QUICK	WINDOW	WINDOW
K-FACTOR	5.6	5.6	5.6	5.6
MANUFACTURER	RELIABLE	RELIABLE	RELIABLE	RELIABLE
MODEL NUMBER	F1FR-56	G5-56	WP56C	WP56
OCCUPANCY HAZARD	LIGHT / ORDINARY	LIGHT / ORDINARY	WINDOW	WINDOW
MAX. SPACING	15' x 15' (LIGHT HAZ.) 10' x 13' (ORD. HAZ. 1)	15' x 15' (LIGHT HAZ.) 10' x 13' (ORD. HAZ. 1)	12' L	12' L
REMARKS	1. SPRINKLER HEADS SHALL BE INSTALLED IN ACCORDANCE WITH THEIR LISTINGS AND AS PER THE MANUFACTURERS RECOMMENDATIONS.			
	2. VERIFY ALL SPRINKLER HEAD FINISHES AND COVER PLATE COVER COLORS WITH ARCHITECT. PROVIDE AS DIRECTED BY ARCHITECT.			
	3. ALL SPRINKLER HEADS SHALL BE OF ORDINARY TEMPERATURE CLASSIFICATION (135F-165F) EXCEPT INTERMEDIATE AND HIGH TEMPERATURE RATED HEADS SHALL BE INSTALLED WHERE REQUIRED BY NFPA 13.			

2022 NEW YORK CITY SPRINKLER NOTES

1. SPRINKLER SYSTEM CONFORMS TO NEW YORK CITY BUILDING CODE, CHAPTER 9, SECTION BC 903 AND APPENDIX Q, SECTIONS BC Q101 & BC Q102.
2. THE INSTALLATION, COMPONENTS, SIZING, SPACING, CLEARANCES, POSITION & TYPE OF SYSTEMS CONFORMS TO BC 903.3 & BC Q102, CHAPTER 6.
3. ONLY APPROVED DEVICES SHALL BE USED AS PER BC Q102, SECTION 6.1.1
4. SPRINKLERS SHALL BE PROTECTED AGAINST FREEZING & INJURY AS PER BC Q102, CHAPTER 8.
5. INSPECTIONS & TESTS OF SPRINKLER SYSTEMS SHALL BE CONDUCTED AS PER BC 901.5 & BC Q102, CHAPTER 27.
6. THE OCCUPANCY OF THE AREAS TO BE SPRINKLERED SHALL BE IN ACCORDANCE WITH BC 903 & BC Q102, CHAPTER 5.
7. WATER SUPPLY TEST PIPES & GAUGES SHALL BE PROVIDED AS PER BC Q102, CHAPTER 6.
8. SPACING, LOCATION & POSITION OF SPRINKLERS SHALL BE IN ACCORDANCE WITH BC Q102, CHAPTER 8.
9. THERE IS NO HIGH PILED STORAGE AS DEFINED IN BC Q102, CHAPTER 12.
10. ALL PIPES PASSING THOUGH WALLS SHALL BE IN ACCORDANCE WITH BC 714.
11. DISTANCE OF SPRINKLERS FROM HEAT SOURCE SHALL BE AS PER TABLE 8.3.2.5 (A) OF BC Q102.
12. ALL VALVES SHALL BE IDENTIFIED AS PER CHAPTER 6.6.4 OF BC Q102.
13. DRAINAGE SHALL CONFORM TO CHAPTER 8.16.2 OF BC Q102.
14. FITTINGS SHALL BE PROVIDED AS PER CHAPTER 6.4 OF BC Q102.
15. VALVES SHALL BE APPROVED TYPE AS PER CHAPTER 6.6 OF BC Q102.
16. PIPE HANGERS SHALL BE PROVIDED AS PER CHAPTER 9 OF BC Q102.
17. PROVISIONS SHALL BE MADE TO FACILITATE FLUSHING SYSTEM PIPING AS PER CHAPTER 8.16.3 OF BC Q102.
18. SPRINKLERS SHALL BE AN APPROVED TYPE AS PER CHAPTER 6.2 OF BC Q102.
19. TEMPERATURE RATING OF SPRINKLERS SHALL COMPLY WITH CHAPTER 6.2.5 OF BC Q102.
20. MINIMUM CLEARANCE OF 18" BELOW SPRINKLER DEFLECTORS SHALL BE MAINTAINED AS PER CHAPTER 8.5.6.1 OF BC Q102.
21. CONCEALED PIPING SHALL BE INSPECTED PRIOR TO BEING COVERED PER BC 901.5 AND NEW YORK CITY FIRE CODE, FC 106.
22. SPRINKLER SYSTEM ALARMS SHALL BE PROVIDED AS PER CHAPTER 6.8 OF BC Q102.
23. SPARE SPRINKLER HEADS AND WRENCH TO BE KEPT ON PREMISES AS PER CHAPTER 6.2.9 OF BC Q102.
24. ENGINEER SHALL BE RESPONSIBLE FOR THE DESIGN TO COMPLY WITH THE REQUIREMENTS OF BC 903 & BC Q102.
25. ALL SPRINKLER BRANCH PIPING SHALL BE A MINIMUM OF 1 INCH AS PER CHAPTER 8 OF BC Q102.
26. SPRINKLER HEADS ON THE SPRINKLER SCHEDULE ARE EITHER FM APPROVED OR UL LISTED, OR BOTH FM APPROVED AND UL LISTED.
27. WATER SUPPLIES TO SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH BC Q102, CHAPTER 24.
28. SPRINKLER SYSTEM SPECIAL INSPECTIONS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION BC 1705.29 OF THE NEW YORK CITY BUILDING CODE.
29. QUICK RESPONSE SPRINKLER HEADS SHALL NOT BE PERMITTED FOR USE IN EXTRA HAZARD OCCUPANCIES PER NFPA 13-2016 ITEM 8.4.1.2 & 11.2.3.2.2.2.
30. SPRINKLER HEADS IN LIGHT HAZARD OCCUPANCIES SHALL BE IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS AS APPLICABLE:
    - 30.1. HEADS SHALL BE QUICK RESPONSE TYPE PER NFPA 13-2016 ITEM 3.6.4.8 HEADS IN RESIDENTIAL OCCUPANCY SHALL MEET NFPA 13-2016 ITEM 8.4.5.
    - 30.2. HEADS FOR MODIFICATION OR ADDITION TO AN EXISTING SYSTEM EQUIPPED WITH STANDARD RESPONSE SPRINKLER HEADS SHALL MEET NFPA 13-2016 ITEM 8.3.3.1
31. QUICK RESPONSE SPRINKLER HEADS & STANDARD RESPONSE SPRINKLER HEADS SHALL NOT BE INTERMIXED WITHIN A COMPARTMENT PER NFPA 13-2016 ITEM 8.3.3.2.
32. WHEN EXISTING LIGHT HAZARD SYSTEMS ARE CONVERTED TO USE QUICK RESPONSE HEADS, ALL SPRINKLERS IN A COMPARTMENT SPACE SHALL BE QUICK RESPONSE PER NFPA 13-2016 ITEM 8.3.3.6.
33. OCCUPANCY OF SPACE IS: LIGHT HAZARD PER BC 903.2 & CHAPTER 5 OF BC Q102.
34. SPRINKLER SYSTEM IS HYDRAULICALLY DESIGNED IN ACCORDANCE WITH CHAPTER 11 OF BC Q102. SPRINKLER SYSTEM IS DESIGNED TO 0.10 GPM/SQ.FT. OVER 1500 SQ. FT.

NYC PROFESSIONAL'S STATEMENT

- PER 1RCNY: 5000-01(E)(2)(III) STANDPIPE AND SPRINKLER WORK IS EXEMPT FROM THE ENERGY CODE.
- I HEREBY CERTIFY THAT THE SYSTEM'S NEWLY CALCULATED HYDRAULIC DEMAND AS PER 2022 NYC BUILDING CODE DUE TO WORK FILED UNDER THIS APPLICATION IS EQUAL TO OR LESS THAN THE HYDRAULIC DEMAND OF THE EXISTING SYSTEM PRIOR TO CURRENT OR PROPOSED MODIFICATION.

NYC FLOOD HAZARD AREA NOTES

- FEMA FLOOD MAPS OBTAINED FROM FEMA FLOOD MAP SERVICE CENTER WEBSITE. DESIGN APPLICANT MAKES NO CLAIM AS TO THEIR ACCURACY.
- PROPERTY IS NOT IN SPECIAL FLOOD HAZARD AREA PER EFFECTIVE 2007 FIRM.

SPRINKLER AND STANDPIPE PAINTING

IN ACCORDANCE WITH 2022 NYCBC CHAPTER 9 SECTION 903.6. ALL STANDPIPE AND SPRINKLER PIPING INCLUDING MAINS, LOOP MAINS AND VALVE HANDLES MUST BE PAINTED, AS OUTLINED IN THE LAW. THIS LAW IS RETROACTIVE AND IS REQUIRED FOR ALL PROJECTS. SPRINKLER BRANCH LINES FROM MAIN TEE'S ARE EXCLUDED FROM THIS REQUIREMENT. SAMPLES OF THE THREE PRIMARY COLORS USED, RED, GREEN AND YELLOW SHALL BE SUBMITTED FOR APPROVAL BY ENGINEER. PAINTING OF ALL PIPING SHALL REQUIRE A SPECIAL INSPECTION AND CERTIFICATION. NO PIPING SHALL BE ENCLOSED PRIOR TO PAINT INSPECTION BY SPECIAL INSPECTOR.

SPRINKLERS DURING CONSTRUCTION

AS PER FIRE CODE SECTION 901.7.2 PROVIDE FIRE WATCH UNLESS OTHERWISE DIRECTED BY THE DEPARTMENT. THE BUILDING SHALL BE EVACUATED OR A FIRE WATCH MAINTAINED IN ACCORDANCE WITH THIS SECTION WHEN A STANDPIPE SYSTEM, SPRINKLER SYSTEM OR FIRE ALARM SYSTEM IS OUT OF SERVICE. SUCH FIRE WATCH SHALL BE CONDUCTED IN COMPLIANCE WITH THE REQUIREMENTS OF FC 901.7.2.1 THROUGH 901.7.2.3.

SPRINKLER DESIGN CRITERIA

EACH SPRINKLER SYSTEM SHALL BE HYDRAULICALLY CALCULATED IN ACCORDANCE WITH NFPA-13-2016 TO MEET FOLLOWING CRITERIA:

SPRINKLER SYSTEM

1. LIGHT HAZARD OCCUPANCY: DENSITY .10 GPM PER SQ. FT. OVER MOST HYDRAULICALLY REMOTE 1500 SQ. FT., MAXIMUM COVERAGE PER SPRINKLER HEAD 225 SQ. FT.
2. EXACT LOCATION OF SPRINKLER HEADS IN FINISHED AREAS WITH SUSPENDED CEILINGS SHALL BE AS INDICATED ON ARCHITECTURAL REFLECTED CEILING PLANS.
3. CLOSELY SPACED SPRINKLER HEADS LOCATED 6'-0" O.C. SHALL DISCHARGE A MINIMUM OF 3 GPM PER LINEAR FOOT OF PROTECTED LINE.
4. MINIMUM PRESSURE AT EACH SPRINKLER HEAD SHALL BE 7 PSI & 15 GPM.
5. WHENEVER ROLL GROOVED CONNECTIONS ARE USED, ALLOWANCE FOR ADDITIONAL PRESSURE LOSS AT GROOVES SHALL BE MADE AS FOLLOWS:
   - A. FOR EACH COUPLING ON STRAIGHT RUN INCLUDING STRAIGHT FLOW THROUGH TEE OR CROSS; ADD 1 EQUIVALENT FOOT OF PIPE.
   - B. FOR EACH COUPLING AT ELBOW, TEE OR CROSS WHERE DIRECTION OF FLOW CHANGES; ADD 2 EQUIVALENT FEET OF PIPE.
7. EQUIVALENT FITTING LENGTHS USED IN HYDRAULIC CALCULATIONS SHALL BE IN ACCORDANCE WITH NFPA 13-2016.
   - A. WHEREVER FITTINGS ARE USED IN CONJUNCTION WITH LIGHTWALL PIPE, EQUIVALENT FITTING LENGTHS INDICATED IN NFPA 13 SHALL BE INCREASED BY 30%.
8. DISCHARGE FROM EACH SPRINKLER HEAD SHALL NOT BE LESS THAN REQUIRED FOR AREA COVERED BY THIS HEAD. AREA COVERAGE PER HEAD SHALL BE DETERMINED IN ACCORDANCE WITH NFPA 13-2016.
9. THE RESULT OF HYDRAULIC CALCULATIONS SHALL INDICATE A MINIMUM 5% SAFETY MARGIN FOR PRESSURE.
10. CONTRACTOR SHALL BASE ALL HYDRAULIC CALCULATIONS ON THE REQUIRED HYDRANT FLOW TEST.
    - A. TEST DATA SHALL INDICATE STATIC PRESSURE, RESIDUAL PRESSURE AT FLOW AND ELEVATION AT LOCATION TESTED.
    - B. FLOW TEST DATA SHALL BE SUBMITTED FOR REVIEW ALONG WITH SHOP DRAWINGS AND HYDRAULIC CALCULATIONS.

SPRINKLER DEMOLITION NOTES

1. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT.
2. VERIFY ALL GOVERNING DIMENSIONS, PIPE SIZES AND LOCATION OF THE PIPING AND EQUIPMENT TO BE REMOVED.
3. NOTIFY BUILDING MANAGER AT LEAST 48 HOURS BEFORE DEMOLITION WORK OR BEFORE SHUT DOWN OF EXISTING SERVICES. RISER SHUT DOWNS SHALL BE PERFORMED AT TENANT'S COST, AT DESIGNATED TIMES UNDER BUILDING MANAGER'S SUPERVISION AND ONLY WITH HIS APPROVAL.
4. ALL EQUIPMENT, PIPING, ETC. TO BE REMOVED, SHALL BE DISPOSED OF, RELOCATED, TURNED OVER TO THE TENANT OR SALVAGED AS DIRECTED BY THE BUILDING OWNER.
5. UPON COMPLETION OF ALL NEW WORK NO ABANDONED PIPING SHALL REMAIN. EXISTING BRANCH PIPING SERVING REMOVED SPRINKLER SHALL BE COMPLETELY REMOVED TO MAIN BRANCH AND CAPPED AT TEE WITH NEW FITTINGS.
6. THE EXISTING SYSTEMS SHALL BE LEFT IN PERFECT WORKING ORDER UPON COMPLETION OF ALL NEW WORK.
7. LOCATIONS AND SIZES OF EXISTING PIPING ARE APPROXIMATE. FIELD VERIFY EXACT SIZES AND LOCATIONS OF ALL EXISTING PIPING AT THE SITE.
8. NO REMOVED EXISTING PIPING FITTINGS, VALVES, FIXTURES, ETC. SHALL BE REUSED UNLESS OTHERWISE APPROVED BY THE ENGINEER.
9. THE CONTRACTOR SHALL NOT INTERRUPT ANY OF THE SERVICES OF THE EXISTING BUILDING NOR INTERFERE WITH THE SERVICES IN ANY WAY WITHOUT THE EXPRESS PERMISSION IN WRITING BY THE BUILDING MANAGER. SUCH INTERRUPTIONS AND INTERFERENCES SHALL BE MADE AS BRIEF AS POSSIBLE AND ONLY AT THE TIME STATED BY THE BUILDING MANAGER.
10. CONTRACTOR & THEIR SUBCONTRACTOR'S SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING SPRINKLERS AND RELATED PIPING AND REMOVING SPRINKLERS AND RELATED PIPING AS REQUIRED TO MEET NEW PROPOSED SPRINKLER HEAD LAYOUT.
11. AS PART OF THIS CONTRACT, THE CONTRACTOR SHALL INCLUDE A FIREWATCH FOR THE DURATION OF THE SPRINKLER SHUT-DOWN, WHERE APPROVED BY BUILDING MANAGEMENT, A TEMPORARY SPRINKLER LOOP MAY BE PROVIDED IN LIEU OF THE REQUIRED FIRE WATCH. THERE SHALL BE NO APPROVED CHANGE ORDERS FOR THIS SCOPE.
12. CONTRACTOR SHALL EXERCISE EXTREME CARE IN PROTECTING AREAS ADJACENT TO CONSTRUCTION AREAS, SHALL FULLY PROTECT THEM FROM ANY DAMAGE RESULTING FROM CONTRACTOR'S WORKMEN, SUBCONTRACTORS OR AGENTS, SHALL BE RESPONSIBLE FOR REPAINTING, CLEANING OR REPLACING ANY SUCH DAMAGE.
13. THE CONTRACTOR SHALL VISIT THE JOB SITE AND THOROUGHLY FAMILIARIZE HIMSELF WITH ALL EXISTING CONDITIONS AND FIRE PROTECTION SYSTEMS PRIOR TO THE BEGINNING OF DEMOLITION WORK.
14. SPRINKLER COVERAGE OF THE EXISTING SPRINKLER SYSTEM OUTSIDE THE AREA OF WORK SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION.
15. PROVIDE TEMPORARY SPRINKLER LOOP WHEN THE NEW CONSTRUCTION BEGINS TO PROTECT ALL MEANS OF EGRESS. IN ACCORDANCE W/ BUILDING BULLETIN 2020-012.
16. IN THE EVENT OF ANY DISCREPANCY BETWEEN THE DEMOLITION PLAN AND THE CONSTRUCTION PLANS, CONSTRUCTION PLANS AND INTENT SHALL GOVERN.

SPRINKLER DRAWING LIST

DWG No.	DRAWING NAME
SP-001	SPRINKLER NOTES, SYMBOLS, & DRAWING LIST
SP-011	3RD FLOOR SPRINKLER DEMOLITION PLAN
SP-101	3RD FLOOR SPRINKLER PLAN
SP-601	SPRINKLER RISER DIAGRAM

FIRE PROTECTION GENERAL NOTES

1. ALL SPRINKLER LOCATIONS SHOWN ON SPRINKLER DRAWING ARE DIAGRAMMATIC. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR EXACT SPRINKLER LOCATION AND ALIGNMENT.
2. SPRINKLER CONTRACTOR IS RESPONSIBLE FOR PROVIDING COMPLETE SHOP DRAWINGS INCLUDING HEAD LOCATIONS, PIPE SIZING AND HYDRAULIC CALCULATIONS.
3. THE SPRINKLER CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS, INSPECTIONS & SIGN-OFF REQUIRED BY THE BUILDING DEPT. OFFICIALS.
4. SPRINKLER HEADS IN GYPSUM BOARD CEILING AREAS TO BE ALIGNED WITH OR CENTERED BETWEEN ADJACENT LIGHT FIXTURES.
5. PROVIDE 'SWING ARM' CONNECTION TO ALL SPRINKLER HEADS TO ASSURE PRIOR ALIGNMENT.
6. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWING FOR EXACT SIZE & LOCATION OF SLAB PENETRATIONS, THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS WITH ALL PENETRATIONS FOR APPROVAL TO STRUCTURAL & MEP ENGINEER PRIOR INSTALLATION OF SPRINKLER WORK.
7. PROVIDE SPRINKLER COVERAGE UNDER OBSTRUCTIONS 48" IN WIDTH OR GREATER.
8. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.
9. EXISTING PIPING WHERE SHOWN FOR VARIOUS SYSTEMS IS DIAGRAMMATIC ONLY.
10. BECOME THOROUGHLY FAMILIAR WITH ACTUAL EXISTING CONDITIONS AT THE BUILDING OF THE PRESENT INSTALLATIONS, INCLUDING LOCATIONS, SIZES, AND ELEVATIONS OF PIPING, TO WHICH CONNECTIONS MUST BE MADE OR WHICH MUST BE CHANGED OR ALTERED. THE INTENT OF THE WORK IS SHOWN ON THE DRAWINGS AND DESCRIBED HEREINAFTER, AND NO CONSIDERATION WILL BE GRANTED BY REASON OF LACK OF FAMILIARITY ON THE PART OF THE CONTRACTOR WITH ACTUAL PHYSICAL CONDITIONS AT THE SITE.
11. INSTALL ALL WORK IN FULL ACCORDANCE WITH THE REQUIREMENTS OF ALL LOCAL AND GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION OVER THESE MATTERS, AS WELL AS WITH ANY REQUIREMENTS OF THE NFPA, UL, AND OTHER APPLICABLE CODES. SECURE AND PAY FOR NECESSARY APPROVALS, PERMITS, INSPECTIONS, ETC., AND DELIVER THE OFFICIAL RECORDS OF THE GRANTING OF PERMITS TO THE ARCHITECT WITHOUT ADDITIONAL COST TO THE OWNER.
12. PREPARE AND SUBMIT FOR APPROVAL MANUFACTURER'S SHOP DRAWINGS AND DATA FOR EQUIPMENT, AND DETAILED DRAWINGS OF ALL SPRINKLER PIPING WORK.
13. KEEP AN ACCURATE RECORD ON ALL DEVIATIONS BETWEEN WORK SHOWN ON DRAWINGS AND THAT WHICH IS ACTUALLY PERFORMED.
14. ALL FIRE PROTECTION VALVES SHALL HAVE TAMPER SWITCHES.
15. ALL FIRE PROTECTION OS&Y VALVES SIZE 4" & LARGER & PRESSURE DIFFERENTIAL OF 200 PSI & GREATER SHALL BE PROVIDED WITH A VALVED BYPASS.
16. ALL FIRESTOPPING MUST BE APPROVED PRODUCTS THAT ARE UL LISTED FIRESTOPPING ASSEMBLIES.
17. ALL SPRINKLER HEADS TO BE INSTALLED SHALL BE NEW.

NYC DOB SPECIAL INSPECTION NOTES

1. AN INDEPENDENT SPECIAL INSPECTOR SHALL BE RETAINED TO PERFORM SPECIAL INSPECTIONS AS WELL AS FILE FORM TR-1 FOR FIRE PROTECTION SYSTEMS DESIGN AS DOCUMENTED ON THESE PLANS IN ACCORDANCE WITH THE NYC BUILDING CODE.
2. SPECIAL INSPECTION REQUIRED FOR SPRINKLER SYSTEMS PER 2022 NYCBC 1705.29.
3. SPECIAL INSPECTION REQUIRED FOR FIRE-RESISTANT PENETRATIONS AND JOINTS PER 2022 NYCBC 1705.17.
4. SPECIAL INSPECTION REQUIRED FOR POST-INSTALLED ANCHORS PER 2022 NYCBC 1705.37.
5. OWNER SHALL NOTIFY FDNY OF SPRINKLER SYSTEM DISCONNECTION BY SUBMITTING A LETTER OF NOTIFICATION.

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

NEW YORK CITY ENERGY CONSERVATION CODE

EXEMPTION WHEN COMPLIANCE WITH FIRE PROTECTION, DETECTION, ALARM AND/OR SUPPRESSION REQUIREMENTS OF TITLE 28 AND/OR THE 2022 NEW YORK CITY CONSTRUCTION CODES CONFLICTS WITH 2020 NYCECC COMPLIANCE, THE TITLE 28 AND/OR 2022 CONSTRUCTION CODES SAFETY PROVISIONS WILL TAKE PRECEDENCE OVER CONFLICTING PROVISIONS IN 2020 NYCECC.

FIT Science Lab Renovation

Project No. 2449

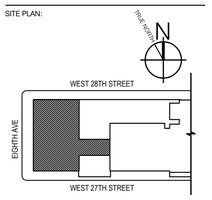
344 8TH AVE
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307 WEST 38TH ST, SUITE 1901
NEW YORK NY 10018
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MEP ENGINEER
MG ENGINEERING D.P.C
116 WEST 32ND STREET
NEW YORK, NY 10001
212.643.9055

LIGHTING DESIGNER
JEFFREY NASH LIGHTING DESIGN
150 WEST 28TH STREET, SUITE 1603
NEW YORK, NY 10001
212.206.8356

SITE PLAN:



SUBMITTAL:

100% Construction Documents

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2026.03.31
	100% CONSTRUCTION DOCUMENT	2026.08.19
	ISSUED FOR DOB FILING	2026.10.21
	100% BID DOCUMENTS	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: TQC CHECKED BY: MDJ

SCALE: N.T.S.

PROJECT#: 8969.109

SHEET TITLE:

SPRINKLER NOTES, SYMBOLS, & DRAWING LIST

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

SP-001.00

SP 01 EXIST. 6" SPK UP & DN 4" FSP UP & DN 2" DR UP & DN

4 SPRINKLER HEADS AND ASSOCIATED PIPING IN AREA OF WORK TO BE REMOVED. CUT AND CAP BRANCH PIPING AT RISER.

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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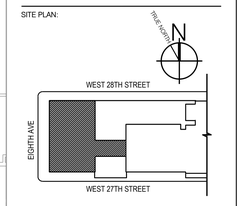
344 8TH AVE
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DRAWN BY: TQC CHECKED BY: MDJ

SCALE: 1/8"=1'-0" PROJECT#: 8969.109

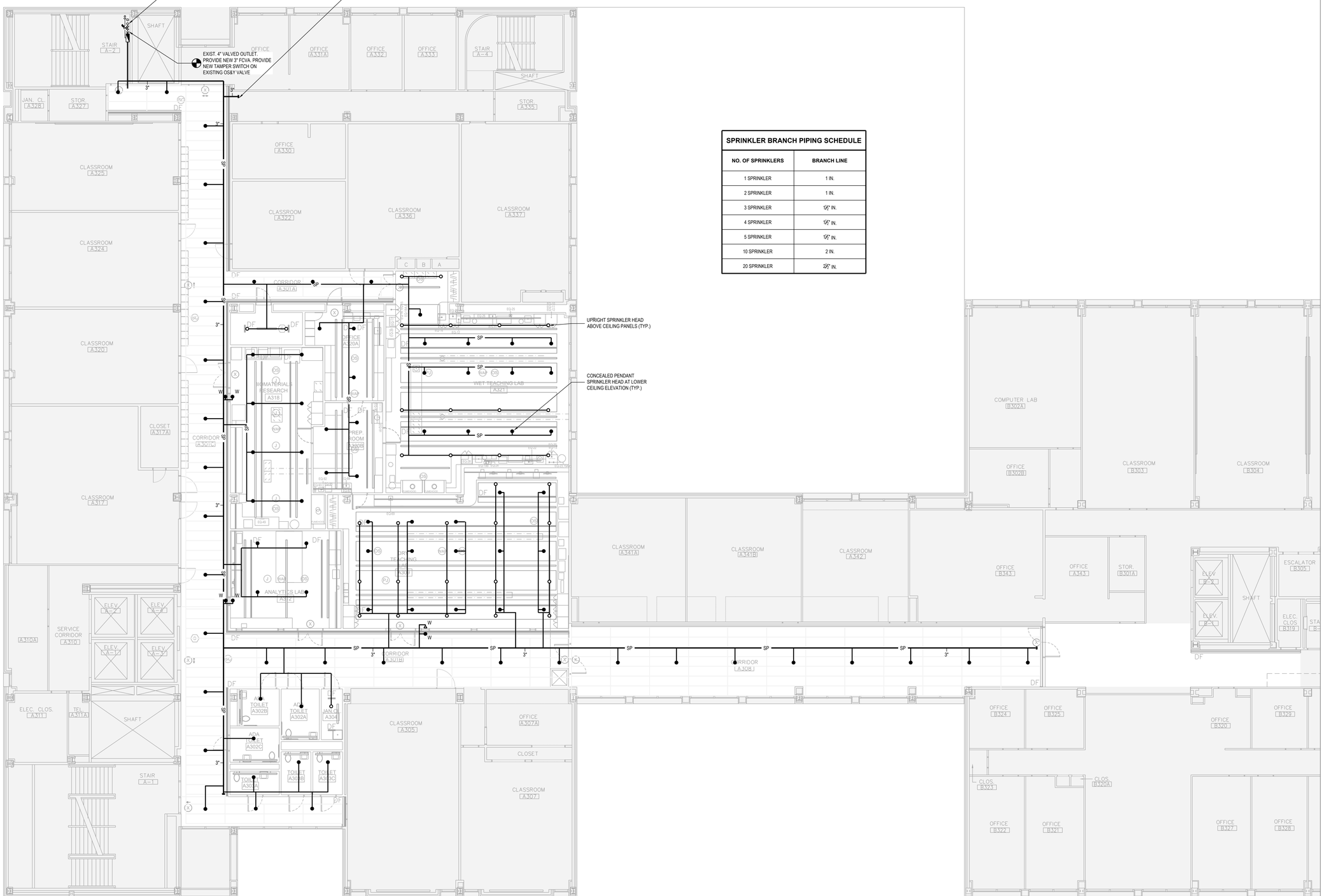
SHEET TITLE:

3RD FLOOR SPRINKLER DEMOLITION PLAN

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

SP-011.00



SPRINKLER BRANCH PIPING SCHEDULE

NO. OF SPRINKLERS	BRANCH LINE
1 SPRINKLER	1 IN.
2 SPRINKLER	1 IN.
3 SPRINKLER	1¼" IN.
4 SPRINKLER	1¼" IN.
5 SPRINKLER	1½" IN.
10 SPRINKLER	2 IN.
20 SPRINKLER	2½" IN.

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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NEW YORK CITY ENERGY CONSERVATION CODE

EXEMPTION WHEN COMPLIANCE WITH FIRE PROTECTION, DETECTION, ALARM AND/OR SUPPRESSION REQUIREMENTS OF TITLE 28 AND/OR THE 2022 NEW YORK CITY CONSTRUCTION CODES CONFLICTS WITH 2020 NYCECC COMPLIANCE, THE TITLE 28 AND/OR 2022 CONSTRUCTION CODES SAFETY PROVISIONS WILL TAKE PRECEDENCE OVER CONFLICTING PROVISIONS IN 2020 NYCECC.

FIT Science Lab Renovation

Project No. 2449

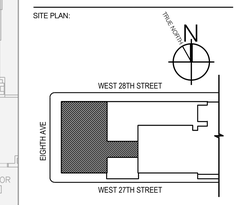
344 8TH AVE
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212.643.9055

LIGHTING DESIGNER
JEFFREY NASH LIGHTING DESIGN
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NEW YORK, NY 10001
212.206.8356

SITE PLAN:



SUBMITTAL:

100%
Construction Documents

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	100% DESIGN DEVELOPMENT	2026.03.31
	100% CONSTRUCTION DOCUMENT	2026.08.19
	ISSUED FOR DOB FILING	2026.10.21
	100% BID DOCUMENTS	2026.10.28

SEAL & SIGNATURE:

DRAWN BY: TGC CHECKED BY: MDJ

SCALE: 1/8"=1'-0" PROJECT#: 8969.109

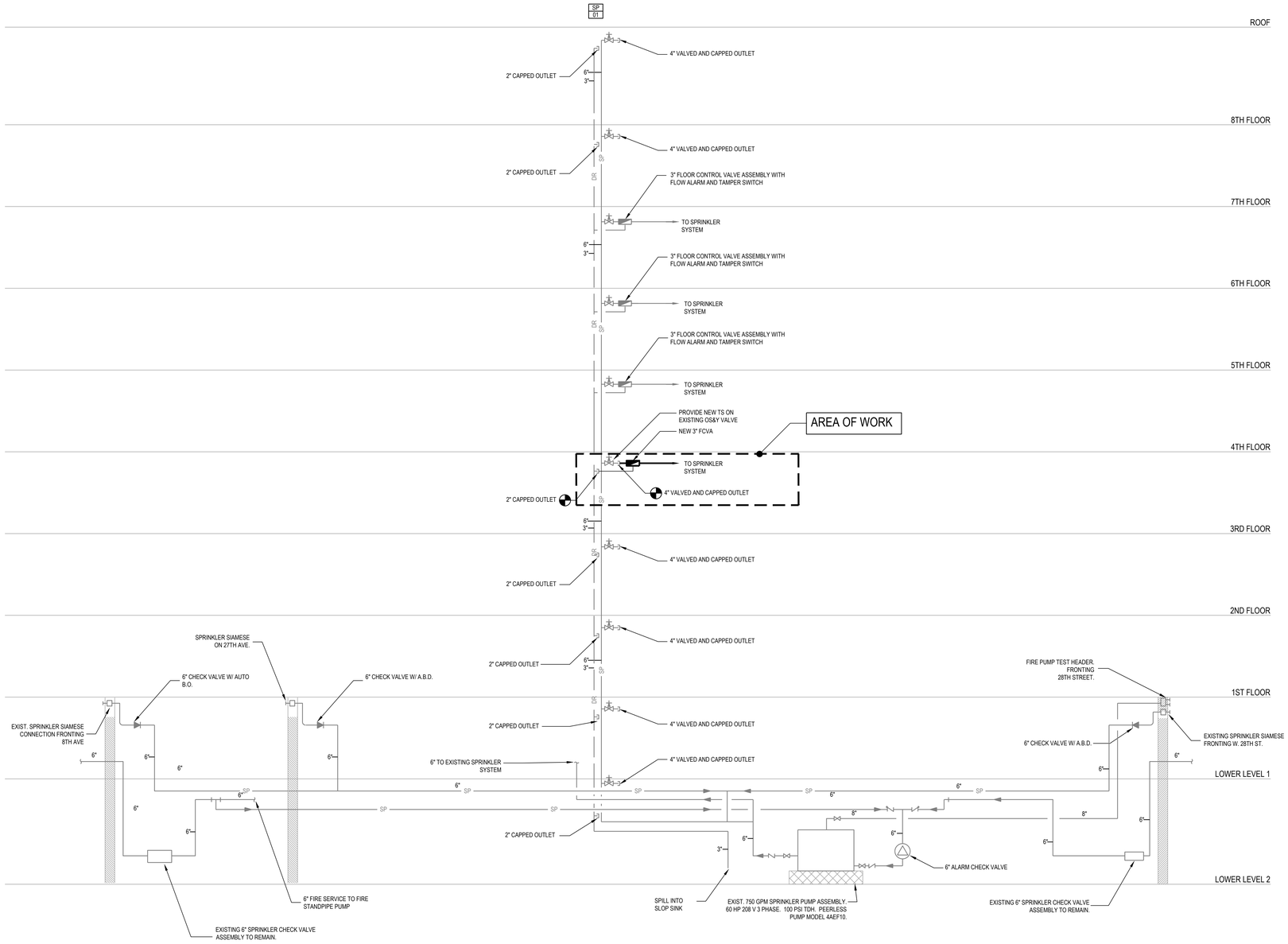
SHEET TITLE:

3RD FLOOR SPRINKLER PLAN

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

SP-101.00



SPRINKLER RISER DIAGRAM

SCALE: N.T.S.

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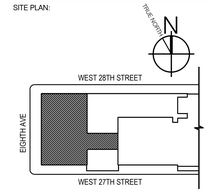
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DRAWN BY: TQC CHECKED BY: MDJ

SCALE: N.T.S.

PROJECT#: 8969.109

SHEET TITLE:

SPRINKLER RISER DIAGRAM

DOB NOW JOB# M01470747-S2

SHEET NUMBER:

SP-601.00