FASHION INSTITUTE OF TECHNOLOGY
Feldman Center New Waterside Economizer
IFB C1672

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SECTION I:
NOTICE TO BIDDERS

SECTION I: NOTICE TO BIDDERS

FASHION INSTITUTE OF TECHNOLOGY
Feldman Center New Waterside Economizer
IFB C1672

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), we'll also need you to mail us the original copy of the bid security to have on file. The bid security must either be mailed to 227 W 27th Street, New York, NY 10001 or dropped off at 333 7th Avenue (16th Floor), New York, NY 10001. Bids must be received by **July 30, 2025, on or before 12:00 P.M**. All bidders will be notified of the bid results within the hour. Bid results are not official until each package has been fully reviewed.

ATTACHMENT A - BID CHECKLIST

FASHION INSTITUTE OF TECHNOLOGY &
Feldman Center New Waterside Economizer
IFB C1672

Bidder shall meet the following requirements and submit necessary information with the Bid. Failure to comply with these requirements shall be grounds for rejection of your Bid.

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

☐ Did you include all required documentation? (As per Bidder Requirements – i.e., proof of being in business, permits, licenses, certifications, etc.)

☐ Did you include the Form of Bid? (See Section VIII.)

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

☐ Did you complete in full the Bid Analysis Form, (See Attachment C)

☐ Did you sign for each Addendum to this project, if any were published? (It is the contractor's responsibility to check FIT's "Current Bid Opportunities" webpage for addendums prior to submitting their bid.)
http://www.fitnyc.edu/about/administration/finance/purchasing/current-bids.php

☐ Did you complete the Contractor Reference Sheet? **Do not list FIT as your projects of similar size and scope.** (See Attachment B)

☐ Can you provide the required levels of insurance coverage? See: General Conditions – Article 15

☐ Did you include the Bid Security?

☐ Can the bidder provide references to at least three (3) different prior contracts that have been completed within the past five (5) years that are similar in size and scope to the project indicated for this Contract?

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

☐ Sub-contracting percentage 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?

☐ You have read and agree to comply and sign Exhibits E, F, G, and H upon award of contract. In addition to the foregoing requirements you are responsible for compliance with any additional safety directives that may be forthcoming by Executive Order or other authorized Federal, State, or local authority, between the date of issuance of this addendum the date of award.

<u>ATTACHMENT B - CONTRACTOR REFERENCE SHEET</u>

FASHION INSTITUTE OF TECHNOLOGY

Feldman Center New Waterside Economizer

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FIT requests a minimum of three references for **<u>completed</u>** 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.)**

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

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

Contact Name/Title: ____
Company Name/Address: ____
Phone Number: ____
Project Name: ____
Project Cost: ____
Project Start/End Date: ____
<u>For FIT Use Only – Reference Responses</u>
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
Feldman Center New Waterside Economizer
IFB C1672

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, and studios. 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") and the F.I.T. Student Housing Corporation 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.

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 Feldman Center New Waterside Economizer Project. 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 the following requirements and submit necessary information with the Bid. Failure to comply with these requirements shall be grounds for rejection of your Bid. FIT reserves the right to reject bids with incomplete information or bid security, or contain conditions not specified in the Bid Terms and Condition herein, or which are presented on a different form other than that provided to bidders. FIT reserves the right to determine whether a Bidder has substantially met all the Bid requirements and to ask for additional information prior to making such a determination.

A. **Bidder shall have been primarily a mechanical contractor in the HVAC 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 size, scope and nature to be performed under this Contract, as evidenced by **references from at least three (3) different successfully completed contracts in an installation similar to those indicated for this Contract in the past five (5) years.** Bidder shall include for each reference: 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 Mechanical 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
- Roof installation
- Electrical
- Fire Alarm
- Automatic Temperature Controls
- Metal Fabrication

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.

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.

VI. PRE-BID SITE INSPECTION AND QUESTIONS

A **mandatory** Pre-Bid Site Inspection for prospective Bidders will be held on **Wednesday, July 2, 2025 at 10:00 A.M.** at the Fashion Institute of Technology, Feldman Building "C Building" Lobby, located at 27th Street (between 7th and 8th Avenues). **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 **July 9, 2025 on or before 3:00 P.M**. Answers shall be provided by **July 16, 2025** in the form of and Addendum and be posted on the FIT purchasing department website. Reference Bid number **C1672.**

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), we'll also need you to mail us the original copy of the bid security to have on file. The bid security must either be mailed to 227 W 27th Street, New York, NY 10001 or dropped off at 333 7th Avenue (16th Floor), New York, NY 10001. Bids must be received by **July 30, 2025, on or before 12:00 P.M**. All bidders will be notified of the bid results within the hour. Bid results are not official until each package has been fully reviewed.

B. Bids received late will not be considered.

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 emailed to the FIT Purchasing Dept. inbox (purchasingbids@fitnyc.edu) on or before **July 30, 2025, on or before 12:00 PM** will be considered.

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. 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.

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

E. 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# **2025004006)**

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.

XIV. EXECUTIVE ORDERS/COVID-19

Contractors and Subcontractor shall comply with Governor Cuomo's Executive Order 202 & 202.16, the COVID-19 Contractor Guidance for Construction Jobsites, FIT's No Damages for Delay Clause, and the Interim Guidance Letter for Contractors. In addition to the foregoing requirements, you are responsible for compliance with any additional safety directives that may be forthcoming by Executive Order between the date of issuance of this addendum the date of award.

In the event the Contractor's performance under this agreement is delayed or interfered with arising out of or connected to the COVID19 pandemic, including but not limited to worker availability, government-mandated suspension of work or any other emergency action associated with protecting the health and safety of the workforce, which leads to a site closure, delay or suspension of the work, Contractor or any subcontractors hereby acknowledge their only remedy under this agreement is to request an extension of time for the performance of the unfinished work as herein provided; under no circumstances will Contractor or any subcontractors or vendors be entitled to any increase in the subcontract price or additional compensation for any alleged costs, expenses or damages as a consequence of such delays or interference, including but not limited to: i) General Condition Costs (e.g.: site clean-up, home and field office expenses, telecommunications equipment or use , and/or supervisory costs including but not limited to Project Manager, Project Engineer, Superintendent and Foremen, etc.), ii) escalation (increases in material costs, transportation charges or any alleged wage or salary increases) or iii) any alleged inefficiencies or loss of productivity. NOTE: The above examples are not intended to be an exhaustive list of all the alleged costs, expenses or damages excluded by this clause. It is offered only as an example of some costs within each category.

Owner shall review the Contractors request for delay and, if acceptable, shall extend the time of performance by Change Order for such reasonable time as the Owner, in its sole discretion, may determine.

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 Feldman Center New Waterside Economizer.**

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 **10:00 pm to 6:00 am,** 7 days a week. Access to the site on Saturday and Sunday must be coordinated in advance with FIT. Demolition, noisy work, or work that could affect the occupants should be performed only during the regular hours, 10:00 pm to 6:00 am. New work on the roof or in the mechanical or electrical spaces could be performed during daytime from 6:00 am to 10:00 pm only with the approval from FIT. 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 Feldman Center New Waterside Economizer** within five (5) working days of receipt of a Notice to Proceed from FIT. The shop drawings process and ordering need to proceed first. Work shall commence on or about **September 15, 2025**. **The project shall be Substantially Completed no later than June 30, 2026.** 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. 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.**

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.

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 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 5% 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 &
EAST COURTYARD AIR HANDLER UNITS REPLACEMENT
IFB C1672
NYS PREVAILING WAGE SCHEDULE PRC # 2025004006

BID BREAKDOWN

Line	Description	Total Labor Cost	Total Materials, Tools & Equipment	Line Total
1	DEMOLITION	$	$	$
2	FIRE STOPS	$	$	$
3	VALVES FOR HVAC	$	$	$
4	VIBRATION ISOLATION	$	$	$
5	HVAC SPECIALTIES	$	$	$
6	TESTING AND BALANCING	$	$	$
7	INSULATION FOR HVAC	$	$	$
8	COMISSIONING	$	$	$
9	HVAC AUTOMATIC TEMPERATURE CONTROLS	$	$	$
10	HVAC INTEGRATION ON BMS	$	$	$
11	PIPING FOR HVAC	$	$	$
12	PUMPS FOR HVAC	$	$	$
13	SHEET METAL DUCTWORK	$	$	$
14	FANS AND GRAVITY VENTILATORS	$	$	$
15	AIR FILTERS	$	$	$
16	AIR HANDLING UNITS	$	$	$
17	VARIABLE FREQUENCY DRIVE	$	$	$
18	COILS	$	$	$
19	HUMIDIFIER	$	$	$
20	ELECTRICAL	$	$	$
21	PLUMBING	$	$	$
22	FIRE ALARM	$	$	$
23	GENERAL REQUIREMENTS	$	$	$
24	GENERAL CONDITIONS	$	$	$

TOTAL BID PRICE (1-24) **$**_____

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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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:

Sam Li
Director of Procurement Services
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 five percent (5%) 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)	(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 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_____, 20__ 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 Principal or 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)	:	
<u>Contractor's Competent Persons</u>		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
Page 1 of 1

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:** Kathy Caraballo kathy_caraballo@fitnyc.edu	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

Fashion Institute of Technolog

Candida Poinsette, Assoc Director Procurement Svc
227 W 27th Street
New York NY 10001

Schedule Year	2024 through 2025
Date Requested	04/02/2025
PRC#	2025004006

Location	Feldman Building
Project ID#	C1672
Project Type	Provide labor, materials, tests, tools and equipment to complete the Feldman Center New Waterside Economizer Project.

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 2024 through June 2025. 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.

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

Candida Poinsette, Assoc Director Procurement Svc
227 W 27th Street
New York NY 10001

Schedule Year 2024 through 2025
Date Requested 04/02/2025
PRC# 2025004006

Location	Feldman Building
Project ID#	C1672
Project Type	Provide labor, materials, tests, tools and equipment to complete the Feldman Center New Waterside Economizer Project.

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.

Payrolls and Payroll Records

Contractors and subcontractors are required to establish, maintain, and preserve for not less that six (6) years, contemporaneous, true, and accurate payroll records.

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.

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. However, 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. 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.

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 — 04/01/2025

JOB DESCRIPTION Asbestos Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2024
Asbestos Worker Removal & Abatement Only*	$ 47.25

NOTE: *On Mechanical Systems that are NOT to be SCRAPPED.

SUPPLEMENTAL BENEFITS

Per Hour:	
Asbestos Worker Removal & Abatement Only	$ 13.65

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) on HOLIDAY PAGE

REGISTERED APPRENTICES
Apprentice Removal & Abatement Only:
1000 hour terms at the following percentage of Journeyman's rates.

1st	2nd	3rd	4th
78%	80%	83%	89%

SUPPLEMENTAL BENEFIT

Per Hour:	
Apprentice Removal & Abatement	$ 13.65

4-12a - Removal Only

Boilermaker — 04/01/2025

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:	07/01/2024	01/01/2025
Boilermaker	$ 67.38	$ 68.88
Repairs & Renovations	67.38	68.88

Repairs & Renovation: Includes Repairing, Renovating replacement of parts to an existing unit(s).

SUPPLEMENTAL BENEFITS
Per Hour:

Boilermaker Repair & Renovations	33.5% of hourly Wage Paid + $ 26.85	33.5% of Hourly Wage Paid + $26.85

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

Repairs & Renovation Includes replacement of parts and repairs & renovation of existing unit.

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
Wage per hour:
(1/2) Year Terms at the following percentage of Boilermaker's Wage

1st	2nd	3rd	4th	5th	6th	7th
65%	70%	75%	80%	85%	90%	95%

Supplemental Benefits Per Hour:

	33.5% of Hourly Wage Paid Plus Amount Below	33.5% of Hourly Wage Paid Plus Amount Below
1st Term	$ 20.36	$ 20.36
2nd Term	21.28	21.28
3rd Term	22.22	22.22
4th Term	23.12	23.12
5th Term	24.07	24.07
6th Term	25.00	25.00
7th Term	25.93	25.93

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Broadband — 04/01/2025

JOB DESCRIPTION Broadband **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2024	06/29/2025
Field Tech Install/Repair	$ 52.40	$ 53.97

For outside work (excluding installation on building construction/alteration/renovation projects), stopping at first point of attachment (demarcation), installing/maintaining/repairing broadband internet service.

SUPPLEMENTAL BENEFITS
Per Hour:
$ 23.24

OVERTIME PAY
See (B, K, *R) on OVERTIME PAGE
Note: *Two and one half times the hourly rate after the 8th hour

HOLIDAY
Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

4-CWA-Dist1

Carpenter — 04/01/2025

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2024
Piledriver	$ 60.59 + 10.00*
Dockbuilder	$ 60.59 + 10.00*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 45.79

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
$26.98 + 5.50*	$32.58 + 5.50*	$40.96 + 5.50*	$49.35 + 5.50*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

All Terms: $ 32.34

8-1556 Db

Carpenter 04/01/2025

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2024

Carpet/Resilient
Floor Coverer $ 55.05
+ 8.25*

*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:
$ 39.45

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
$ 25.20 + 1.85*	$ 28.20 + 2.35*	$ 32.45 + 2.85*	$ 40.33 + 3.85*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 15.22	$ 16.22	$ 19.32	$ 20.32

8-2287

Carpenter **04/01/2025**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour: 07/01/2024

Marine Construction:

Marine Diver	$ 75.46
	+ 10.00*
Marine Tender	$ 55.00
	+ 10.00*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 45.65

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	$ 26.98
	+ 5.50*
2nd year	32.58
	+ 5.50*
3rd year	40.96
	+ 5.50*
4th year	49.35
	+ 5.50*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits
Per Hour:

All terms	$ 32.20

8-1456MC

Carpenter **04/01/2025**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2024

Building

Millwright	$ 59.35
	+ 13.12*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS

Per hour:

Millwright $ 45.41

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Paid: See (18,19) on HOLIDAY PAGE.

Overtime See (5,6,8,11,13,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$ 32.16	$ 37.61	$ 43.06	$ 53.96
+ 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.
$ 30.56	$ 33.09	$ 36.27	$ 40.69

8-740.1

Carpenter — 04/01/2025

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per Hour:

	07/01/2024
Timberman	$ 55.59
	+ 10.26*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per Hour:

	07/01/2024
	$ 44.96

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
$24.96	$30.07	$37.72	$45.38
+ 5.55*	+ 5.55*	+ 5.55*	+ 5.55*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:
All terms $ 31.95

8-1556 Tm

Carpenter **04/01/2025**

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:	07/01/2024
Core Drilling:	
Driller	$ 46.25
	+ 3.25*
Driller Helper	$ 36.28
	+ 3.25*

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: When required to work on water: an additional $ 3.00 per hour.

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS

Per hour:	
Driller and Helper	$ 30.24

OVERTIME PAY
See (B, G, P) on OVERTIME PAGE

HOLIDAY

Paid:	See (5, 6) on HOLIDAY PAGE
Overtime:	See (5, 6) on HOLIDAY PAGE

8-1536-CoreDriller

Carpenter **04/01/2025**

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:	07/01/2024
Show Exhibit	$ 55.75
	+ 9.80**
Bldg. Carpenter*	$57.05
	+ 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	$ 45.20
Bldg. Carpenter	39.75

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
Wages per hour: Show Exhibit

(1) year terms:

1st.	2nd.	3rd.	4th.
$22.30	$27.88	$36.24	$44.60
+ 4.90*	+ 4.90*	+ 4.90*	+ 4.90*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:
All terms $ 30.25

Wages per hour: Bldg. Carpenter
(1) year terms:

1st	2nd	3rd	4th
$ 22.20	$ 25.20	$ 29.45	$ 37.33
+ 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
$ 15.37	$ 16.42	$ 19.52	$ 20.52

8-EXHIB

Carpenter - Heavy&Highway 04/01/2025

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:

	07/01/2024
Heavy & Highway	
Carpenter	$ 60.59
	+ 10.00*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour worked:

Heavy & Highway
Carpenter $ 45.70

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
Paid : for 1st & 2nd yr
Apprentices See (5, 6, 11, 13, 25)

REGISTERED APPRENTICES
Wage per hour:
One (1) year terms:

	1st	2nd	3rd	4th
Heavy & Highway	$ 26.98	$ 32.58	$ 40.96	$ 49.35

+ 5.50* + 5.50* + 5.50* + 5.50*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits:
Per Hour:

All terms
$ 32.25

8-NYC H/H

Electrician **04/01/2025**

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour: 07/01/2024

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 **04/01/2025**

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour: 07/01/2024

Electrician	$ 32.00
Telephone	32.00

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:

07/01/2024
$ 27.20
29.23*

* 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 **04/01/2025**

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond, Westchester

WAGES
Per hour: 07/01/2024

Service Technician $ 37.40

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: $ 21.85

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 **04/01/2025**

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per Hour: 07/01/2024

Electrician
Audio/Sound and Temporary Light/ Power $ 62.00

Solar-Photovoltaic Systems

Group 1 62.00
All tasks not listed in Group 2

Group 2 32.00

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	$ 72.75
Night (Graveyard Shift): Electrician Audio/Sound and Temporary Light	$ 81.49

SUPPLEMENTAL BENEFITS
Per Hour:

Electrician	$ 66.09
	70.01*
Swing Shift:	75.07
	79.66*
Graveyard Shift:	82.66
	87.81*
Temporary Light/Power:	30.33
	33.64*
Group 1:	66.09
	70.01*
Group 2:	27.21
	29.23*

* 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 $168,600 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:

One (1) year terms	
First term:	07/01/2024
0-6 mos.	$ 18.00
7-12 mos.	18.50
Second term:	
0-6 mos.	19.50
7-12 mos.	20.50
Third term	
0-6 mos.	21.50
7-12 mos.	22.50
Fourth term:	
0-6 mos.	23.50
7-12 mos.	25.50
Fifth term/MIJ:	
0-12 mos.	27.50
13-18 mos.	32.00

Supplemental Benefits per hour:

One (1) year terms:

First Term:	Regular	Overtime
0-6 mos.	$ 17.18	$ 18.38
7-12 mos.	17.44	18.67

Second Term:		
0-6 mos.	17.97	19.26
7-12 mos.	18.49	19.85
Third Term:		
0-6 mos.	19.02	20.44
7-12 mos.	19.54	21.03
Fourth Term:		
0-6 mos.	20.06	21.62
7-12 mos.	21.11	22.80
Fifth Term/MIJ:		
1-12 mos.	24.79	26.52
13-18 mos.	27.21	29.23

9-3

Electrician - Highway and Street Lighting, Traffic Signals and Controls — 04/01/2025

JOB DESCRIPTION Electrician - Highway and Street Lighting, Traffic Signals and Controls **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2024
Electro Pole Electrician	$ 62.00
Electro Pole Foundation Installer	47.66
Electro Pole Maintainer	41.61

SUPPLEMENTAL BENEFITS
Per Hour:

	07/01/2024
Electro Pole Electrician	$ 68.20 72.12*
Electro Pole Foundation Installer	51.68 54.69*
Electro Pole Maintainer	47.03 49.66*

*Applies when premium wages are paid

Note: Reduce benefit rate by 6.2% for any employee who has accumulated wages in $168,600 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 — 04/01/2025

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:

	07/01/2024	03/17/2025
Elevator Constructor	$ 80.35	$ 83.37
Modernization & Service/Repair	63.16	65.54

SUPPLEMENTAL BENEFITS
Per Hour:

Elevator Constructor	$ 46.367	$ 47.65
Modernization & Service/Repairs	45.217	46.47

OVERTIME PAY
Constructor See (D, M, T) on OVERTIME PAGE.

Modern/Service See (B, F, S) 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 Journeyman's wage of classification Working in.

SUPPLEMENTAL BENEFITS:

	07/01/2024	03/17/2025
Elevator Constructor		
1st Term	$ 0.00	$ 0.00
2nd & 3rd Term	36.15	36.90
4th & 5th Term	37.19	37.99
6th & 7th Term	38.80	39.70
8th & 9th Term	40.41	41.40
Modernization & Service/Repair		
1st Term	$ 0.00	$ 0.00
2nd & 3rd Term	36.15	36.88
4th & 5th Term	37.19	37.58
6th & 7th Term	38.80	39.20
8th & 9th Term	40.41	40.83

4-1

Glazier — 04/01/2025

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:

	07/01/2024	05/01/2025 Additional
Glazier, Glass Tinting and Window Film	$ 63.28	$ 1.11***
Scaffolding, including swing scaffold	67.28	

*Mechanical Equipment	64.28
**Repair & Maintenance	30.76

*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 $193,000.

***To be allocated at a later date.

SUPPLEMENTAL BENEFITS

Per hour:	7/01/2024
Glazier, Glass Tinting Window Film, Scaffolding and Mechanical Equipment	$ 42.13
Repair & Maintenance	24.62

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:

	7/01/2024
1st term	$ 22.34
2nd term	30.64
3rd term	40.87
4th term	50.14

Supplemental Benefits:
(Per hour)

1st term	$ 19.27
2nd term	27.34
3rd term	32.85
4th term	36.01

8-1087 (DC9 NYC)

Insulator - Heat & Frost — 04/01/2025

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per Hour: 07/01/2024

Insulators Heat & Frost	$ 71.01

SUPPLEMENTAL BENEFITS
Per Hour:

Insulators Heat & Frost	$ 36.76

OVERTIME PAY
See (B, 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
Wages:
1 year terms.
Wages Per Hour:

1st	2nd	3rd	4th
$ 31.96	$ 39.06	$ 46.16	$ 53.26

Supplemental Benefits:

$ 16.56	$ 20.23	$ 23.91	$ 27.06

4-12

Ironworker **04/01/2025**

JOB DESCRIPTION Ironworker **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2024	01/01/2025 Additional
Stone Derrickmen Rigger	$ 75.40	$ 1.64*
Stone Handset Derrickman	72.55	1.11*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour:

Stone Derrickmen Rigger	$ 45.52
Stone Handset Derrickman	44.76

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
07/01/2024	$ 37.20	$ 53.28	$ 59.32	$ 65.36

Supplemental Benefits:
Per hour:

07/01/2024	23.27	34.39	34.39	34.39

Stone Handset:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2024	$ 35.78	$ 51.04	$ 56.79	$ 62.55

Supplemental Benefits:
Per hour:

07/01/2024	22.95	34.08	34.08	34.08

9-197D/R

Ironworker **04/01/2025**

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2024	01/01/2025
Ornamental	$ 47.65	$ 47.90
Chain Link Fence	47.65	47.90
Guide Rail	47.65	47.90

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker:	$ 66.29	$ 67.29

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

1st Term	$ 25.98	$ 26.45
2nd Term	28.45	28.97
3rd Term	30.80	31.36
4th Term	34.39	35.02
Supplemental Benefits per hour:		
1st Term	$ 16.29	$ 16.29
2nd Term	18.29	18.29
3rd Term	19.29	19.29
4th Term	20.29	20.29

4-580-Or

Ironworker **04/01/2025**

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
PER HOUR:

	07/01/2024	01/01/2025
Ironworker:		
Structural	$ 57.20	$ 58.45
Bridges		
Machinery		

SUPPLEMENTAL BENEFITS
PER HOUR PAID:

Journeyman	$ 89.85	$ 91.35

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
WAGES PER HOUR:

6 month terms at the following rate:

1st	$ 30.23	$ 30.36
2nd	30.83	30.96
3rd - 6th	31.44	31.57

Supplemental Benefits
PER HOUR PAID: 62.47 63.48

4-40/361-Str

Ironworker 04/01/2025

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:	07/01/2024
Reinforcing & Metal Lathing	$ 56.95
"Base" Wage	55.20 plus $ 1.75

"Base" Wage is used to calculate overtime hours only.

SUPPLEMENTAL BENEFITS

Per hour:	
Reinforcing & Metal Lathing	$ 44.63

OVERTIME PAY
See (B, E, Q, *X) on OVERTIME PAGE
*Only $23.50 per Hour for non worked hours

Supplemental Benefit Premiums for Overtime Hours worked:

Time & One Half	$ 51.13
Double Time	57.63

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 11, 13, *18, **19, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following wage rates:

Prior to 01/01/2020:

1st term	2nd term	3rd term	4th Term
Wage Per Hour:			
$ 22.55	$ 28.38	$ 34.68	$ 37.18
"Base" Wage			
$21.00	$26.80	$33.10	$35.60
plus $1.55	plus $1.58	plus $1.58	plus $1.58

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENIFITS
Per Hour:

1st term	2nd term	3rd term	4th Term
$18.17	$21.34	$22.00	$22.50

After 01/01/2020:

1st term	2nd term	3rd term	4th Term
Wage Per Hour:			
$ 22.55	$ 23.60	$ 24.60	$ 25.65
"Base" Wage			
$21.00	$22.00	$23.00	$24.00
plus $1.55	plus $1.60	plus $1.60	plus $1.65

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENIFITS
Per Hour:

1st term	2nd term	3rd term	4th Term
$18.40	$17.40	$16.45	$15.45

4-46Reinf

Laborer **04/01/2025**

JOB DESCRIPTION Laborer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2024	07/01/2025 Additional
Striper (Highway/streets):		
Striping-Machine Operator	$ 41.00	$ 3.05**
Striping Thermoplastic	45.00	
Flagger - Traffic Safety*	39.00	

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.

** To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour paid:

Journeyworker	$ 19.27

OVERTIME PAY
See (B, H) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 13) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 13) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:

1st Term (1-2000 hours)	$ 31.36
2nd Term (2001-4000 hours)	33.00

Supplemental Benefits per hour:

All Terms	19.27

9-1010-LS

Laborer **04/01/2025**

JOB DESCRIPTION Laborer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2024
Laborer/Excavation	
**Asbestos and Lead Abatement & Removal, Hazardous Waste Removal (including soil)	$ 45.00
Basic	45.00
Flagman	45.00
Pipelayer	45.00
*Tree Work, *Landscape	45.00

*Includes trimming, cutting, planting and/or removal of trees.
** Applies to Heavy & Highway projects

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 54.03

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.

		07/01/2024
1st	0 - 1000	$ 22.50
2nd	1001-2000	27.00
3rd	2001-3000	33.75
4th	3001-4000	40.50

Supplemental Benefits per hour:

All Apprentices	54.03

9-731Ex

Laborer **04/01/2025**

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)	07/01/2024
Laborer (Tunnel)-FREE AIR:	
Group 14	$ 77.13
Group 16	73.75
Group 17*	68.18
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 $3.00 per day when using an air spade, jack hammer or pavement breaker.

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	$ 55.32
GROUP 16	53.06
GROUP 17	49.11
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 — 04/01/2025

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2024	01/01/2025
Basic Laborer and Mason Tender	$ 44.70*	$ 45.25*
*Before calculating premium wage deduct	$ 3.25	$ 3.45

SUPPLEMENTAL BENEFITS
Per hour:

Basic Laborer and Mason Tender	$ 29.99	$ 30.69

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 07/01/2024	$ 22.05*	$ 23.80*	$ 25.30*	$ 27.80*

01/01/2025	$ 22.25*	$ 24.10*	$ 25.60*	$ 28.10*

*Before calculating premium wage deduct
$ 0.50 $ 0.60

Supplemental Benefits per hour:

All Terms
$ 10.77 $ 11.02

9-MTDC(79)

Laborer - Building 04/01/2025

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2024	07/01/2025 Additional
Skilled Interior Demolition Laborer:	$ 39.70*	$ 0.75***
General Interior Demolition Laborer:	28.89**	

* Before calculating overtime wages deduct $1.70

**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. Also performs clean-up of the site when demolition is complete.

***To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

Skilled Interior Demolition Laborer:	24.84
General Interior Demolition Laborer:	19.16

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
$ 21.80*	$ 23.55*	$ 25.05*	$ 27.55*

* Before calculating overtime wages deduct $0.50

Supplemental Benefits Per Hour:

All Terms: 10.47

9-MTDC (79-ID)

Laborer - Building 04/01/2025

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour: 07/01/2024

Laborer:
Laborer-Concrete

(including flag person) $ 42.53
+ 8.00*

* This portion is not subjected to overtime premiums.

SUPPLEMENTAL BENEFITS

Per Hour

$ 20.20
+ 9.00**

** 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
$ 15.35 + 2.49*	$ 20.15 + 7.32*	$ 20.95 + 7.80*

* This portion is not subjected to overtime premiums.

Supplemental Benefits:

Per hour:

$ 12.70 + 2.65*	$ 16.70 + 3.45*	$ 16.70 + 4.25*

Journeyworker rate applies after 4000 hours

*This portion subjected to same premium as wages.

9-6A/18A/20-C

Laborer - Building 04/01/2025

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES

Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2024	01/01/2025
Building:		
Plasterer Tender and Spray Fireproofing Tender	$ 44.70*	$ 45.25*
* Before calculating overtime wages deduct	$ 3.25	$ 3.45

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker	$ 29.99	$ 30.69

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
07/01/2024	$22.05*	$23.80*	$25.30*	$27.80*
01/01/2025	$22.35*	$24.10*	$25.60*	$28.10*

* Before calculating overtime wages deduct

	$ 0.50	$ 0.60

Supplemental Benefits per hour:

All Terms:		
	$ 10.77	$ 11.02

9-30 (79)

Laborer - Building **04/01/2025**

JOB DESCRIPTION Laborer - Building **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2024	01/06/2025
Asbestos, Lead and Hazardous Material Abatement Laborer	$ 40.55	$ 41.15

(Re-Roofing Removal See Roofer)
NOTE: Asbestos removed from Mechanical Systems not to be scrapped See Asbestos Worker

SUPPLEMENTAL BENEFITS

Per Hour:		
Laborer	$ 20.10	$ 21.00

OVERTIME PAY
See (B, B2, I) on OVERTIME PAGE
07/01/2024 - *Calculate at $39.00 per hour then add $1.55
01/06/2025 - *Calculate at $39.25 per hour then add $1.90

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 28) on HOLIDAY PAGE

REGISTERED APPRENTICES
1000 hour terms at the following:

Per Hour:		
1st Term	$ 21.00*	$ 21.48*
2nd Term	22.00**	22.48**
3rd Term	25.00***	25.48***
4th Term	27.00****	27.48****

SUPPLEMENTAL BENEFIT

Per Hour:		
All Terms	$ 14.35	$ 15.07

OVERTIME PAY:
07/01/2024
*Calculate at $20.00 per hour then add $1.00
**Calculate at $21.00 per hour then add $1.00
***Calculate at $24.00 per hour then add $1.00
****Calculate at $26.00 per hour then add $1.00
01/06/2025
*Calculate at $21.20 per hour then add $1.28
**Calculate at $22.20 per hour then add $1.28
***Calculate at $24.20 per hour then add $1.28
****Calculate at $26.20 per hour then add $1.28

4-NYDC(78)

Laborer - Building **04/01/2025**

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2024	01/01/2025
Skilled Demolition Laborer:	$ 42.48*	$ 42.66*
General Demolition Laborer:	31.06**	31.24**

*Before calculating overtime wages deduct

	3.00	3.05

**Before calculating overtime wages deduct

	2.35	2.40

**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. Also performs clean-up of the site when demolition is complete.

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:	$ 28.92	$ 29.24
General Demolition Laborer:	21.98	22.30

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
07/01/2024	$ 22.05*	$ 23.80*	$ 25.30*	$ 27.80*
01/01/2025	22.35*	24.10*	25.60*	28.10*

*Before calculating overtime wages deduct

	$ 0.50	$ 0.60

Supplemental Benefits per hour:

All Terms:

	10.77	11.02

9-79/95

Laborer - Concrete & Asphalt Paving — 04/01/2025

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:	07/01/2024
Concrete Formsetter	$ 49.35 + $ 8.00*
Asphalt Screeperson/Micro Paver	49.95 + $ 8.00*
Asphalt Raker	49.35 + $ 8.00*
Group 1	45.48 + $ 8.00*
Group 2	45.48 + $ 8.00*

* This portion is not subjected to overtime premiums.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 45.55

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.

**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%.

* 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.

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
$ 31.36 + $ 8.00*	$ 33.00 + $ 8.00*

* This portion is not subjected to overtime premiums.

Supplemental Benefits per hour:
2000 hours term:

1st term	2nd term
1-1999	2000-4000
$ 18.67	$ 18.67

9-1010H/H

Laborer - Trac Drill — 04/01/2025

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:	07/01/2024
Group 1	$ 45.00
Group 2	52.35
Group 3	51.52
Group 4	58.21

SUPPLEMENTAL BENEFITS

Per Hour:

All Classifications: 54.03

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.

		07/01/2024
1st	0 - 1000	$ 22.50
2nd	1001-2000	27.00
3rd	2001-3000	33.75
4th	3001-4000	40.50

Supplemental Benefits per hour:

All Apprentices 54.03

9-731/29

Laborer - Tunnel 04/01/2025

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)

	07/01/2024
Laborer (Compressed Air):	
GROUP 5	$ 80.82
GROUP 6	77.95
GROUP 7	76.65
GROUP 8,9	75.10
GROUP 10	66.18

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	$ 57.61
GROUP 6	55.81
GROUP 7	54.68
GROUP 8,9	53.84

GROUP 10 50.85

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 — 04/01/2025

JOB DESCRIPTION Mason **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour: 07/01/2024

Brick/Block Layer $ 67.14

Base Wage for OT Calculation $ 55.93

SUPPLEMENTAL BENEFITS
Per Hour:

Brick/Block Layer $ 34.90

OVERTIME PAY
See (A, E, E2, Q) on OVERTIME PAGE
Note: OT Calculated on Base Wage plus $ 11.21/hr.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(800 hour) Terms at the following Percentage of Journey workers "Base Wage" plus $ 5.94/hr.:

1st	2nd	3rd	4th	5th
50%	60%	70%	80%	90%

Supplemental Benefits per hour:

All Apprentices $ 24.70

4-1Brk

Mason - Building — 04/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Building

Wages per hour:	07/01/2024	01/01/2025
Mosaic & Terrazzo Mechanic	$ 60.98	$ 61.33
Mosaic & Terrazzo Finisher	58.96	59.72

SUPPLEMENTAL BENEFITS
Per hour:

Mosaic & Terrazzo Mechanic	$ 31.36* + $9.78	$ 31.46* + $10.39
Mosaic & Terrazzo Finisher	$ 31.36* + $9.77	$ 31.46* + $10.38

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (A, E, Q) on OVERTIME PAGE
07/01/2024- 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
07/01/2024	$ 25.19	$ 32.39	$ 38.18	$ 40.78	$ 49.00	$ 55.75
01/01/2025	25.36	32.60	39.95	41.09	49.37	56.15

Supplemental Benefits per hour:

07/01/2024	$7.12* + 3.43	$9.16* + 4.40	$17.22* + 5.87	$23.86* + 6.84	$24.86* + 7.83	$27.36* + 8.80
01/01/2025	$7.12* + 3.64	$9.16* + 4.67	$15.72* + 6.24	$23.86* + 7.27	$24.86* + 8.31	$27.36* + 9.35

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/3

Mason - Building — 04/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2024	12/02/2024
Tile Setters	$ 64.40	$ 64.62

SUPPLEMENTAL BENEFITS
Per Hour:

$ 28.51* +8.52	$ 29.01* +8.52

*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
07/01/2024									
$22.19	$27.21	$34.45	$39.46	$43.07	$46.58	$50.23	$55.24	$57.71	$62.00
12/02/2024									
$22.29	$27.35	$34.36	$39.41	$43.05	$46.60	$50.29	$55.33	$57.84	$62.20

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2024									
$12.55*	$12.55*	$15.36*	$15.36*	$16.36*	$17.86*	$18.86*	$18.86*	$18.86*	$24.11*
+ $.76	+ $.81	+ $.91	+ $.96	+$1.43	+$1.48	+$1.91	+$1.97	+$4.57	+$5.18
12/02/2024									
$12.70*	$12.70*	$15.81*	$15.81*	$16.81*	$18.31*	$19.31*	$19.31*	$19.31*	$24.56*
+ $.76	+ $.81	+ $.91	+ $.96	+ $1.43	+ $1.48	+ $1.91	+ $1.97	+ $4.57	+ $5.18

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52

Mason - Building — 04/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2024	01/06/2025
Building-Marble Restoration:		
Marble, Stone & Terrazzo Polisher	$ 47.72	$ 47.93

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker:

Building-Marble Restoration:		
Marble, Stone & Polisher	$ 31.50	$ 31.86

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
07/01/2024	$ 33.40	$ 38.18	$ 42.94	$ 47.72
01/06/2025	33.54	38.34	43.13	47.93
Supplemental Benefits Per Hour:				
07/01/2024	29.06	29.87	30.69	31.50
01/06/2025	29.59	30.34	31.11	31.86

9-7/24-MP

Mason - Building — 04/01/2025

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:

	07/01/2024	01/06/2025

Marble Cutters & Setters	$ 63.92	$ 64.21

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 40.05	$ 40.51

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+
07/01/2024							
$ 27.01	$ 40.52	$ 43.88	$ 47.26	$ 50.64	$ 54.32	$ 60.71	$ 63.92
01/06/2025							
$ 27.24	$ 40.84	$ 44.25	$ 47.63	$ 51.05	$ 54.58	$ 60.99	$ 64.21

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2024							
$ 26.42	$ 29.76	$ 30.61	$ 31.44	$ 32.28	$ 37.55	$ 39.23	$ 40.05
01/06/2025							
$ 26.88	$ 30.14	$ 30.95	$ 31.78	$32.59	$38.07	$ 39.71	$ 40.51

9-7/4

Mason - Building — 04/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2024	12/02/2024
Tile Finisher	$ 49.46	$ 49.59

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

$ 25.36*	$ 25.81*
+ $8.33	+ $8.34

* 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 — 04/01/2025

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2024	01/06/2025
Marble, Stone,		

Maintenance Finishers:	$ 27.72	$ 27.99

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:	$ 15.74	$ 15.88

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:

	07/01/2024	01/06/2025
0-750	$ 22.32	$ 22.91
751-1500	23.04	23.59
1501-2250	23.75	24.26
2251-3000	24.48	24.95
3001-3750	25.56	25.96
3751-4500	27.00	27.32
4501+	27.72	27.99

Supplemental Benefits:
Per hour:

0-750	12.69	12.43
751-1500	13.10	12.89
1501-2250	13.51	13.35
2251-3000	13.91	13.80
3001-3750	14.52	14.50
3751-4500	15.33	15.41
4501+	15.74	15.88

9-7/24M-MF

Mason - Building / Heavy&Highway — 04/01/2025

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per hour:

	07/01/2024	01/06/2025
Marble-Finisher	$ 49.99	$ 50.22

SUPPLEMENTAL BENEFITS
Journeyworker:
Per hour

Marble- Finisher	$ 37.39	$ 37.69

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 **04/01/2025**

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2024
Cement Mason	$ 57.72

SUPPLEMENTAL BENEFITS
Per Hour:

Cement Mason	$ 34.66
1.5 X overtime rate	$ 62.95
2 X overtime rate	$ 69.32

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 Term	$ 23.39
2nd Term	$ 28.29
3rd Term	$ 33.69

Supplement Benefits per hour paid:

	ST	1.5X OT	2X OT
1st Term	$ 14.86	$ 22.30	$ 29.72
2nd Term	$ 15.16	$ 22.75	$ 30.32
3rd Term	$ 15.27	$ 22.91	$ 30.54

4-780

Mason - Building / Heavy&Highway **04/01/2025**

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:

	07/01/2024	05/01/2025 Additional
Stone Setter	$ 69.91	$ 3.42/Hr+
Base Rate	53.84*	
Stone Tender	$51.82	
Base Rate	44.54*	

(+)To be allocated at a later date for all classes.

SUPPLEMENTAL BENEFITS
Per Hour:

Stone Setter	$ 42.52
Stone Tender	23.15

OVERTIME PAY
See (*C, **E, Q) on OVERTIME PAGE
* Base Rates are used to Calculate Overtime Premiums then adding in: $15.81/Hr. for Stone Setter or $7.28/Hr. for Stone Tender.

** On weekdays the eighth (8th) and ninth (9th) hours are time and one-half all work thereafter is paid at double the hourly rate.

*** The first nine (9) hours on Saturday is paid at time and one-half all work thereafter is paid at double the hourly rate.

HOLIDAY
Paid: See (*18) on HOLIDAY PAGE
Overtime: See (5, 6, 10) on HOLIDAY PAGE
Paid: * Must work first 1/2 of day.

REGISTERED APPRENTICES
Per Hour:

Stone Setter(800 hour) terms at the following Percentage of Stone Setters Base wage rate per hour plus $7.32:

1st	2nd	3rd	4th	5th	6th
50%	60%	70%	80%	90%	100%

Supplemental Benefits:
All Apprentices $ 25.85

4-1Stn

Mason - Heavy&Highway 04/01/2025

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour: 07/01/2024

Pointer, Caulkers & Cleaners $ 63.69

SUPPLEMENTAL BENEFITS
Per Hour:

Pointer, Cleaners & Caulkers $ 31.90

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
Wages per hour:

One (1) year terms at the following wage rates.

1st	2nd	3rd	4th
$ 32.76	$ 37.09	$ 42.97	$ 51.60

Apprentices Supplemental Benefits:
(per hour paid)

$ 15.40	$ 21.70	$ 24.45	$ 25.45

4-1PCC

Operating Engineer - Building 04/01/2025

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) 07/01/2024

Building Construction:

Party Chief	$ 79.99
Instrument Man	60.36
Rodman	40.45

Steel Erection:

Party Chief	83.13
Instrument Man	64.21
Rodman	44.33

Heavy Construction-NYC counties only:
(Foundation, Excavation.)

Party Chief	88.06
Instrument man	65.66
Rodman	55.70

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2024
Building Construction	$ 28.63* +$ 7.65
Steel Erection	29.23* + 7.65
Heavy Construction	30.04* + 7.64

* This portion subject to SAME premium as wages

Non-Worked Holiday Supplemental Benefit:
21.83

OVERTIME PAY
See (A, B, E, Q) on OVERTIME PAGE
Code "A" applies to Building Construction and has double the rate after 7 hours on Saturdays.
Code "B" applies to Heavy Construction and Steel Erection and had 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 — 04/01/2025

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:	07/01/2024
Steel Erection:	
Group 1	$ 81.43
Group 2	76.58
Group 3	58.22
Building Construction:	
Group 1	$ 72.41
Group 2	57.36
Group 3	69.09
Group 4	52.62
Group 5	46.07
Heavy Construction:	
Group 1	$ 57.43
Group 2	58.68
Group 3	108.95
Group 4	84.24

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2024
Building Construction	$ 30.52* + $7.40
Steel Erection & Heavy	31.02* + $7.40

* This portion of benefits is subject to same OT premium as wages.

Non-Worked Holiday Supplemental Benefits:
21.87

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.
$ 38.52	$ 45.23	$ 48.70	$ 52.17

Supplemental Benefits:
Per Hour:
All Terms $ 16.52* + 7.40

* This portion of benefits is subject to same OT premium as wages.

9-15Ab

Operating Engineer - Building / Heavy&Highway **04/01/2025**

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:	07/01/2024
Maintenance Engineer (Sewer Systems)	$ 84.24

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyman $ 31.02*
+ $ 7.40
*This portion of benefits subject to SAME premium as OT wages.

Non-Worked Holiday Supplemental Benefits:
$ 21.87

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
$38.52	$45.23	$48.70	$52.17

Supplemental Benefits:
Per Hour:

All Apprentices: $ 16.52* + $ 7.40

* This portion of benefits subject to the SAME premium as OT wages

9-15Sewer

Operating Engineer - Building / Heavy&Highway **04/01/2025**

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2024	08/01/2024
Well Driller	$ 41.85	$ 43.11
Well Driller Helper	$ 36.26	$ 37.35

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 & Helper	10% of straight time 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 Term	$ 28.00
2nd Term	$ 29.00
3rd Term	$ 30.00

SUPPLEMENTAL BENEFITS
Per Hour:

All Terms	10% of Wage + $ 13.50

Additional $4.25/Hr. for premium time hours worked.

4-138well

Operating Engineer - Building & Steel Erection — 04/01/2025

JOB DESCRIPTION Operating Engineer - Building & Steel Erection **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per Hour:	07/01/2024
STEEL ERECTION:	
Three Drum Derricks	$ 107.16
Cranes, Two Drum Derricks, Hydraulic Cranes & Fork Lifts, Boom Trucks	103.28
Compressors, Welding Machines	63.36
Compressors (not combined with welding machines)	60.71
BUILDING CONSTRUCTION:	
Cranes, Stone Derrick, Boom Trucks, Hydraulic Cranes,	103.62
Double Drum	98.28
4 Pole Hoists and Single Drum Hoists	87.78
Fork Lifts, Plaster(Platform Machine)Plaster Bucket, Concrete Pumps and all other equipment used for hoisting	80.54
*House Cars and Rack & Pinion	71.35
*House Cars (New Projects)	58.47

Erecting and dismantling Cranes 88.64

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 62.20

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:	07/01/2024
All Operator Classes	$ 26.15* 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
07/01/2024	$ 44.92	$ 54.40	$ 63.88

Supplemental Benefits Per Hour:

	07/01/2024
Straight Time	$ 15.65* 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 — 04/01/2025

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)	07/01/2024
Group 1	$ 123.06
Group 2	102.98
Group 3	106.03
Group 4	103.66
Group 5	101.78
Group 6	98.05
Group 7	99.74
Group 8	97.10
Group 9	95.24
Group 10	91.40
Group 11	85.94
Group 12	87.66
Group 13	88.24
Group 14	80.02
Group 15	68.59
Group 16	64.34
Group 17	92.77
Group 18	63.97
Group 19	97.10
Group 20	94.83
Group 21	81.44
Group 22	94.83

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 $ 26.15* plus $ 6.30

* This portion of benefits subject to the same premium as shown for wages.

Non-Worked Holiday Supplemental Benefits:

$ 20.80

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	$ 44.92	$ 54.40	$ 63.88

Supplemental Benefits:

Groups 1-22	
Regular Time	$ 15.65*
	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 — 04/01/2025

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)	07/01/2024
Group 23	$ 87.05
Group 24	84.62
Group 25	80.57
Group 26	76.47
Group 27	54.57
Group 28	80.57

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	31.02* + $7.40

* This portion of benefits subject to the same OT premium as wages.

Non-Worked Holiday Supplemental Benefits:
21.87

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	$38.52	$45.23	$48.70	$52.17

Supplemental Benefits:

Regular Time $ 16.52* + $ 7.40

* This portion of benefits subject to same OT premium as wages.

9-15 HC

Operating Engineer - Marine Dredging 04/01/2025

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 wages do not apply to Operating Engineers on land based construction projects. For those projects, please see the Operating Engineer Heavy/Highway Rates. The wage rates below for all equipment and operators are only for marine dredging work in navigable waters found in the counties listed above.

Per Hour:	07/01/2024
CLASS A1 Deck Captain, Leverman, Mechanical Dredge Operator, Licensed Tug Operator 1000HP or more.	$ 45.26
CLASS A2 Crane Operator (360 swing)	40.33
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 Operator II, Fill Placer, Engineer Chief Mate, Electrician,Chief Welder, Maintenance Engineer,Licensed Boat, Crew Boat Operator	39.14
CLASS B2 Certified Welder	36.84
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	35.83
CLASS C2 Boat Operator	34.68
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook,	28.81

Messman, Porter/Janitor

SUPPLEMENTAL BENEFITS
Per Hour:
THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	$ 12.00 plus 7% of straight time wage, Overtime hours add $ 0.63
All Class C & D	$ 11.75 plus 7% of straight time wage, Overtime hours add $ 0.50

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 — 04/01/2025

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:	07/01/2024
Survey Classifications	
Party Chief	$ 49.39
Instrument Man	40.96
Rodman	35.63

SUPPLEMENTAL BENEFITS
Per Hour:

All Crew Members: $ 23.75

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 — 04/01/2025

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2024	05/01/2025 Additional
Brush	52.86*	$ 2.62**
Abatement/Removal of lead based or lead containing paint on materials to be repainted.	52.86*	

Spray & Scaffold	$ 55.86*
Fire Escape	55.86*
Decorator	55.86*
Paperhanger/Wall Coverer	55.09*

*Subtract $ 0.10 to calculate premium rate.

** To be allocated at a later date.

SHIFT WORK
Counties of Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, and Westchester; Agency/Government mandated off-shift work to be paid at time and one-half the hourly wage.

SUPPLEMENTAL BENEFITS
Per hour:

Paperhanger	$ 36.73
All others	34.31
Premium	38.28**

**Applies only to "All others" category, not paperhanger journeyworker.

OVERTIME PAY
See (A, E, 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:	07/01/2024
Appr 1st term...	$ 20.22*
Appr 2nd term...	25.93*
Appr 3rd term...	31.61*
Appr 4th term...	42.40*

*Subtract $ 0.10 to calculate premium rate.

Supplemental benefits:
Per Hour:

Appr 1st term...	$ 16.89
Appr 2nd term...	20.95
Appr 3rd term...	24.10
Appr 4th term...	30.57

8-NYDC9-B/S

Painter — 04/01/2025

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:	07/01/2024
Drywall Taper	$ 57.44

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker: $ 25.29

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	$ 22.30
2nd term	28.99
3rd term	34.67
4th term	46.05

Supplemental Benefits per hour:

1st term	$ 14.35
2nd term	19.83
3rd term	20.93
4th term	23.12

8-NYC9-1974-DWT

Painter - Bridge & Structural Steel 04/01/2025

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: 07/01/2024
$ 56.00
+ 10.35*

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).

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:
$ 12.43
+ 31.55*

* 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).

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.

1st year	$ 22.40

	+ 4.14
2nd year	$ 33.60
	+ 6.21
3rd year	$ 44.80
	+ 8.28

Supplemental Benefits - Per hour:

1st year	$ 1.16
	+ 12.62
2nd year	$ 7.46
	+ 18.93
3rd year	$ 9.94
	+ 25.24

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Metal Polisher — 04/01/2025

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

	07/01/2024
Metal Polisher	$ 39.33
Metal Polisher*	40.43
Metal Polisher**	43.33

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2024
Journeyworker:	
All classification	$ 12.79

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:

	07/01/2024
1st year	$ 19.67
2nd year	21.63
3rd year	23.60
1st year*	$ 22.06
2nd year*	22.07
3rd year*	24.14
1st year**	$ 22.17
2nd year**	24.13
3rd year**	26.10

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
Per hour:

1st year	$ 8.69
2nd year	8.69
3rd year	8.69

8-8A/28A-MP

Plasterer — 04/01/2025

JOB DESCRIPTION Plasterer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per hour:

	07/01/2024	08/01/2024
Building:		
Plasterer/Traditional &	$ 47.72	$ 47.99
Spraying Fireproofing	+ $5.00*	+ $5.62*

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 25.35	$ 26.10

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
*This portion is not subjected to OT premiums.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages:	07/01/2024	08/01/2024
(Per hour)		
800 hours term:		
1st term	$ 19.30 + 0.68*	$ 19.44+ 0.68*
2nd term	22.53 + 0.81*	22.69+ 0.81*
3rd term	25.79 + 0.95*	25.98+ 0.95*

*This portion is not subjected to OT premiums.

Supplemental Benefits:
(Per hour):
(800) hours term:

1st term	$ 11.59	$ 11.95
2nd term	12.02	12.44
3rd term	12.52	13.08

9-262

Plumber — 04/01/2025

JOB DESCRIPTION Plumber **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2024
Plumber	$ 74.95
Temporary Service**	$ 60.04

** 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	$ 43.00
Temporary Service	$ 34.32

OVERTIME PAY
See (C, *D, O, V) on OVERTIME PAGE
*Where the plumbing contract price is one and one half million dollars ($1,500,000.00) 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	$ 30.22	$ 32.32	$ 35.17	$ 36.57	$ 48.64

Supplemental Benefits:
(1/2) year term at the following dollar amount:

1st	2nd	3rd-10th
$ 5.43	$ 6.43	$ 22.73

9-1 Const

Plumber - Pump & Tank: Oil Trades Installation & Maintenance — 04/01/2025

JOB DESCRIPTION Plumber - Pump & Tank: Oil Trades Installation & Maintenance **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2024
Pump & Tank	$ 73.00

SUPPLEMENTAL BENEFITS
Per hour:

Plumber	$ 32.81

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 04/01/2025

JOB DESCRIPTION Plumber - Repairs & Maintenance **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2024	01/01/2025
Repairs & Maintenance	$ 48.20	$ 48.90

*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 $725,000 are excluded.

SUPPLEMENTAL BENEFITS
Per hour:

Repair Maintenance	$ 21.36	$ 22.26

OVERTIME PAY
Repairs & Maintenance See (B, H) on OVERTIME PAGE.

HOLIDAY
Repairs & Maintenance
Paid: See (1) on HOLIDAY PAGE.
Overtime: See (5, 6, 25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Note: The Repairs & Maintenance Category has NO Apprentices.

9-1 R&M

Roofer 04/01/2025

JOB DESCRIPTION Roofer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES
Per Hour: 07/01/2024

Roofer/Waterproofer	$ 48.50 + $7.00*

* 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: $ 31.87

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
$ 16.97	$ 24.25 + 3.50*	$ 29.10 + 4.20*	$ 36.37 + 5.26*

Supplements:

1st	2nd	3rd	4th
$ 4.10	$ 16.17	$ 19.31	$ 24.02

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

1st	2nd	3rd	4th	5th
$ 18.43	$ 21.82	$ 24.25	$ 29.10	$ 36.37
	+ 3.16*	+ 3.50*	+ 4.20*	+ 5.26

Supplements:

1st	2nd	3rd	4th	5th
$ 7.73	$ 14.59	$ 16.17	$ 19.31	$ 24.02

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker — 04/01/2025

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour:

	07/01/2024	08/01/2024
Sign Erector	$ 58.00	$ 60.00

NOTE: Structurally Supported Overhead Highway Signs(See STRUCTURAL IRON WORKER CLASS)

SUPPLEMENTAL BENEFITS
Per Hour:

	07/01/2024	08/01/2024
Sign Erector	$ 57.12	$ 58.31

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:

07/01/2024

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 18.27	$ 20.75	$ 25.22	$ 25.70	$ 34.66	$ 37.74	$ 41.65	$ 44.78	$ 47.93	$ 51.04

08/01/2024

$ 18.65	$ 21.16	$ 23.69	$ 26.22	$35.39	$ 38.52	$ 42.55	$ 45.75	$ 48.96	$ 52.15

4-137-SE

Sheetmetal Worker — 04/01/2025

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2024	11/01/2024
Sheetmetal Worker	$ 61.09	$ 62.34
Maintenance of Fans Temporary Operation	48.87	51.42

SUPPLEMENTAL BENEFITS
Per Hour:

Sheetmetal Worker	$ 53.25	$ 55.00
Maintenance Worker	53.25	55.00

OVERTIME PAY
See (B, E, E2, Q, V) on OVERTIME PAGE
For Maintenance See Codes B,E, Q & V

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour: Wages

Six(6) Month Terms As Follows:

1st & 2nd Term	$ 21.26	$ 21.70
3rd & 4th Term	27.39	27.95
5th & 6th Term	33.52	34.21
7th & 8th Term	42.75	43.63
9th Term	48.55	49.85

Per Hour: Supplemental Benefits

1st & 2nd Term	$ 19.66	$ 19.72
3rd & 4th Term	26.73	26.97
5th & 6th Term	31.57	31.98
7th & 8th Term	38.78	39.45
9th Term	43.62	44.47

Steamfitter — 04/01/2025

JOB DESCRIPTION Steamfitter **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2024	01/01/2025
AC Service/Heat Service & Refrigeration	$ 46.10	$ 46.60

Refrigeration, A/C, Oil Burner and Stoker Service and Repair.

NOTE: Refrigeration Compressor installation. (Not to exceed 5 Hp combined on any one project).

NOTE: Air / Heating Compressor installation.(Not to exceed 15 tons combined on any one project).

SUPPLEMENTAL BENEFITS
Per Hour Worked:

AC Service/Heat Service & Refrigeration	$ 20.96	$ 22.71
Per hour Paid:	$ 17.65	$ 19.65

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

REGISTERED APPRENTICES
1 year terms
Wages per hour:

1st Term	$ 22.31	$ 22.55
2nd Term	26.94	27.23
3rd Term	31.38	31.72

4th Term	37.90	38.31
Benefits per hour worked:		
1st Term	$ 14.44	$ 14.93
2nd Term	15.91	16.43
3rd Term	17.41	17.99
4th Term	19.44	20.10
Benefits per hour paid:		
1st Term	$ 11.38	$ 11.87
2nd Term	12.85	13.37
3rd Term	14.35	14.93
4th Term	16.38	17.04

4-638B-StmFtrRef

Steamfitter 04/01/2025

JOB DESCRIPTION Steamfitter **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2024	10/1/2024	04/01/2025
Sprinkler/Steam AC/Heat Fitter	$ 69.11	$ 69.86	$ 70.36
Temporary Heat & AC Fitter	52.54	53.11	53.49

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	$ 53.49	$ 53.49	$ 54.24
Temporary Heat & AC Fitter	43.67	43.67	44.43

OVERTIME PAY
Note: The posted overtime rates are applicable after 8 hours plus Saturday, Sunday and Holidays:

Per Hour:			
Wages	07/01/2024	10/01/2024	04/01/2025
Sprinkler/Steam	$ 138.22	$ 139.72	$ 140.66
Temp Heat/AC	105.08	106.22	106.92
Supplemental Benefits			
Sprinkler/Steam	105.99	106.84	107.49
Temp Heat/AC	85.35	87.34	87.87

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per hour:
WAGES

1 year Terms	1st	2nd	3rd	4th	5th
07/01/2024	$ 27.98	$ 34.96	$ 41.94	$ 48.92	$ 55.90
04/01/2025	28.18	35.21	42.24	49.27	56.30
Supplemental Benefits					
07/01/2024	21.80	27.05	32.28	37.53	42.76
10/01/2024	22.10	27.42	32.73	38.05	43.36

04/01/2025	22.20	27.55	32.88	38.23	43.56

Premium Time Supplemental Benefits

07/01/2024	43.60	54.10	64.56	75.06	85.52
10/01/2024	43.36	53.94	64.52	75.18	85.68
04/01/2025	43.56	54.23	64.87	75.54	86.18

4-638A-StmSpFtr

Teamster - Delivery of Concrete — 04/01/2025

JOB DESCRIPTION Teamster - Delivery of Concrete **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per Hour:

Effective 07/01/2025

	07/01/2025
Concrete Delivery	$ 43.29
	+ 2.66

SUPPLEMENTAL BENEFITS
Per Hour:

Concrete Delivery	$ 46.85
Driver	

OVERTIME PAY
See (B, E, P, *R, **U, ***V) on OVERTIME PAGE
Note: R* for Holidays 2, 11, & 15 ONLY
U** for Holidays 5 & 6 ONLY
V*** paid at $13.25 per hour worked 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 — 04/01/2025

JOB DESCRIPTION Teamster - Heavy Construction **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per Hour:

Drivers (Debris Removal, Street Level and below)*

	07/01/2024
Dump Trucks	$ 44.165
Tractor Trailers	47.315
Euclid/Turnapull	47.88

*Dump & Tractor Trailer Drivers- Asphalt Delivery starting 7/1/2025

SUPPLEMENTAL BENEFITS
Per Hour:

Dump Trucks	$ 59.1525
All Others	56.9025
Up to 40 Hours Worked	

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE
Note: Employees receive 2 hours of Holiday Pay for each day worked in holiday week (not to exceed 8 hours)
Note: Employees receive 5 1/3 hours of Holiday Pay for each day worked in Thanksgiving Holiday Week.

Welder **04/01/2025**

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 07/01/2024

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)	Saturday and 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 03/28/2025

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5754	0369 CONTRACTORS, LLC		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
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	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		AMJED PARVEZ		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL		ANGELO F COKER		2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		ANGELO GARCIA		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
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 MONGELLI		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	NYC		ARADCO CONSTRUCTION CORP		115-46 132RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC		AVM CONSTRUCTION CORP		117-72 123RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC		AZIDABEGUM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	DOL		B&L RENOVATION CO.		618 OCEAN PARKWAY APT A6BROOKLYN NY 11230	09/17/2020	09/17/2025
DOL	NYC	*****2113	BHW CONTRACTING, INC.		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL	*****5078	BLACK RIVER TREE REMOVAL, LLC		29807 ANDREWS ROAD BLACK RIVER NY 13032	10/17/2023	10/17/2028
DOL	DOL		BRADLEY J SCHUKA		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	DOL	*****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL	*****5161	CALADRI DEVELOPMENT CORP.		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****3391	CALI ENTERPRISES, INC.		1223 PARK STREET PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0026	CHANTICLEER CONSTRUCTION LLC		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	NYC	*****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DOL		CHRISTOPHER GRECO		26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
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	*****3228	CROSS-COUNTY LANDSCAPING AND TREE SERVICE, INC.	ROCKLAND TREE SERVICE	26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027

DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	09/17/2020	09/17/2025
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		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG		EDWIN HUTZLER		23 NORTH HOWELLS RD BELLPORT NY 11713	08/04/2021	08/04/2026
DOL	DA		EDWIN HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
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	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		FREDERICK HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****2998	G.E.M. AMERICAN CONSTRUCTION CORP.		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	NYC		GAYATRI MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
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		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	*****2397	ISLAND BREEZE MARINE, INC.		6400 BALTIMORE NATIONAL CANTONSVILLE MD 21228	10/24/2024	10/24/2029
DOL	DOL	*****9211	J. WASE CONSTRUCTION CORP.		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
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		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		JIM PLAUGHER		17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896	07/16/2021	07/16/2026
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 MARKOVIC		47 MANDON TERRACE HAWTHORN NJ 07506	03/29/2021	03/29/2026
DOL	DOL		JOHN WASE		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		JORGE RAMOS		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
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		KARIN MANGIN		796 PHELPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	DOL		KATE E. CONNOR		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026

DOL	DOL		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL	*****2959	KELC DEVELOPMENT, INC		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
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		LOUIS A. CALICCHIA		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****2196	MAINSTREAM SPECIALTIES, INC.		11 OLD TOWN RD SELKIRK NY 12158	02/02/2021	02/02/2026
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		MAQSOOD AHMAD		618 OCEAN PKWY BROOKLYN NY 11230	09/17/2020	09/17/2025
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	NYC		MUHAMMED A. HASHEM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
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 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
DOL	DOL	*****7429	NICOLAE I. BARBIR	BESTUCCO CONSTRUCTION, INC.	444 SCHANTZ ROAD ALLENTOWN PA 18104	09/17/2020	09/17/2025
DOL	DOL		NIKOLA NTONI		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029

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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		PAULINE CHAHALES		935 S LAKE BLVD MAHOPAC NY 10541	03/02/2021	03/02/2026
DOL	DOL		PETER STEVENS		11 OLD TOWN ROAD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DOL		PETER STEVENS		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
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	NYC		RASHEL CONSTRUCTION CORP		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DA	*****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
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	*****4772	RWLOBDELL CONSTRUCTION LLC		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DOL		SAL FRESINA MASONRY CONTRACTORS, INC.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		SAL MASONRY CONTRACTORS, INC.		(SEE COMMENTS) SYRACUSE NY 13202	07/16/2021	07/16/2026
DOL	DOL	*****9874	SALFREE ENTERPRISES INC		P.O BOX 14 2821 GARDNER RDPOMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		SALVATORE A FRESINA A/K/A SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DOL		SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
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	DOL	*****0440	SOLAR GUYS INC.		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	NYC		SOMATIE RAMSUNAHAI		115-46 132ND ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
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	*****9528	STEEL-IT, LLC.		17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL	*****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
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

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DOL	DOL	*****9733	TERSAL CONSTRUCTION SERVICES INC		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13208	07/16/2021	07/16/2026
DOL	DOL		TERSAL CONTRACTORS, INC.		221 GARDNER RD P.O BOX 14POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		TERSAL DEVELOPMENT CORP.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL	*****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
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	DA	*****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****6418	VALHALLA CONSTRUCTION, LLC.		796 PHLEPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	NYC	*****2426	VICKRAM MANGRU	VICK CONSTRUCTI ON	21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	NYC		VICKRAM MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DOL		VINCENT CORRAO		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM G. PROERFRIEDT		85 SPRUCEWOOD ROAD WEST BABYLON NY 11704	01/19/2021	01/19/2026
DOL	DOL	*****5924	WILLIAM G. PROPHY, LLC	WGP CONTRACTIN G, INC.	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026
DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

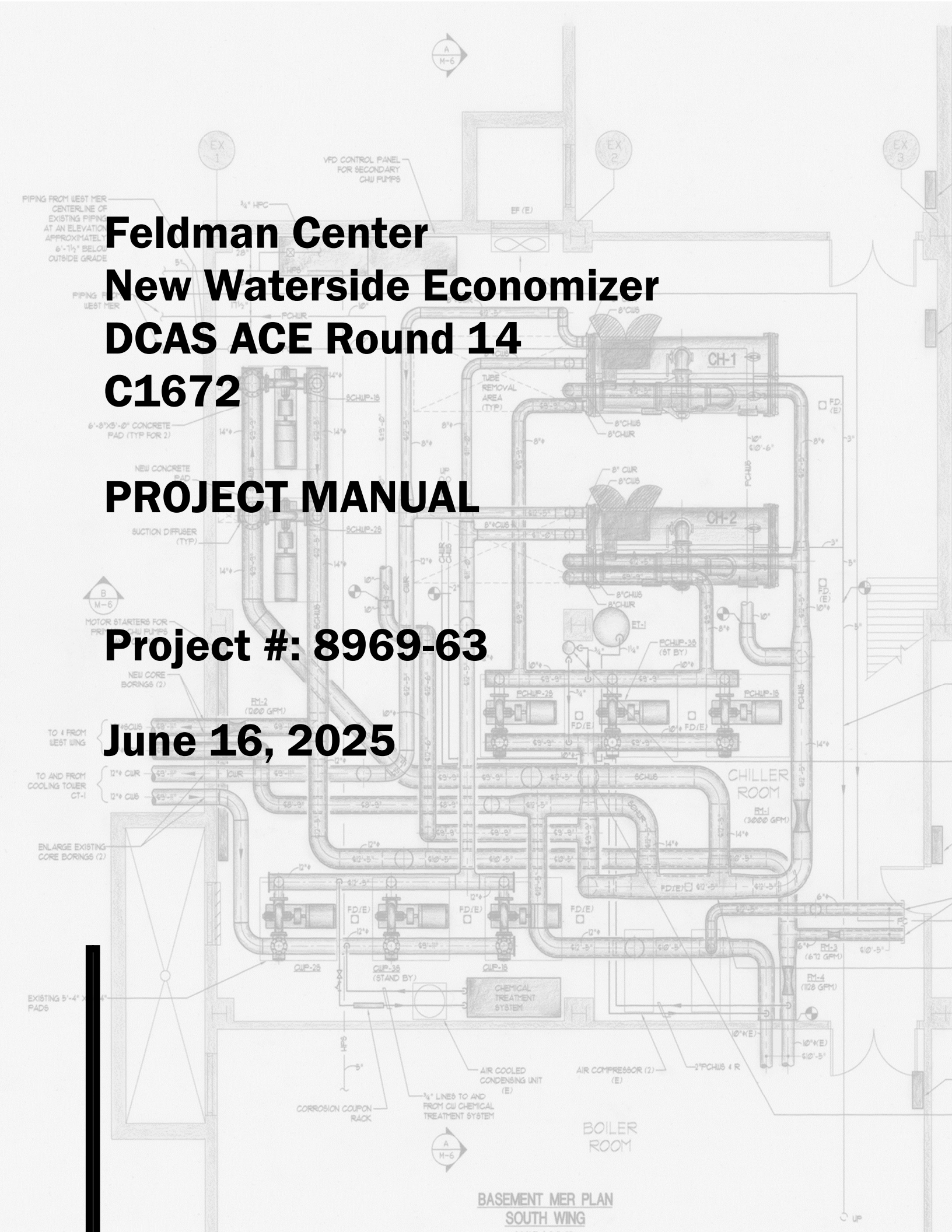
EXHIBIT C: SPECIFICATIONS

Feldman Center
New Waterside Economizer
DCAS ACE Round 14
C1672

PROJECT MANUAL

Project #: 8969-63

June 16, 2025



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Section 07 25 00.....Sprayed-On Fireproofing
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PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 CODES AND STANDARDS

A. NY State Building Code, Fire Code, Mechanical Code, Plumbing Code, Fuel Gas Code, Energy Conservation Construction Code

B. NFPA National Fire Protection Association

C. ASME American Society of Mechanical Engineers

D. ANSI American National Standards Institute

E. ASTM American Society for Testing Materials

F. AWWA American Water Works Association

G. IBR Institute of Boiler and Radiator Manufacturers

H. NEMA National Electrical Manufacturers Association

I. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers

J. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.

K. ARI Air Conditioning and Refrigeration Institute

L. UL Underwriters' Laboratories

M. AMCA Air Movement Control Association

N. AABC Associated Air Balance Council

O. Local Water Company Rules and Regulations

P. National Electric Code

1.4 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.

1.5 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 the 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.

1.6 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.

1.7 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.

1.8 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. Within twenty (10) 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.

D. 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.

E. The materials, workmanship, design, and arrangement of all work installed under the Contract shall be subject to the approval of the Architect.

F. 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.

G. 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.

H. 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.

I. 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.

J. All equipment of one type (such as fans, coils, etc.) shall be the product of the same manufacturer.

K. 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 ensure 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 do not invalidate the Plans and Specifications if the shop drawings are in conflict with the Plans and Specifications.

1.9 SHOP DRAWINGS AND SUBMITTALS

A. Prior to delivery to the job site, but sufficiently in advance of requirements necessary to allow the 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 electronic format 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 all files containing electronic AutoCAD versions of same.

C. Shop drawings shall consist of manufacturers’ 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 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. Failure to do so is ground to be rejected without review.

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 the 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.

1.10 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. Where record drawings are CAD type, provide CD's or equivalent digital drive containing AutoCAD files of these drawings to the Architect, the Engineer and the Owner.

1.11 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.

1.12 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.

1.13 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 the 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 the same as required pending installation.

I. Where the work is to be installed in close proximity to the work of other trades, or where there is evidence that the work is to interfere with the 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 the 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 a Mechanical Equipment Room with Plumbing and Electrical Contractors under the supervision of the General Contractor. After coordination, each Contractor shall digitally sign the 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 a written review from the Architect, each Contractor shall prepare the shop drawings as required under the paragraph "Shop Drawings" in the Specifications.

1.14 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 damage.

1.15 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.

1.16 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.

E. 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.

F. 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.

G. 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.

1.17 PIPE EXPANSION

A. All pipe connections should 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 should 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.

1.18 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 some 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.

1.19 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.

B. The Section furnishing the equipment shall provide not less than six-inch high concrete bases for all pumps, refrigeration machines, compressors, fans, humidifier units, air handlers, boilers, etc. and rotating machinery. Bases shall extend six inches beyond machinery base in all directions, with top edge chamfered. Provide ½" x 6" steel dowels into floors to anchor bases. Provide anchor bolts set in pipe sleeves; two sizes larger than anchor bolts for securing machinery. After anchor bolts are aligned with equipment bases, fill sleeves with concrete and allow to set.

C. Concrete pads shall also be provided below any floor-mounted duct support, pipe support and electrical panel support (including switchboards, power panels, starters, VFDs, pull boxes, etc.). Provide six-inch-high concrete pads below the mounting feet of any of the above duct, pipe or equipment support legs. Provide connection hardware (anchor bolts) as described above for rotating equipment.

D. Concrete bases are specified under other Sections of the Specification. Each Contractor shall furnish dimensioned drawings to the General Contractor. Steel dowels, sleeves and anchor bolts shall be furnished and set by the Contractor.

E. New concrete pads shall be doweled into the existing concrete with ½" rods at corners, drilled 6" deep and grouted. An epoxy bonding agent shall be applied between the old and new concrete. Concrete shall be 3000 psi reinforced with one middle layer 4 x 4 - w2.9 x w2.9.

1.20 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 foundation walls shall be James B. Clow & Sons № F-1430 or F-1435 cast iron wall sleeve with intermediate integral flange. Sleeves shall be set with ends flush with each face of wall. The space between sleeve and pipe shall be packed with a mechanical rubber seal, such as "Link Seal" manufactured by Thunderline Corp., (VICO) and then with oakum to within 2" of each face of the wall. The remaining space shall be packed and made watertight with a waterproof compound.

D. Sleeves through concrete floors shall be Schedule 40 black steel pipe and extending 1" above finished floors. The open-sleeved space shall be packed with non-combustible materials.

E. 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.

F. 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.

G. 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.

H. 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.

I. 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 the roof shall be a minimum of 10" from walls or other construction to permit proper flashing. Provide counter flashing.

J. 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 the finished floor.

K. 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.

L. All hangers, rods and supports shall be installed prior to construction fireproofing.

M. The required fire resistance rating of floor or floor/ceiling assemblies and walls shall be maintained where 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.

N. Owner shall retain the services of a NYS Licensed Professional Engineer and under his direction shall inspect the existing spray or fireproofing of existing structural members exposed during the renovation. Provide a report of deficiencies.

1.21 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.

1.22 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.

1.23 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 a 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.

1.24 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 a 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.

1.25 IDENTIFICATION

A. Identification shall be in accordance with the "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.
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

LABEL AND VALVE TAG SCHEDULE			
Service	Label Designation	Color	Tag Designation
Chilled Water Ret.	Chilled Water Return	Green	CHWR
Dual Temperature Water Supply	Dual Temp. Water Supply	Green	CHS
	Dual Temp. Water Ret.	Green	CHR
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. HIGH VOLTAGE" in black letters two inches high, stenciled at 10-foot intervals over a continuously painted orange background.

J. 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 push-button 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.

K. 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.

L. 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.

M. The bolted covers of housing for disconnecting switches or links in bus ducts between network transformers and switchboards shall be lettered to identify the equipment within.

N. Serial numbers shall be stenciled on the tanks and covers of transformers having their nameplates attached to the high voltage switch chamber covers.

O. 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.”

1.26 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.

1.27 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.

1.28 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 that are considered objectionable by the Architect, eliminate the same in a manner reviewed by the Architect.

1.29 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.

1.30 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.

1.31 DELIVERY OF MATERIAL

A. Deliver the material and store the same in spaces indicated by the Architect and assume full responsibility for damage to structure caused by any overloading of the material.

1.32 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 is 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.

1.33 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 support 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.

1.34 PAINTING

A. All finished 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 to Finished Rooms or Finished Spaces: 1 coat of primer and 2 coats of latex semi-gloss enamel.

2) Exposed to 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 to 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 to Unfinished Rooms or Unfinished Spaces: 1 coat of primer and 2 coats of finish.

c. Piping in floor trenches after fabrication: primer and finish.

d. Uninsulated Mechanical Equipment:
1) Furnished with a Factory Applied Prime Coat Finish: 2 coats of acrylic latex semi-gloss enamel. No primer required.

e. Vessels, Tanks, and Like Equipment Specified to be Insulated: l coat of corrosion resistant paint, prior to the application of insulation.

f. Uninsulated Exposed Iron and Steel Surfaces of Boilers, Including the Steel Casing, Buck Stays, Boiler Fronts, Castings, Smoke Pipes, Breeching and the Exposed Surfaces of all Other Iron or Steel Installed in Conjunction with Boiler Work: 1 coat of primer and 2 coats of heat-resistant enamel.

g. Insulated exposed piping in Mechanical Rooms, Boiler Plants, Chiller Plants and Generator Rooms (except on segments of pipe which are clad in aluminum).

h. 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.

i. 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.

j. 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.

k. Convector enclosures shall be painted at the factory as specified in Section 15835: Convectors.

l. Underground pipe, ducts and conduits - two coats of black asphaltum paint (except when constructed using a pre-engineered underground insulation system with poly jacketing.

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. Ductwork: Grey.
3. 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.

1.35 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.

1.36 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 that 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 should 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.

1.37 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.

1.38 INSTRUCTION OF OWNER'S PERSONNEL

A. During the operating period, fully instruct the Owner's representative in the complete operation, adjustment, and maintenance of the entire installation.

B. 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.

1.39 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.

1.40 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.

1.41 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. All wiring between fire/smoke dampers and fire alarm panel shall be by the Electrical Contractor. All wiring between the fire alarm panel and air handling equipment for automatic fire alarm shutdown shall be by the Electrical Contractor. All wiring for operation of smoke purge fan and associated floor dampers shall be by the Electrical Contractor.

H. 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.

I. Each contractor should 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.

J. If a motor is replaced (even with the same horsepower) a new starter shall be provided for that motor.

K. 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.

L. 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 ensure such conformance shall be included as part of the mechanical work.

M. The furnishing of floor mounted motor starting equipment shall include the purchase and delivery of channel sills for mounting.

N. Whether or not shown on the drawings, the Electrical Contractor shall furnish and install a local disconnect switch at each motor that is not in sight from the controller location.

O. 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.

P. 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.

Q. Electric power required for control circuits shall be taken by the HVAC Contractor 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 shall run power wiring to the nearest electrical panel with spare circuits and provide required circuit breaker. The ATC Contractor shall provide and wire all required transformers for the ATC system.

R. The HVAC Contractor shall coordinate the control systems with unit ventilator and VAV terminal box manufacturers. The HVAC Contractor 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 shall provide all field wiring.

1.42 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 ___ 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%
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%

1.43 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 should 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.

1.44 MOTOR CONTROL CENTER

A. Motor Control Centers (MCC's) shall be furnished by the HVAC Contractor and shall be installed by the Electrical Contractor. The Electrical Contractor shall set and fully install the MCC on the concrete pad. Concrete pads shall be provided by the HVAC Contractor. *(or General Contractor, check with Architect).

B. Starters furnished as part of motor control centers (MCC's) shall comply with applicable requirements of section: "Individual Motor Starters".

C. The construction of MCC's shall meet ANSI, UL, NEC and NEMA Standards.

D. MCC's shall be NEMA Class I, Type B and shall operate on _____ volts, 3-phase, 60 cycle, 3-wire service. MCC bus bracing and circuit breakers shall be rated to withstand maximum available short circuit current as indicated on drawings.

E. Provide reduced voltage starters for all motors 10 HP and larger, and provide time delay for restart.

F. MCC shall consist of 20" wide, 20" deep, and 90" high sections, totally enclosed type joined together to form a rigid, free-standing, dead front assembly. The individual units shall be removable from the front with sliding contacts. Provide venting covers top and bottom.

G. MCC shall contain horizontal and vertical copper bus bars, starters, circuit breakers, start-stop pushbuttons, H-O-A switches, selector switches, indicating lights, relays, auxiliary switches, and all other devices necessary for the proper control and operation of motors. Provide a copper ground bus of minimum ¼" x 1" cross-sectional area, extending the full length of the MCC.

H. Each section shall consist of side frames of № 12 gauge full finished steel formed top and bottom to provide proper wiring facilities hereinafter described and flanged over not less than 1" for the full vertical length to provide for the unit door frames. These flanges shall be so punched as to provide for interchangeable mounting of any standard unit and door. Each section will be provided with № 12 gauge steel top and bottom plates to ensure a rigid assembly without the unit door frames or enclosing plates. The top piece shall consist of № 12 gauge formed sheet steel and shall be provided with a removable sheet steel plate to permit ready entrance of overhead line, load and control circuit conduits.

I. 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
   3. The electrical control devices should be interoperable with standard electrical equipment.

J. 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 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 should 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

K. 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.

L. 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.

M. 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.

N. 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.

O. 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].

P. 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.

Q. Each section shall be provided with horizontal wiring trough which shall line up with a similar trough in the adjacent sections to form a convenient pull box the entire length of the MCC. Suitable openings to this wiring trough shall be provided in each section to permit convenient wiring between sections. The interior of the horizontal wiring trough shall be accessible from the front of each section by removing a filler plate on the front of the structure, or from the top.

R. Each section shall be provided with vertical wiring troughs. Each trough shall be provided with suitable wiring clamps so that all wiring may be supported in a neat manner.

S. A 3-phase main horizontal bus of capacity as shown on the drawings shall be provided across the top of each section. Bus bars should be of rectangular cross section and in accordance with NEMA standards. The bus shall be supported in each section by insulating blocks. Main feed for MCC's shall be through the top or bottom as indicated on drawings. Provide necessary connectors.

T. Structural details of any one section shall be the same as all others and so arranged that additional sections may be added readily at either end of the MCC in the field as required. Vertical sections shall be suitable for mounting against the wall or back-to-back.

U. Unless otherwise specified, the starter units shall be of the combination circuit breaker and across-the-line starter type consisting of a full voltage magnetic starter, 3 coil thermal overload, low-voltage protection and external manual reset. The disconnecting means shall be circuit breakers. The external operating handle shall clearly indicate the condition of the switch "ON" or "OFF" 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 the door in "ON" position.

V. 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.

W. 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 control centers shall be shipped with the overload heaters in the starter 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 HVAC Contractor shall replace any improperly selected heaters.

X. 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 as per the National Electrical Code.

Y. Each starter unit shall be mounted independently of the door on a unit frame. Each frame shall be furnished with a panelboard type door supported by semi-concealed hinges so as to swing open in excess of 90 deg. The supporting structure for each starter shall be such as to provide isolation and baffling of one controller from all others. Any unused portions shall be covered by a blank plate. An approved nameplate for circuit identification shall be provided by the HVAC Contractor.

Z. Each starter assembly or blank plate shall be supported by screw fasteners arranged so that any unit may be removed and inspected without having access to the rear of the section and without any parts falling out of place.

AA. Each starter shall be provided with an individual terminal board at the rear plate of the starter and shall be completely accessible from the front and so arranged that connection to the starter can be made from the front when the unit frame and starter is in place. All studs should be clearly marked for line, load and control circuit connections.

BB. For motors requiring electric interlocks or automatic control features, starters should be equipped with the necessary auxiliary relays and contacts to provide the control features desired. Such starters shall be provided with "hand-off-auto" push buttons mounted in cover. For two speed motors, provide "high-low-off-auto" four position selector switch.

CC. 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.

DD. Indicating lights shall be transformer or series resistor type. There shall be one red light for each single speed motor to indicate when the motor is running. For multiple speed motors, one indicating light for each speed shall be provided.

EE. Each circuit controlled from the MCC shall have a suitable laminated nameplate with engraved white letters designating the purpose of the circuit. Mounting screws for nameplates shall be manufactured from approved non-ferrous, non-corrosive metals. Nameplates shall be provided by the HVAC Contractor.

FF. After fabrication, steel surfaces shall be prepared for painting by bonderizing or equivalent process, followed by one coat of rust resisting primer and one coat of finish enamel. Paint color shall be ANSI № 61 light gray.

GG. MCC's should be as manufactured by Westinghouse, General Electric, Square D, Eaton/Cutler-Hammer, or Allen-Bradley.

HH. For schedule of starters, controllers and auxiliaries to be located in the MCC refer to Drawings. Shop drawings shall be provided of minimum scale of one inch per foot, showing plan, front, side and rear elevations and all internal construction details, dimensions, ratings, and schedule of nameplates, for approval prior to fabrication.

1.45 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 the finished area shall be flush-mounted.

E. The Electrical Contractor shall install and provide wiring for motor controllers. The contractor providing the motor should 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.

1.46 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

3.1 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 01 31 46

SECTION 01 91 13

COMMISSIONING-GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of the commissioning process is to provide the Owner/Operator of the facility with a high level of assurance that the mechanical and electrical systems have been installed in the prescribed manner, and operate within the performance guidelines set in the design intent. The Commissioning Authority shall provide the Owner with an unbiased objective view of the system=s installation, operation, and performance. This process is not to take away or reduce the responsibility of the design professionals or installing contractors to provide a finished product. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems to beneficial use by the owner. The Commissioning Authority will be a member of the construction team, cooperating and coordinating all commissioning activities with the design professionals, construction manager, contractors, subcontractors, manufacturers and equipment suppliers.

1.2 SCOPE

A. The functions and responsibility of the Commissioning Authority shall include:
   1. Responsibility: The primary point of responsibility is to inform the Owner on the status, integration, and performance of systems to be commissioned within the facility.
   2. Information: The Commissioning Authority shall function as a catalyst and initiator to disseminate information and assist the design and construction teams in the completion of the construction process for the commissioned scope of work. This shall include system completeness, performance, and . adequacy to meet the intended performance standards of each system. Services include construction observation, spot testing, supervision of verification and functional performance testing, and providing performance and operating information to the responsible parties, e.g., contractors, design professionals, and the Owner.
   3. Quality Assurance: Assist the responsible parties to maintain a high quality level of installation and system performance.
   4. Observation of tests: Commissioning Authority shall observe, coordinate and supervise testing as required to ensure system performance meets the design intent parameters.
   5. Documentation of tests: Commissioning Authority shall document the results of the performance testing directly and/or ensure that all testing is documented by the appropriate technicians. The Commissioning Authority shall provide standard forms to be used by all parties for consistency of approach and type of information to be recorded.
   6. Resolution of disputes: The Commissioning Authority is to remain an independent party present on the project with specific knowledge of the project. Should disputes arise, the Commissioning Authority shall perform research to determine the scope and extent of the problem and educate the involved parties as to the nature and extent of the problem. This shall include technical and, financial aspects of the dispute, including assistance to help identify who the responsible parties are to implement corrective action. The Owner/Architect shall preside over resolution of the problem.
   7. Deficiencies: Provision of technical expertise to oversee and verify the correction of deficiencies found during the commissioning process.

8. Acceptance: The Commissioning Authority shall determine and advise the Owner of the date of acceptance for each component and system for start of the warranty period.
9. Provision of technical expertise to review and edit operating and maintenance descriptions by system.

B. The Commissioning Agency is referred to as an independent contractor in this Division and shall work under a separate contract directly for the Owner.

C. The Commissioning Agency shall not be financially, associated with any of the contractors on this project to avoid potential conflicts of interest.

1.3 SYSTEMS TO BE INCLUDED IN COMMISSIONING PROCESS

The following pieces of equipment and systems shall be subject to commissioning:

A. HVAC
1. Pumps
2. Heat Exchangers
3. VFD
4. Piping System
5. TAB
6. Controls

1.4 COORDINATION

A. The Commissioning Authority shall receive directly from the design professional(s) and DDC a copy of all the construction documents, addenda, change orders, and appropriate approved submittals and shop drawings of all the equipment or system to be commissioned.

B. The Commissioning Authority shall disseminate written information and documents to all responsible parties relative to the nature and extent of the communication.

C. The Commissioning Authority is primarily responsible to the Owner, and as such, shall regularly apprise the Owner of progress, pending problems and/or disputes, and shall provide regular status reports on progress with each system to be commissioned. Any potential change in the contractual and/or financial obligations of the Owner (credits, change orders, schedule change, etc.) shall be identified and quantified as soon as possible.

D. The Commissioning Authority shall coordinate the schedule of commissioning activities with the construction schedule. It is possible that some procedures will be implemented before the entire system is completed.

1.5 SCHEDULE

A. Commissioning of systems shall proceed per the criteria established in the specific sections that follow, with activities to be performed on a timely basis. The Commissioning Authority shall be available to respond promptly to avoid construction delays.

B. Start-up and testing of systems may proceed prior to final completion of systems to expedite progress. However, the Commissioning Authority shall not supervise standard, regular testing and checkout services that are the primary responsibility of the contractor/vendor in advance of their commissioning testing and checkout.

C. Problems observed shall be addressed immediately, responsible parties notified, and actions to correct deficiencies coordinated in a timely manner.

D. Contractor schedules and scheduling is the responsibility of the CM. The Commissioning Authority shall provide commissioning scheduling information to the CM for review and planning activities.

1.6 RELATED WORK SPECIFIED ELSEWHERE

A. Commissioning requires support from the Contractors. The commissioning process does not relieve any Contractors from their obligations to complete all portions of work in a satisfactory and timely manner.

B. Refer to Section 23 08 00 of Division 23 and Section 26 08 00 of Division 26 regarding roles and responsibilities related to the commissioning process.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All industry standard test equipment required for performing the specified tests shall be available at the project site. Any proprietary vendor specific test equipment shall be provided by that vendor or manufacturer.

B. Any portable or hand-held setup I calibration devices required to initialize the control system shall be made available by the control vendor (at no cost) to the Commissioning Authority.

C. The instrumentation shall meet the following standards:
1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required.
2. Be calibrated at the manufacturer=s recommended intervals with calibration tags permanently affixed to the instrument.
3. Be maintained in good repair and operating condition throughout the duration of use on this project.
4. Be immediately re-calibrated or repaired if dropped and/or damaged in any way during use on this project.

PART 3 - EXECUTION

3.1 COMMISSIONING PLAN AND SCHEDULE

A. The Commissioning Authority shall develop and submit a schedule for the commissioning process which shall be integrated with the construction schedule. Included shall be the required work by all team members (Commissioning Authority, design team, contractors, and the Owner). Overlay with the construction schedule, and include time for test and balance, verification, and functional performance testing.

3.2 CONSTRUCTION OBSERVATION

A. This is an additional and separate activity from that provided by the design team. Construction observation is required as part of the commissioning and coordination process to be provided by the Commissioning Authority.

3.3 TEST AND BALANCE

A. Air balance shall be accomplished by an independent test and balance firm. The Commissioning Authority shall spot check this work to verify accuracy of results.

3.4 VERIFICATION AND FUNCTIONAL PERFORMANCE TEST PROCEDURES AND ACCEPTANCE PROCEDURES

A. Personnel experienced in the technical aspects of each system to be commissioned shall implement and document the commissioning procedure to be used outlined in the Checklists. Verification checklist and functional performance checklist shall be provided for each system and shall be reviewed by the appropriate design engineers for technical depth, clarity of documentation and completeness. Special emphasis shall be placed on testing procedures that shall conclusively determine actual system performance and compliance with the design intent.

B. The Commissioning Authority shall determine the acceptance procedures for each commissioned system within Division 23 discipline. The acceptance procedures shall incorporate the commissioning standards and successful testing results as referred to throughout Division 23 specifications. >

C. The appropriate contractor and vendor(s) shall be informed of what test are to be performed and the expected results. Whereas some test results and interpretations may not become evident until the actual test are performed, all parties shall have a reasonable understanding of the requirements.

D. Acceptance procedures shall confirm the performance of systems to the extent of the design intent. When a system is accepted, the Owner shall be assured that the system is complete, works as intended, is correctly documented, and operator training has been performed.

3.5 SOFTWARE DOCUMENTATION REVIEW

A. Review detailed software documentation for all DDC control systems related to the commissioned equipment and systems. This includes review of vendor documentation, their programming approach, and the specific software routines applied to this project. Discrepancies in programming approaches and/or sequences shall be reported and coordinated in order to provide the Owner with the most appropriate, simple, and straightforward approach to software routines.

3.6 OPERATING AND MAINTENANCE (O&M) MANUALS

A. The Commissioning Authority shall review the draft form of the O&M manuals related to the commissioned equipment and system and provided by the Division 23 Contractor. The review process shell verify that O&M instructions meet specifications and are included for all equipment furnished by the contractor, and that the instructions and wiring diagrams are specific (edited where necessary) to the actual equipment provided for this project. Published literature shall be specifically tailored to the provided equipment, indicating required operation and maintenance

procedures, parts lists, assembly/disassembly, diagrams emergency telephone numbers, and related information. The Contractor shall incorporate the standard technical literature into system specific formats for this facility as designed and as actually installed. The resulting O&M Information shall be system specific, concise, to the point, and tailored specifically to this facility. The Commissioning Authority shall review and edit these documents as necessary for final corrections by the contractor.

B. The O&M manual review, and coordination efforts shall be completed prior to Owner training sessions, as these documents are to be utilized in the training sessions.

3.7 TRAINING

Schedule and coordinate training sessions for the Owner=s staff for each system to be commissioned. Training shall be in a classroom setting with the appropriate schematics, handouts, and visual/audio training aids on-site with equipment.

A. The Commissioning Authority organizes, schedules, and directs the training sessions.

B. The appropriate installing contractors shall provide training on all the major systems per specifications, including aspects, peculiarities specific to this project.

C. The equipment vendors shall provide training on the specifics of each major equipment item subject to commissioning including philosophy, troubleshooting, and repair techniques.

D. The automatic control vendor shall provide training on the control system per their specification section.

3.8 RECORD DRAWINGS

A. The Commissioning Authority shall review the as-built contract documents to verify incorporation of both design changes and as-built construction details. Discrepancies noted shall be corrected by the appropriate party.

3.9 EXCLUSIONS

A. Responsibility for construction means and methods: The Commissioning Authority is not responsible for construction means, methods, job safety, or any construction management functions on the job site.

B. Hands-on work by the Commissioning Authority: The contractors shall provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring equipment and systems into, a fully operational state. The Commissioning Authority shall coordinate and observe these procedures (and may make minor adjustments), but shall not perform construction or technician services other than verification of testing, adjusting, balancing, and control functions.

END OF SECTION 01 91 13

SECTION 03 61 00

GROUTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Furnish material, equipment, labor, services required to provide non-shrink grout. Work includes but is not limited to grouting under steel and mechanical equipment base plates, filling of fence and rail posts sleeves, grouting of piping, and wherever else shown on Drawings.

1.2 RELATED SECTIONS

C. Structural Steel..... Section 051200

1.3 REFERENCES

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

A. American Society of Testing and Materials (ASTM) Standards, latest editions.

ASTM C109 Test Method for Compressive Strength of Hydraulic Cement Mortars.

ASTM C191 Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle

ASTM C1090 Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout

ASTM C1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).

B. Army Corp of Engineers

CRD C-621 Specification for Non-Shrink Grout.

1.4 SUBMITTALS

A. Product Data

Submit manufacturer's information on the non-shrink grout, including mixing and installation instructions for each type of application.

B. Quality Control Submittals

1. Qualifications

Provide proof of Manufacturer and Installer qualifications specified under “Quality Assurance”.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Company specializing in the production of grout shall have a minimum of five years experience.

2. Installer: Company specializing in performing the work of this section shall have three years minimum experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered in manufacturer’s sealed and undamaged packaging. Each package shall contain clear and legible labels that meet requirements of local, state and federal regulations identifying manufacturer’s name, product name, quantity of material, and batch number.

B. Protect material from the elements and from other damage at site.

C. Replace and pay for material and work damaged to the satisfaction of the Authority.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply grout at temperatures below 40ºF or higher than 90°F. Follow manufacturer's recommendations for placement temperatures, which is typically at an optimum range of 50ºF to 80ºF. Provide hot and cold weather procedures at other temperatures as per ACI 305R and ACI 306R respectively.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Grout

1. Sika Corp., Lyndhurst, NJ 07071

2. Euclid Chemical Company, Cleveland, OH 44110

3. Five Star Products, Inc., Fairfield, CT 06824

4. HiltiInc., Tulsa, OK 74146

5. Mapei, Deerfield Beach, FL 33442

2.2 MATERIALS

A. Grout

1. Grout shall be non-shrink, non-metallic, cement-based material meeting ASTM 1107 and CRD C-621 with the following characteristics:

a. Minimum compressive strength of 6000 psi @ 28 days when testing in accordance with ASTM C109 or CRD C-621.

b. Slight positive expansion when tested in accordance with CRD C-621 or ASTM C1090.

2. Products:

a. SikaGrout 212 by Sika Corp.

b. Dry Pack Grout and NS Grout by Euclid Chemical Company

c. "Five Star Grout" by U.S. Grout Corp.

d. Multipurpose Grout by Hilti, Inc.

e. Precision Grout by Hilti, Inc.

f. Planigrout 712 by Mapei

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all adjoining work on which this Work is in any way dependent for proper installation and workmanship. Report to the Authority any condition that prevents the performance of this Work.

B. Repair surfaces to receive grout as approved by the Engineer of Record to ensure that the maximum allowed thickness of material is not exceeded.

3.2 SURFACE PREPARATION

A. Concrete surface shall be free of all loose material.

B. All metal components shall be clean and free of corrosion.

C. Surfaces and metal components shall be free of oil, grease, loose paint, corrosive deposits, dust, laitance and other contaminants.

D. Sleeves and holes shall be clean of water, dust and debris.

3.3 APPLICATION

A. Perform all grouting in accordance with the recommendations of ACI, CSI, and the grout manufacturer's published specifications for site preparation, product mixing, and placing. For grouting in weather below 50°F, contact manufacturer for cold weather instructions.

B. Arrange with the manufacturer of the grout for the services of a qualified field representative to instruct the work crews in the mixing of components, preparation of surfaces, technique of installation, and inspection procedures.

C. Place grout at a no more than “flowable” consistency as required by the application, carefully using the manufacturer’s recommended water content for Dry Pack, Plastic or Flowable consistencies.

D. Locations

1. Provide grout 1" thick minimum, 2” thick maximum, unless otherwise specified, under column base plates and beam bearing plates. Work grout under plates to provide full and even bearing. Grouting is to be done prior to the placement of any concrete on the structure.

2. Provide grout for grouting fence posts into sleeves. Grout is to be placed at a “plastic” consistency and crowned at the post to shed water away from the post onto the adjoining concrete surface.

3. Provide grout for grouting bars in concrete and for "Dry Packing". Follow manufacturer's procedure for mixing and installation.

4. Provide grout under equipment bases.

5. Provide for grouting in pipes entering precast units.

6. Provide grout wherever else it is indicated on Drawings or Specifications.

D. Follow manufacturer's instructions for curing.

3.4 PROTECTION AND CLEANING

A. Clean all adjacent areas of excess material and clean all floors and walls of powder and droppings.

3.5 FIELD QUALITY CONTROL

A. The Authority's Testing Laboratory will inspect the grouting procedure and take cube specimens to test compressive strength.

B. The Authority will inspect and reject any that are of inadequate strength or contain cracks or other defects. These areas shall be fixed at the contractor's expense.

C. Engage the services of the material manufacturer's representative to instruct in the proper mixing and usage of the material to ensure the grout is placed in the correct consistency and manner.

END OF SECTION 03 61 00

LIST OF SUBMITTALS

SUBMITTAL	DATE SUBMITTED	DATE APPROVED
Product Data:		_____
1. Grout		
Qualifications		_____
1. Manufacturer		
2. Installer		

* * *

SECTION 04 20 00

UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes, but is not limited to, the following:

Provide brick masonry, concrete unit masonry, structural facing tile masonry, glazed concrete block masonry, acoustic block masonry, fireclay flue lining work, cavity wall insulation, and other masonry Work as specified herein, as shown on the Drawings, and as needed for a complete and proper installation. The terms Concrete Masonry Unit (CMU) and Concrete Block are inter-changeable.

B. Related Work includes, but is not limited to, Division 7 Section “Fluid-Applied Membrane Air Barrier, Vapor Retarding”, for air barrier system at masonry cavity walls.

1.2 DESIGN REQUIREMENTS

A. No air-entraining admixtures or material containing such shall be permitted in the mortar. Also, no anti-freeze compounds, calcium chloride, or other compounds, unless expressly permitted otherwise, shall be permitted in the mortar.

B. Mortar types to be used at the following locations, unless otherwise stated:

1. Face brick, concrete masonry units - Type N unless otherwise noted.

2. Load bearing masonry, - Type S

3. GCB, SFT - Type N "White"

4. Brick and other masonry below grade and exposed to earth - Type M

1.3 REFERENCES

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

A. American Society of Testing and Materials (ASTM) standards, latest editions.

A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Products.

A240 Standard Specification for Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.

A615	Standard Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.
A706	Standard Specifications for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
A951	Standard Specification for Steel Wire for Joint Reinforcement.
C27	Standard Classification of Fireclay and High-Alumina Refractory Brick.
C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
C33	Standard Specification for Concrete Aggregates.
C55	Standard Specification for Concrete Building Brick.
C62	Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).
C67	Standard Methods of Sampling and Testing Brick and Structural Clay Tile.
C90	Standard Specification for Hollow, Load-Bearing Concrete Masonry Units.
C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 MM Cube Specimens).
C126	Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
C129	Standard Specification for Non-Load-Bearing Concrete Masonry Units.
C140	Standard Methods of Sampling and Testing Concrete Masonry Units.
C144	Standard Specifications for Aggregate for Masonry Mortar.
C145	Standard Specification for Solid Load-Bearing Concrete Masonry Units.
C150	Standard Specification for Portland Cement.
C207	Standard Specification for Hydrated Lime for Masonry Purposes.
C216	Standard Specification for Facing Brick (Solid Masonry Units made from Clay or Shale).
C270	Standard Specification for Mortar for Unit Masonry.
C315	Standard Specification for Clay Flue Linings.
C331	Standard Specification for Lightweight Aggregates for Concrete Masonry Units.

C404 Standard Specifications for Aggregates for Masonry Grout.

C476 Standard Specification for Grout for Reinforced and Nonreinforced Masonry.

C578 Standard Specification for Preformed, Cellular Polystyrene Thermal Insulation.

C595 Standard Specifications for Blended Hydraulic Cements.

C652 Standard Specification for Hollow Brick

C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

C979 Standard Specification for Pigments for Integrally Colored Concrete.

C1019 Method of Sampling and Testing Grout

C1232 Standard Terminology of Masonry.

C1405 Standard Specification for single-fired Glazed Brick

B. Industry Standards.

1. "Standard for Concrete Masonry Units" - UL 618- Underwriters Laboratory.

2. American Welding Society – AWS D1.4 – Structural Welding Code – Reinforcing Steel

1.4 SUBMITTALS

A. Submittals for Specified Items

1. For items that are specified herein by manufacturer's name and model number, submit a Product Schedule indicating the item description, manufacturer name, model number and any other identifying nomenclature. The Schedule will be accepted by the Authority for record purposes only. Product Data and Samples are not required for such specified items except for selection of color or similar purpose. When submitting items that are not specified herein by manufacturer's name and model number, provide complete Product Data and Samples for each item for review and approval.

B. Product Data

Submit Product Data to show compliance with specified requirements.

1. Submit complete data for masonry units. Laboratory test reports for brick shall be no more than two years old. Submit a list indicating the maximum dry weight of each type and size of CMU to be used in the project.

2. Submit complete data for reinforcement and ties, of each type.

3. Portland Cement: Brand and manufacturer's name.

4. Lime: Brand and manufacturer's name.

5. Mortar Pigments: Brand and manufacturer's name.

6. Packaged Products: Manufacturer's specifications and application instructions.

7. Sand: Location of pit, name of owner, and previous test data.

8. Masonry reinforcement, anchors

C. Samples

1. Submit 3 of each color of: Concrete Block. Submit Block of special sizes and shapes to match existing.

2. Submit as many face brick of each color to show the entire color range and in quantities sufficient to determine percentages. Submit samples of face brick of special sizes and shapes, including factory fabricated corners and lip brick.

E. Quality Control Submittals

1. Schedule of Uses: By mortar type.

2. Certificates

a. Submit the lightweight CMU producer's and GCB manufacturer's certificate stating that the minimum equivalent thickness and mix design are in conformance with UL 618 for the indicated fire rating.

b. Submit lightweight CMU producer’s certificate stating aggregate used is 100% lightweight, expanded shale, clay, or slate (rotary kiln) aggregate, in accordance with ASTM C331. To provide the required recycled content, it is acceptable to provide up to 20% lightweight recycled aggregate that will maintain the same fire resistance equivalent thickness of 100% expanded shale, clay, or slate without a decrease in block strength.

c. Furnish notarized Building Department affidavit from masonry manufacturer (Form 10H) stating materials delivered to project comply with the Specification requirements.

d. Furnish notarized Building Department affidavit from masonry supplier (Form 10J) stating materials delivered to project comply with the Specification requirements.

e. For GCB, submit evidence of conformance to the requirements of Section BC 803 of the 2014 NYC Building Code for toxicity.

f. Provide certification that insulation used in Project was not produced with, nor contains, any of the U.S. EPA regulated CFC compounds that are listed in the Montreal Protocol.

F. Mockups

In accordance with Article titled Quality Assurance.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Company specializing in the Work of this Section shall have a minimum of three years experience and at least two projects with similar quantity of materials.

2. Adhesive Anchor Installer: Installer for adhesive anchors installed in a horizontal or upwardly inclined position supporting sustained tension loads shall be certified per ACI Appendix D9.2.2 as per Section BC 1912 of the 2014 NYC Building Code.

B. Regulatory Requirements

1. Building Code: Work of this Section shall conform to all requirements of the NYC Building Code and all applicable regulations of governmental authorities having jurisdiction, including safety, health, noise, and anti-pollution regulations. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.

2. UL 618: Fire rating of CMU and assemblies shall conform to the requirements UL 618 and Section BC 602.

3. NYC Board of Standards and Appeals (BSA) approvals, NYC Materials and Equipment Acceptance (MEA) approvals or Office of Technical Certification and Research (OTCR)

C. Certifications

Masonry construction shall conform to the material acceptance, certification and inspection requirements of Section BC 1701.

D. Mockups

1. General

a. Construct sample panels to conform with appearance and workmanship as indicated in the Drawings and Specifications.

b. Use approved sample panels for a standard of comparison for the Project. All Work shall conform in workmanship and appearance to that of the approved samples.

c. If not approved, remove panel and install new panel (or panels) repeating the process until panel is approved.

d. Do not proceed with Work until panels are approved in writing by the Project Architect. Do not build Sample Panel "B" until Sample Panel "A" has been approved.

e. Approved Panel "B" may remain in place as part of the Project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in undamaged condition per ASTM guidelines. Store in an enclosed location or off the ground with waterproof covering as needed to protect all materials from moisture, contaminants, corrosion, deleterious temperature changes, and other harmful conditions.

B. Packaged Products

1. Deliver materials to the site in manufacturer's original, sealed containers. Do not deliver materials which have exceeded shelf life limitation set forth by the manufacturer. Material containers shall bear the manufacturer's label indicating manufacturer's name, trade name of product, lot number, shelf life of product, and mix ratio (if applicable). This includes individual bags of pre-bagged mortar mixes.

2. Comply with manufacturer's printed instructions for storing and protecting materials.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Construction Requirements

1. Per Section BC 2104.3, cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8C shall be implemented when either the ambient temperature falls below 40°F or the temperature of masonry units is below 40°F.

2. Salt or other chemicals for lowering the freezing temperature of the mortar shall not be used.

B. Hot Weather Construction Requirements

Per the requirements of Section BC 2104.4, hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8D shall be implemented when temperatures exceed 100°F, or 90°F with a wind velocity greater than 8 mph.

C. Wetting of Clay Masonry Units

Provide prewetting of masonry for units with initial rates of absorption that require their wetting before laying (21.42 grams per 30 square inches or 0.025 ounce psi).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Aggregate for Concrete Masonry Units (CMU)

1. Northeast Solite Corporation, Mt. Marion, N.Y.

2. Norlite Corporation, Cohoes, N.Y.

B. Reinforcement and Ties

1. Hohmann & Barnard, Inc., Hauppage, N.Y.

2. Wire-Bond, Charlotte, NC

3. Other manufacturers for specific products as specified herein.

C. Insulation

1. Dow Chemical Co., Midland, Michigan.

2. UC Industries Inc., Parsippany, NJ

D. Insulation Adhesive

Adhesives, mastics, compatible with air barrier systems and other contacted materials:

1. Henry Company

2. W. R. Grace & Co.

E. Mortar Coloring

1. "SGS" Mortar Colors, Solomon Grind-Chem Services, Inc.

2. "True Tone Mortar Colors", Davis Colors, Rockwood Industries, Inc.

3. "Flamingo Colors ", Lehigh Corporation.

I. Fire Clay Brick (Fire Brick)

1. A.P. Green Refractories Co., Kearny, N.Y.

2. J.H. France Refractories Co., Long Island City, N.Y.

3. General Refractories Co.

4. Harbison-Walker Refractories Co.

J. Fire Clay Flue Lining

1. Superior Clay Products, Nelsonville, Ohio

2. General Refractories Co.

3. Harbison-Walker Refractories Co.

K. Refractory Mortar

1. A.P. Green Refractories Co., Kearny, N.J.

2. J.H. France Refractories Co., L.I.C., N.Y.

L. Mortar Additives

1. ACM Chemistries, Norcross, GA 30010

2. Master Builders, Inc., Cleveland, OH 44122

3. Sika Corp., Lyndhurst, NJ 07071

M. Mortar Dropping Collection Net

1. Advanced Building Products Inc., Springvale, Maine.

2. Mortar Net USA, Ltd., Gary, Indiana

3. Hohmann and Barnard, Inc., Hauppauge, NY

4. Wire-Bond, Charlotte, NC

N. Mortar Weeps

1. Mortar Net USA, Ltd., Gary, Indiana

2. Hohmann and Barnard, Inc., Hauppauge, NY

3. Wire-Bond, Charlotte, NC

2.2 FACE BRICK MANUFACTURERS/DISTRIBUTORS

2.3 MATERIALS

A. Base Materials

1. Portland Cement

   a. Type I — ASTM C150

   b. Type II (for manholes) — ASTM C150

2. Slag cement (only use for Manufacture of concrete block) — ASTM C989, Grade 100 or 120.

3. Sand for Mortar Mix — ASTM C144
   Sand shall be washed natural sand with 100% passing the No. 8 sieve.
   Mix shall not contain chlorides.

4. Aggregate for CMU - 100% light-weight aggregate, expanded clay shale or slate (rotary kiln process). To meet recycled content, lightweight recycled aggregate of up to 20% of total material that will maintain the same fire resistance equivalent thickness of 100% expanded shale, clay, or slate without a decrease in block strength may be used. — ASTM C331

5. Aggregate for Masonry Grout — ASTM C404

6. Hydrated Lime — ASTM C207 Type "S"

7. Water: Shall be clean potable water free of injurious foreign matter conforming to the requirements of Section BC 1903.4.

8. Mortar Coloring: Provide pure mineral pigments, natural and synthetic iron oxides, and chromium oxides compounded for use in mortar mixes. Material shall conform to ASTM C979. Coloring shall not contain alkalyde salts or chlorides. No liquid colorants shall be permitted.

9. Mortar additive for use in setting of exterior brick coping caps, granite steps, and other such elements with horizontal surfaces exposed to weather. Use additive for such elements within 10 vertical feet of grade or walking areas.

   a. Additive shall be non-toxic, non-flammable, and non-hazardous during storage, mixing, application, and when cured.

   b. Finished mortar shall be resistant to urine, dilute acid, dilute alkali, sugar, brine, and calcium chlorides and other salts used in de-icing salts.

10. Premixed sand and lime for mortar mixes is not permitted. The use of batched material by Spec-Mix and factory-packaged cement-lime-pigment by major mortar

manufacturers is permitted. Each individual bag of material shall have the manufacturer's label identifying the mortar type.

B. Brick

1. Modular Face Brick: Clay or shale, ASTM C216 (solid), grade SW, type FBX, or ASTM C652 (hollow), grade SW, type HBX of size $3^{5}/_{8}$" x 2¼" x $7^{5}/_{8}$" (nominal dimensions 4" x $2^{2}/_{3}$" x 8"). Cores holes shall be a minimum of 1" from faces of brick. Colors and textures as selected by the Project Architect. Where indicated on the Drawings or in the Specifications, the manufacturer and brick are the Basis of Design. Special sizes and shapes as shown on the Drawings or specified herein. Brick shall be manufactured to special sizes and shapes for corners, brick arches/lintels, and other locations and are not to be cut in the field from the standard brick. Brick shall be tested for efflorescence in accordance with ASTM Test Methods C67 and the rating shall be "Not Effloresced".

   a. Lipped brick, such as are used above relieving angles and lintels, shall be manufactured with the lip portion having dimensions not less than 5/8" high and 3/4" deep. Provide brick with larger lip dimensions when recommended by brick manufacturer. When recommended by the manufacturer, lipped brick may be cut to the required dimensions from solid brick in the factory, provided that cuts are carefully made to a 90 degree interior angle and do not extend past this angle.

2. Building Brick (Common Brick): Clay or shale, ASTM C62 (solid), grade SW, or ASTM C652 (hollow), grade SW, modular size unless indicated otherwise on Drawings. Special sizes and shapes as shown on the Drawings or specified herein.

3. Manhole Brick: ASTM C32, Grade MS, burned clay or shale, modular sizes, cored or solid.

H. Joint Reinforcement and Ties

1. Material

   a. Reinforcement and Ties for Exterior Walls (includes back-up walls of cavity wall systems): Formed from stainless steel, 18-8, type 304.

      1) Sheet steel: (No. 2B Finish), cold-rolled, annealed, ASTM A240.

      2) Wire steel: ASTM A951.

   b. Reinforcement and Ties for Interior Walls: ASTM A951, hot-dip galvanized (after fabrication), ASTM A153.

   c. Provide factory-fabricated corners and tees at corners and intersecting walls for continuous type reinforcing, such as truss type, except as indicated otherwise.

   d. Width of truss and mesh reinforcement to place edge of reinforcement 1" from each face of masonry.

2. Manufactured Units. Units are listed by Hohmann & Barnard model number in order to establish a standard for comparison. For some units model numbers are also listed for products by Wire-Bond, Charlotte, NC; and product descriptions shall be the same as for the Hohmann & Barnard products. Deliver all units with manufacturer's printed installation instructions.

   a. Exterior Walls - Brick with Concrete Backup -All items to be stainless steel except for seismic clips:

      Provide Flexible Dovetail Brick Tie, dovetail end to be 16 gage minimum, 1" wide. Tie diameter 3/16" of length to provide 2" embedment in brick. Dovetail Anchor Slots, 18 gage minimum. Provide multi-grooved rigid PVC Seismiclips for seismic interlock system. Provide 3/16" diameter Type 304 stainless steel continuous joint reinforcement wire.

      H&B: #315-BT Vee Byna Brick tie, #305 Series Anchor slot, #187-A seismiclips and continuous joint reinforcement wire.

      Wire-Bond: #2102-O dovetail offset triangular tie, #1304 dovetail slot, #3690 plastic seismiclips and continuous joint reinforcement wire.

   b. Exterior Walls - Brick with Concrete Masonry Unit (CMU) Backup – All items to be stainless steel:

      1) Dub'l Loop Lok Truss Seismiclip Interlock System consisting of the following components: All components must be from same manufacturer.

         a) Type 304 stainless steel Dub'l Loop Lok truss type horizontal joint reinforcement with welded loops. Truss 9 gauge. Deformations along each longitudinal rod for mortar bonding. Loops 3/16" diameter.
            H&B: #180
            Wire-Bond: #6000

         b) 3/16" diameter Type 304 stainless steel ties. Provide Box type or Bent-Box type as required for coursing. Provide sizes required for 2" embedment in brick.
            H&B: Byna-Ties
            Wire-Bond: #1500-O

         c) Impact resistant, multi-grooved rigid PVC Seismiclips.
            H&B: #187-A
            Wire-Bond: #3690

         d) Type 304 stainless steel continuous wire.
            H&B: 3/16" diameter wire
            Wire-Bond: #3500 wire

e) At walls with cavity insulation, provide washers to mechanically lock rigid insulation in place.
H&B: Loop-Lok
Wire-Bond: #3692

2) Column Anchor, 1/4" thick by 1¼" wide, twisted, with a slotted opening for lock stud. Provide a straight positive lock stud, 3/8" diam., threaded, with nut and washers for anchoring masonry to steel column when masonry is parallel to column flange. Length as required for conditions.
H&B: #355L
` Wire-Bond: #2755L

3) Column Anchor, 1/4" thick by 1¼" wide, twisted, with a slotted opening for lock bolt. Provide a bent positive lock stud, 3/8" diam., threaded, with nut and washers, for anchoring masonry to steel column when masonry is perpendicular to column flange. Length as required for conditions.
H&B: #353L
Wire-Bond: #2751H

4) Juncture of exterior back-up wall with interior block partition: 16 gage Wire Mesh, of proper width for wall thickness.
H&B: #MWT, 1/2" square by 16 gage
Wire-Bond: #1900

5) Concrete block to steel spandrel: Channel type to be welded to steel spandrel. Length as required for conditions.
H&B: #360 Gripstay Channel with # 365 Gripstay Anchor, 12 gage
Wire-Bond: #1302 channel slot and #1402 channel slot anchor

c. Exterior Brick Walls/Parapet Walls (Multi-wythe) - All items to be stainless steel: LOX-ALL #120 truss, 9-gage, of proper width for wall thickness. Deformations along each longitudinal rod for mortar bonding. Wire-Bond Truss Type Series 300.

d. Interior Concrete Masonry Unit Walls – All items to be hot-dip galvanized: LOX-ALL #120 Truss-Mesh, 9 gage, of proper width for wall thickness. Deformations along each longitudinal rod for mortar bonding. Wire-Bond Truss Type Series 300.

e. Interior Concrete Masonry Unit Walls (Non-Loading Bearing) - All items to be hot-dip galvanized:

1) At Partition Junctures: #MWT, 1/2” square by 16 gage, of proper width for wall thickness. Wire-Bond #1900 Mesh Wall Tie.

2) For Wall Carried up Separately: #344 steel straps, 1/4" x $1^{1}/_{2}$" x 8” with 2 bent ends (90 degrees). Wire-Bond #3000Z Rigid Steel Tie.

I. Miscellaneous Accessories

1. Weeps: High Density polyester, polypropylene, or polyethylene woven mesh, 90% open, full height of adjacent brick x full width of joint. Recessed 1/4" from face of brick, and extending to back of brick. Color to be selected by Architect from manufacturer's standard colors.

   a. "Weep Vent" by Mortar Net

   b. "Mortar-Trap Weep Vent" by Hohmann & Barnard.

2. Mortar Collection/Deflection Device: High density polyethylene, polyester, or polypropylene open woven mesh of width to fill entire cavity after installation of the insulation. Provide double layer of material to ensure cavity is filled. Mesh shall be installed to create an up and down effect.

   a. "Mortar Break DT" by Advanced Building Products Inc.

   b. "Mortar Net" by Mortar Net, Inc.

   c. "Mortar Trap" by Hohmann & Barnard, Inc.

   d. "Cavity Net DT" # 3611 by Wire-Bond.

J. Reinforcing Steel

1. Deformed bars conforming to ASTM A615, Grade 60. Reinforcement to be welded shall conform to the requirements of ASTM A706, Grade 60.

2. Reinforcement in exterior construction, such as parapets, shall be galvanized in accordance with ASTM A767 or epoxy coated in accordance with ASTM A775. Touch up coating for galvanized material shall be in accordance with ASTM A780. Touch-up epoxy coating in accordance with coating manufacturer's instructions.

K. Insulation

1. Extruded polystyrene, rigid, ASTM C578 Type X with R-value (aged) of 5.0/inch at 75^{o}F mean temperature when tested in accordance with ASTM C518.

   a. Minimum compressive strength: 15 psi in vertical direction when tested in accordance with ASTM D1621.

   b. Maximum water absorption: 0.3% by volume when tested in accordance with ASTM C272.

   c. Surface Burning Characteristics in accordance with UL tests): Flame Spread - 15, Smoke Developed - 165.

2. Product shall not be produced with or contain any of the U.S. EPA regulated CFC compounds which are listed in the Montreal Protocol.

3. Provide Styrofoam Brand Cavity-mate by Dow Chemical.

   Panel size: 16" x 96". Thickness: as shown on the Drawings. Provide each panel of full thickness indicated.

4. Adhesive: Type recommended by insulation manufacturer and air barrier manufacturer. Compatible with insulation and substrates.

L. Masonry Cleaner

Masonry cleaner capable of cleaning masonry without degrading the masonry material or mortar. Cleaner must be approved by the masonry manufacturer.

M. Precast Concrete Lintel

Cast lintel units, using same type cement (ASTM C150) and aggregate ASTM C331) as for CMU; compressive strength: 3,500 psi. Refer to Drawing Details for sizes, reinforcing, and other requirements.

N. Electrodes for Welding

Electrodes for welding stainless steel to carbon steel: E309-16.

2.4 MIXES

A. Mortar (basic)

Shall conform to ASTM C270 and BIA M1-88. Provide Type I Portland cement (Type II Portland Cement when used for manholes). Masonry cement shall not be used as a substitute. Preconstruction testing with the proportions carefully monitored is to be used to establish the upper end of the strength range, which may be near or slightly above the minimum strength of the next higher strength mortar (e.g. Type N many times is in the 2000 to 2500 range).

1. Type M: 1 part gray cement, 1/4 part lime, $3^{3}/_{4}$ parts dry sand. Minimum compressive strength shall be 2500 psi at 28 days.

2. Type S: 1 part gray cement, 1/2 part lime, $4^{1}/_{2}$ parts dry sand. Minimum compressive strength shall be 1800 psi at 28 days.

3. Type N: 1 part gray cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi at 28 days.

4. Type N "White": 1 part white cement, 1 part lime, 6 parts dry white sand. Minimum compressive strength shall be 750 psi at 28 days.

B. Mortar Color

Proportion mortar coloring with other mortar mix ingredients to obtain desired color, as approved by the Project Architect. Provide white cement instead of gray cement where required to meet the desired color. Do not exceed 1 part pigment to 10 parts cement, by weight. If consistent color cannot be obtained, provide as a minimum premixed Portland cement and coloring from major cement manufacturer.

C. Refractory Mortar

Manufactured from fire clay as defined in ASTM C1232. Shall be "Sairset" by A. P. Green Refractories Co.

D. Grout for Masonry

1. Mixes

a. Fine Grout: 1 part Portland Cement, 0-1/10 part Hydrated Lime, $2^{1}/_{4}$-3 times the sum of volumes of cementitious materials of fine aggregate (Proportions by volumes).

b. Coarse Grout: 1 part Portland Cement, 0-1/10 part Hydrated Lime, $2^{1}/_{4}$-3 times the sum of volumes of cementitious materials of fine aggregate, and 1-2 times the sum of the volumes of cementitious materials of coarse aggregate (Portions by volume).

c. Aggregates for Mixes: ASTM C 404.

d. Slump: 8" minimum, 11" maximum.

e. Compressive Strength: At least equal to the strength of the masonry, and not less than 2000 psi as determined by ASTM C1019 - Method of Sampling and Testing Grout.

2. Location

a. For spaces less than 2" in any direction, use fine grout.

b. For spaces 2" and more in any direction, use coarse grout.

2.5 SOURCE QUALITY CONTROL

A. The Authority will assign a Special Inspector who will inspect the masonry construction under the requirements of Section BC 1704.5.

B. Preconstruction Testing

1. Preconstruction testing of mortar properties will be done in accordance with ASTM C780. The Contractor shall assist the Authority’s laboratory by any means necessary and shall provide the mock-up prior to beginning the installation work to allow for adjustments of the mix if necessary. Do not proceed with masonry work

until the preconstruction testing is completed. Contractor shall mix mortar as it intends for the actual construction.

2. Compressive strength tests of field mixed mortar and factory batched/prepackaged mortar are to be done during construction of the mock-up, or earlier if desired by the Contractor, to provide a benchmark for the strength based on actual field conditions and proportioning of the mortar. If mortar strengths are too high or too low, proportions and material source may be required to be modified if directed by the Architect or Engineer of Record.

3. Preconstruction testing of masonry grout properties will be done in accordance with ASTM C1019. The Contractor shall assist the Authority's laboratory by any means necessary and shall provide the mock-up prior to beginning the installation work to allow for adjustments of the mix if necessary. Do not proceed with masonry work until the preconstruction testing is completed. Contractor shall mix mortar as it intends for the actual construction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all adjoining Work on which this Work is in any way dependent for proper installation and workmanship. Report to the Authority any conditions that prevent the performance of this Work.

3.2 PROTECTION

A. Cover top of masonry wall with waterproof plastic membrane at the end of the work period, when work is not in progress, and at other times when Work needs to be protected from rain and other precipitation. Extend cover down sides as needed to thoroughly protect the Work.

B. During cold weather, do not use wet masonry units and frozen masonry units.

C. Do not use frozen materials or lay masonry on frozen materials; remove frozen materials from wall. Refer to Part 1 of this Section, "Environmental Requirements" for temperature restrictions.

D. Remove excess mortar from walls as soon after laying units as practicable to prevent staining and to facilitate cleaning of wall.

E. Brace walls as needed until sufficiently set, or until intersecting walls provide lateral support.

F. Prevent masonry cleaners from coming in contact with adjacent glass, metal, and other masonry surfaces such as cast stone. Protect adjoining glass and metal surfaces and all other adjacent materials and property from masonry operations.

3.3 MIXING PROCEDURES FOR MORTAR

A. Measure material by volume or equivalent weight. In measuring by volume, measure ingredients by container. Do not measure by shovel.

B. Mix ingredients in a clean mechanical mixer for a minimum of 3 minutes, maximum of 5, with the minimum amount of water to produce a workable consistency. Water rententivity must be appropriate for the IRA of the brick. Bricks of 3 grams per minute per 30 sq in require a lower water retentivity property to maintain production by allowing the mortar to give up the water easier to the brick.

C. Mortar that has stiffened because of evaporation of water from the mortar may be retempered only once, and only during the first hour of placement to restore the required consistency. Do not over water to make mortar "soupy" as water retentivity must be appropriate for the IRA of the brick. Mortar shall be used within $2^1/_2$ hours after initial mixing. Limit amount of mortar batched at one time to stay within these requirements.

3.4 LAYING - GENERAL

A. Lay units true to dimensions, plumb and level, square; exterior and interior bond work in bond indicated on the Drawings or specified herein. Lay courses level and in plane with joints uniform; vertical joints spaced properly for plumb alignment. Provide masonry lines, plumb bobs, and utilize a 4 foot level to maintain wall within 1/4" of theoretical dimensions. Adjoining faces of brickwork sections, such as at expansion joints, relieving angles, etc, shall be flush with each other, unless specifically indicated otherwise on drawings.

B. Fill bed joints and cross joints solid with mortar. Furrowed bed and spotted cross joints not permitted. For hollow block units, apply mortar full length on all bearing surfaces.

C. "Tooth" temporary openings in exposed masonry walls, to maintain proper bond when closed.

D. Tool joints in exposed masonry with a concave jointer to provide a neat, smooth, compacted surface.

E. Rough cut joints in masonry that are to receive plaster, to provide good plaster bond.

F. Remove excess mortar, leaving masonry surface clean.

G. Cut brick and concrete masonry units with circular masonry wet saw.

H. Build-in miscellaneous metal inserts and other items not furnished under this Section but specified to be installed under this Section.

I. Lay brick in bond patterns as shown on the Drawings. If bond is not indicated on Drawings, use running bond, all stretchers.

3.5 FACE BRICK WORK

A. Lay face brick from scaffolding erected on face brick side of wall. Do not build or attach scaffolding into the brick face.

B. Use face brick for exterior walls, chimneys, bulkheads, and backs of parapets, except where concrete parapets are indicated.

C. At exterior relieving angles/lintels or other brick projections on exterior face of building, brick shall be placed such that the cores are not visible. Ensure lintels and relieving angles are placed such that cores will not be visible when brick is placed at its correct location.

D. Wet clay and shale brick which have initial rates of absorption of more than 30 grams for each 30 square inches per minute (ASTM C67). Wet brick sufficiently to prevent excess absorption of mortar moisture, but keep surface dry enough to obtain bond.

E. Lay with shoved joints, avoiding dry contacts between brick.

F. Lay not more than 5 courses before setting backup units.

G. Clean loose mortar from wall as brick is laid.

H. Leave openings for mechanical trades work, then close up solid after mechanical installations are completed.

I. Provide weep holes in the head joints of the first two courses of masonry above wall flashing (space at 24" o.c. linear in each course, staggering the first course with the second course). Provide weep holes at other locations as denoted on the Drawings.

J. Construct 1/2” wide vertical expansion joints at locations indicated on the drawings. If not indicated, provide at approximately 25’-0” o.c. and within 5’-4” from the corners.

3.6 CAVITY WALL

A. Keep the cavity free of mortar droppings. Do not permit mortar to collect on ties and bridge across the cavity.

B. Provide continuous row of mortar mesh at base of wall, over relieving angles and lintels, at all locations with flashing and weep holes, and as indicated, directly on flashing. Flashing shall extend above top of mortar mesh except where indicated otherwise. Trim mortar mesh to size indicated on the Drawings.

C. In laying up the wall, keep the cavity clean of mortar droppings by temporarily placing a wood strip 2" high and full width of cavity on each succeeding course of anchors as they are installed, removing the strip, cleaning it off, and reinserting it on the next course of anchors before laying up the next portion of wall. Do not leave any wood strips in the cavity.

D. Prepare CMU backup for application of fluid applied membrane air/vapor barrier specified in Division 7. Mortar joints shall be completely filled and struck flush with unit masonry. Leave surfaces clean, and without projections, voids, cracks, contaminants, or other irregularities that would hinder proper application of the membrane. Clean mortar droppings from surfaces and brick ties.

E. Provide reinforcement between brick and backing.

F. Upon inspection and when directed by the Authority after the wall has been topped out at each level below the flashing or lintel line, flood the cavity with water prior to installation of the brick above to verify that all weeps drain freely and no water passes the backing.

3.7 INSULATION

A. Prior to installation of cavity insulation verify that:

1. Substrate is properly prepared.

2. Wall is clean.

3. Air barrier membrane provided under Section 072500 has sufficiently cured, as recommended by the membrane manufacturer.

B. Application

1. Install insulation horizontally within cavity space, against concrete block wall and other substrates, butt edges tightly, with vertical joints staggered. Cover wall completely, forming a continuous enclosure of the building envelope without gaps.

2. Adhere insulation as recommended in writing by the air barrier manufacturer for the specific air barrier system provided for this Project:

a. Upon completion of the air barrier membrane system, and after a curing period recommended by the membrane manufacturer, apply insulation adhesive in a serpentine pattern over the air barrier membrane using a notched trowel. Immediately after application of the adhesive, or within the time period recommended by the manufacturer, embed insulation board into the adhesive and press firmly into place to ensure full contact and adhesion over entire area of board. Apply additional adhesive if allowed to skin over.

3. In addition to adhesive attachment of insulation to all substrates, provide an insulation retainer washer at each brick tie.

4. Fabricate insulation panels by means of saw, knife or other sharp tool to fit around obstructions across cavity such as vents, louvers, piping, conduits, and other penetrations. Make insulation continuous, filling all voids. Use largest pieces of insulation possible to minimize joints. Fill cracks with material compatible with insulation, air barrier, and masonry.

3.8 BUILDING BRICK (COMMON BRICK) WORK

A. Use building brick or face brick for infilling walls of solid brick construction such as at piers, filling around structural members, solid brick parapets, and for all masonry where brick work is indicated, and for which face brick, SFT, concrete block, or other material is not shown or specified. All joints within the solid masonry construction shall be filled solid.

B. Lay up with Type N mortar, except when within 8" of cut stone work, use Type N "White" mortar.

C. When exterior door frames are not in place at the time adjacent walls are being erected, set hot-dip galvanized steel anchors in masonry every sixth course to provide adequate anchorage for door frames to masonry when door frames are installed.

D. When brick is used for back-up wall for limestone, laying of brick shall not commence until parging for limestone is dry.

E. Provide weep holes or open side joint as required.

3.9 CONCRETE MASONRY UNITS (CMU)

A. General

1. Lay blocks with cells vertical. Provide running bond unless shown otherwise on the Drawings or as indicated below, bonded at corner angles. Fill cores containing vertical reinforcement with masonry grout for full height, as the wall is erected.

2. Where interior partitions intersect other partitions or walls, bond together with metal wall ties spaced 2'-0" o.c. min., vertically. Refer to Article on "Reinforcement".

3. Where interior walls are to be furred with soap units, secure furring with steel ties, spaced one for each 4-square feet.

4. Provide grout in cores of blocks at jambs, parapets, under lintels, and where indicated on the Drawings.

5. Bond beam units shall be filled with lightweight concrete having a minimum compressive strength of 3000 psi and reinforced as shown on details.

B. Horizontal and Vertical Face Joints

1. Make joints uniform and 3/8" thick, unless otherwise indicated.

2. Shove vertical joints tight.

3. Tool joints with a concave smooth, non-staining tool, when thumb print hard, at surfaces to be painted or exposed.

4. Point joints tight with a trowel, in unparged masonry below grade.

5. Strike mortar joints flush in surfaces to be plastered, stuccoed, covered with other masonry, or which are otherwise concealed from view. Prepare masonry for application of fluid applied membrane air/vapor barrier as indicated herein in Article titled “Cavity Wall”.

C. Exposed and Painted Surfaces

1. Smooth, even texture, free of chips, cracks, or other imperfections and free from any material that will stain paint.

2. External corners in all rooms and spaces, except for utility and service areas, shall be formed with bull-nose blocks. Bull-nose blocks shall be factory fabricated.

D. Control Joints

1. Construct 1/2" wide vertical control joints in partitions. Provide control joints at a distance not more than 1.5 times the height of the wall or 25’-0” on center, whichever is less, and where indicated on the Drawings.

2. Joints to extend full height of partition (floor to underside of slab or beam).

3. Continue control joints through wainscoting.

4. Filler

    a. Polyethylene Foam Bar, or

    b. Polyurethane Type Filler

    c. Width as required for partition thickness, minus 1".

    d. Install filler as partition is erected.

    e. Filler to extend full height of joint.

3.10 GENERAL - CUTTING, FITTING AND LAYING (SFT, CMU, GCB, ACOUSTIC BLOCKS)

A. Cut units with motor-driven carborundum wet-saw; provide smooth, straight edges.

B. Provide necessary cuts to fit tightly in and around mechanical installations.

C. Where split block units are used to conceal piping or other installations, provide reinforcement for bonding the split units together.

D. Drill holes neatly for attachment of handrail brackets and for other items to be attached.

E. Reinforce first two courses above all door openings with a layer of truss type reinforcement extending 12" beyond jambs, in addition to the rebars required for seismic reinforcement.

F. Remove mortar protrusions that extend into cells or cavities which are to be reinforced and filled.

G. Set block up with special care for plane, jointing, pattern, and cutting.

H. Keep faces of units clean; clean off mortar droppings on block face immediately.

I. Defective units will be rejected. Replace defective units with perfect units at no extra cost to the Authority.

J. At exposed surfaces tool joints with a smooth, non-staining tool to produce a smooth and slightly concave surface.

K. See Drawings for thickness of block.

L. Maintain the rating of fire-rated partitions. Provide openings of minimal size to limit the amount of required firestopping. Firestopping systems shall be provided under Section 078400.

M. Extend interior partitions and furring up to underside of slabs, arches, and beams. Leave sufficient space between partition and slab/arch/beam to install firestopping materials as specified in Section 078400. If firestopping is not required, provide resilient material such as mineral wool packing with backer rod and sealant (See Section 078400) at each side of partition.

N. Where units meet metal door frames, leave vertical joint open to receive caulking.

O. Control joints shall extend full height of partition (floor to underside of slab or beam). Joints shall not intersect any structural members in the wall. Wall joint reinforcement shall not continue through the control joints.

3.11 REINFORCEMENT

A. General

1. Brick ties: Shall be embedded a minimum of the midpoint of the brick to 2” into brick, exclusive of the seismic clip and wire. Wire shall be 3/4” to 1” back from the face of the joint.

2. Block ties: Shall be embedded a minimum of 2/3 the block width

B. Exterior Walls - Brick with concrete back-up:

Provide ties at 16" o.c. vertical spacing, 24" o.c. horizontal spacing.

C. Exterior Walls - Brick with concrete masonry unit (CMU) back up:

1. Provide truss/ladder type horizontal joint reinforcement/box tie system between block and veneer brick, continuous at alternate block courses (16" o.c.), with loops spaced at 16" o.c. horizontally, maximum. Provide seismic interlock system, including seismic clips, and continuous wire. Provide retainer washer at each set of loops to lock insulation in place.

2. Provide column anchor to anchor block masonry to steel columns when columns are not encased in concrete. Provide anchors in pairs, spaced 16" o.c. maximum vertically.

3. Provide ties with interior partitions at 16” o.c.

4. Provide spandrel anchor to anchor block masonry to steel spandrels. Provide anchors spaced 16” o.c. maximum vertically.

5. Install reinforcing bars in cells and bond beams at locations and spacing indicated on Drawings.

D. Interior Concrete Masonry Units and Glazed Concrete Block Walls:

1. Provide mesh continuous at every third block course.

2. Provide ties at 24" o.c. vertical spacing. Embed in masonry 4" minimum each wall.

3. Provide straps at 48" o.c. vertical spacing.

E. Structural Facing Tile (SFT - 2-wythe):

Provide ties at 16" o.c. vertical spacing, 36" o.c. horizontal spacing.

F. Structural Facing Tile (SFT - with C.M.U. back-up):

Provide ties at 16" o.c. vertical spacing, 36" o.c. horizontal spacing.

G. Exterior Brick Walls (multi-wythe with no cavity):

1. At multi-wythe walls without cavity, provide truss/ladder type joint reinforcement at 16” o.c. vertical spacing.

2. Install reinforcing bars at locations and spacing indicated on Drawings.

H. Exterior Walls – Veneer Brick with multi-wythe solid brick back-up:

1. Provide truss type horizontal joint reinforcement/box tie system between multi wythe brick back-up and veneer brick, continuous at 16" o.c., with loops spaced at 16" o.c. horizontally, maximum. Provide seismic interlock system, including seismic clips, and continuous wire. Provide retainer washer at each set of loops to lock insulation in place.

2. Install reinforcing bars at locations and spacing indicated on Drawings.

I. Exterior Brick with steel back-up:

Provide ties at 16" o.c. vertical spacing, 24" o.c. horizontal spacing. Provide seismic interlock system, including seismic clips, and continuous wire.

K. Expansion joints and control joints

Install “slip-set” stabilizer at 24” o.c. vertically in all masonry control and expansion joints of masonry partitions, CMU walls, and multi-wythe brick walls/parapets.

L. Lap ends of adjoining strips of continuous reinforcement 6".

M. Size (width) of reinforcement as required for 4", 6", 8", 10" partitions.

N. In partitions where control joints are indicated, keep reinforcement 1" short of each end of blocks at control joint.

O. Install continuous reinforcement over all door openings in first and second mortar joints above doorframe or lintels.

P. Provide galvanized steel bent straps secured to slab, to brace tops of interior masonry partitions. Installation shall permit vertical deflection of slab. Refer to Drawing details.

Q. For bonding of SFT or other facing materials to block construction: set ties and anchors at proper height to coincide with horizontal joints of facing materials.

R. Structural Reinforcement Installation

1. Where reinforcement is anchored to slab, drill hole 1/8" larger than bar diameter and set in epoxy similar to Sikadur 31 by Sika Corp. Holes are to be brushed and air-blown clean prior to pouring of epoxy. Hole depths to be 3" minimum unless indicated otherwise in Contract Documents. Adhesive anchor systems with ICC certification in cracked concrete are acceptable and are to be installed in accordance with the ICC certification. Submit product data to Engineer of Record for approval

2. Provide a minimum 20" lap at splices, tying bars together or using mechanical fasteners.

3. Cells of hollow masonry units containing reinforcing bars are to be filled completely with masonry grout.

4. Install reinforcing bars in bond beam units at depths indicated on drawings. Bars are to be continuous lengths in bond beams over masonry openings.

5. Where indicated, weld reinforcement to steel in accordance with AWS D1.4 and the manufacturer's written instructions. Keep electrode dry. Oven dry electrode after exposing it for more than 6 hours. Touch-up damaged coatings and weld area upon completion.

6. For reinforcement in solid wythe brick, ensure bars are completely surrounded with grout. Cut brick in inner wythe as required.

3.12 BUILT-IN WORK

A. Where sleeves are required in brick walls or in partitions, furnish standard wrought iron pipes of necessary sizes and lengths and build in where shown.

D. Maintain bucks, frames, and other built-in work in their proper position. Do not remove any braces or stays from these items until they are securely supported by and fastened to masonry.

E. Set all loose lintels (exterior and interior), bolts, plates, and other items furnished under Section 051200 and specified to be installed in this Section.

F. Build into partitions and walls: Frames for grilles, convectors, access doors, and boxes for electrical equipment.

G. Do not build wood blocks into walls for securing of grounds. Grounds shall be secured to the masonry by carpenter, nailing directly into masonry units or joints.

I. Provide necessary special jamb blocks, regular and irregular angle blocks where required to obtain smooth, evenly jointed and regular block patterns.

3.13 FIELD QUALITY CONTROL

A. The Authority will assign under the requirements of Section BC 1704.5 a Special Inspector who will inspect the masonry construction. Where post-installed anchors are utilized, the Special Inspector will perform Special Inspection on post-installed anchors as per Section BC 1704.32. Adhesive anchors installed in concrete in a horizontal or upwardly inclined position supporting sustained tension loads shall be installed under continuous Special Inspection as required by paragraph D9.2.4 of ACI 318-11.

B. The Special Inspector will make inspections and any testing deemed necessary. Testing of mortar properties shall be in accordance with ASTM C780. Mortar suspected or tested to be too strong or too weak will be subject to petrographic analysis or other methods deemed necessary by the Engineer of Record and Special Inspector. Testing of masonry grout shall be in accordance with ASTM C1019. The Contractor shall pay for all tests if they verify improper work. Inspections will include, but not be limited to, the following:

1. Proper installation of reinforcement and placement of brick on angles.

2. Proper installation of mortar, including proportioning and mixing. Those mortar properties listed in the Appendix of ASTM C780 are to be tested at the discretion of the Special Inspector or the Architect/Engineer of Record Mortar strengths, when tested, will be determined in accordance with ASTM C780 using cylinders.

3. Proper installation of weeps, flashing, drip edges, mortar mesh, cleaning of cavity (if cavity wall construction), etc.

4. For cavity wall construction, all bed and head joints are filled completely. At solid masonry construction, all bed, head, and collar joints are filled completely.

D. If any results are found to be not in conformance with the applicable ASTM, industry practice, and the Specifications, the masonry in question shall be removed and redone. Pay for testing if results of testing verify improper workmanship or proportions not in conformance with the specifications and ASTM standards.

3.14 CLEANING

A. Before cleaning masonry walls, examine faces for holes, cracks, and other defects. If corrections cannot be made to provide an appearance acceptable to the Project Architect, replace defective units.

B. Exterior Masonry

1. After completion of laying and the completion of other adjacent work liable to soil masonry, clean face work and point all open joints.

2. Start cleaning operations at top and proceed downward, using solution not detrimental to material or mortar.

3. Use only masonry cleaners approved by the manufacturer of the specific face brick and follow the brick manufacturer's instruction for use of the product. Perform a mock-up of the cleaning procedure in the presence of the cleaner manufacturer's representative and Authority's field representative. The use of muriatic acid is not approved.

C. Concrete Masonry Units

1. Clean wall surfaces to be painted; rub with carborundum stone: remove mortar from surfaces; remove rough edges from joints.

2. Point up holes and joints. Brush with stiff bristle brush. Leave surface in condition to receive paint.

3. Clean other wall surfaces with stiff-bristle brush.

4. Do not use wire brush.

END OF SECTION 04 20 00

LIST OF SUBMITTALS

SUBMITTAL	DATE SUBMITTED	DATE APPROVED
Product Data:	_____	_____
1. Masonry unit data		
2. List of max. dry wt. Each Type CMU		
3. Reinforcement, anchors & ties		
4. Portland Cement Mfr & Brand		
5. Lime Mfr & brand		
6. Mortar Pigments Mfr & Brand		
7. Packaged Products: Mfr's specs & application instructions		
8. Sand: Location of pit, Owner's name, & previous test data		
Samples:	_____	_____
1. Face Brick		
2. CMU		

SECTION 05 12 00 – STRUCTURAL STEEL

GENERAL PROVISIONS FOR STRUCTURAL STEEL WORK

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This section includes the supply, fabrication, and erection of structural steel for the steel dunnage supporting two 5,100 lb cooler units.

B. Work includes:

1. Structural steel beams, columns, and bracing.

2. Connections, fasteners, and erection procedures.

3. Shop drawings, coatings, and testing requirements.

1.2 REFERENCES: AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

1. TAISC 360 – Specification for Structural Steel Buildings. B. American Society for Testing and Materials (ASTM)
2. ASTM A992 – Structural Steel for W-Shapes.
3. ASTM A500 – Cold-Formed Welded Structural Tubing.
4. ASTM A36 – Carbon Structural Steel.
5. ASTM A572 – High-Strength Low-Alloy Structural Steel.
6. ASTM A325 – High-Strength Structural Bolts. C. American Welding Society (AWS)
7. AWS D1.1 – Structural Welding Code – Steel. D. Society for Protective Coatings (SSPC)
8. SSPC-SP3 – Power Tool Cleaning.

1.3 SUBMITTALS

A. Shop drawings showing dimensions, member sizes, and connection details.

B. Welding procedures and welder qualifications.

C. Material Specifications for steel members, bolts, and welding electrodes.

D. Inspection and test reports.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel:
1. Beams: W8X18, ASTM A992.
2. Columns: HSS 4X4X5/16”, ASTM A500 Gr B/C.
3. Bracing: L3X3X5/16”, ASTM A36 or A572.

4. Gusset Plates: 3/8" steel plate, ASTM A36, welded to HSS posts and W8X18 beams. B. Fasteners:
5. Bolts: ASTM A325 high-strength bolts.

B. Fasteners:
1. Bolts: ASTM A325 high-strength bolts.
2. Welding Electrodes: AWS E70XX.

C. Coatings:
1. Primer: Shop-applied per SSPC-SP3.
2. Galvanizing (if required): ASTM A123.

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate structural steel in accordance with AISC 360

B. Cut, drill, and weld steel members to dimensions specified in shop drawings.

C. Shop weld per AWS D1.1 standards

D. Weld 3/8” gussets plates to HSS and W8x18 beams pre approved shop drawings.

3.2 ERECTION

A. Install steel members per approved shop drawings

B. Bolted and welded connections shall meet AISC and AWS requirements.

C. Ensure propoer alignment, leveling, and bearing members.

D. Install anchor bolts per structural drawings.

E. Weld gusset plates to HSS and beam connections per specifications.

3.3 QUALITY CONTROL

A. Bolting inspection: Verify bolt tightness using turn-of-nut or direct tension indicators (DTIs)

B. Welding Inspection: Conduct visual and nondestructive testing (ultrasonic or magnetic particle as requiered)

C. Final verification: Inspect for compliance with design loads and alignment tolerances.

END OF SECTION 05 12 00

SECTION 05 12 10

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Furnish and erect all steel as shown on Drawings.
B. Provide shop painting and/or galvanizing as specified.

1.2 REFERENCES

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

A. American Society of Testing and Materials (ASTM) standards, latest editions.

A6 Standard Specification for General Requirements for Rolled Steel Bars, Plates, Shapes, and Sheet Piling.

A29 Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for

A36 Standard Specification for Carbon Structural Steel.

A108 Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.

A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service, or Both.

A307 Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength.

A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

A490 Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.

A563 Standard Specification for Carbon and Alloy Steel Nuts.

A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coating.

A992 Standard Specification for Steel for Structural Shapes for Use in Building Framing

F436 Standard Specification for Hardened Steel Washers

F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

B. "Standard Welding Symbols - A2.0" - American Welding Society (AWS).

C. "Specification for Mild Steel Covered Arc-Welding Electrodes - A5.1" - AWS.

D. "Structural Welding Code - D1.1" - AWS.

1.3 DEFINITIONS

A. Structural Steel

Structural Steel consists of the steel elements of the structural steel frame essential to support the design loads. These elements consist of material as shown on the structural steel plan and listed in Article 2.1 of the AISC "Code of Standard Practice for Steel Buildings and Bridges."

B. Other Steel

Structural steel does not apply to those elements listed in Article 2.2 of the AISC "Code of Standard Practice for Steel Buildings and Bridges."

1.4 SUBMITTALS

A. Product Data

Submit manufacturers' specifications for the following products:

1. Primer paints, galvanizing repair paint

2. Stud shear connectors

3. Expansion/adhesive anchors

4. Zinc Metallizing

B. Shop Drawings

1. Failure to submit legible shop drawings will be cause for return without review.

2. All connections shall be designed by and all drawings shall be prepared under supervision of a Professional Engineer licensed in the State of New York. Do not submit unchecked shop drawings. First submissions of all job standards, shop drawings of connections not shown on, or that are in deviation of, the job standards, and calculations shall have one set sealed and signed by the Engineer. After final approval of all shop drawings, submit a final set sealed and signed by the Professional Engineer.

3. Shear connections (framed beam, seated beam, single plate, etc.) shall be designed by the detailer's licensed engineer and detailed by the structural steel detailer, unless otherwise shown on Drawings. All wind and seismic connections (moment connections, bracing, etc.) are generally detailed on the Drawings. Based on the indicated loads (axial force, moment, etc.), the structural steel detailer's engineer shall design the connections. Those not detailed shall be detailed by the structural steel detailer.

4. Immediately after award of Contract and before preparing steel shop drawings, submit for review a set of job standards showing all necessary joint details with full particulars of connection pieces, shop and field welds, and holes for erection bolts and permanent bolts. These shall include any moment and shear connection designed by the Engineer of Record as well as those designed by the detailer. Appropriate marks for designating all types and sizes of joint details shall be included. Submit all calculations pertaining to the job standards. After approval of these job standards, the erection plans are to be submitted and shall be marked to indicate unmistakably the type and size of joint to be used for every beam connection. Do not order steel in advance of approval of the job standards and the erection plans with joint marks, except at own risk.

5. Prepare remainder of steel shop drawings after approval of job standards and erection plans. Drawings submitted prior to approval of job standards will be returned without review. Submit drawings gradually and not all at the same time so that sufficient time is allowed for checking and approval. No more than 100 drawings are to be submitted within a 14-day period to allow for checking and approval of package before submittal of next package. Shop Drawings for MEP equipment dunnage and access platforms shall not be submitted until after approval of the submitted MEP units. Ensure shop drawings submitted for MEP equipment dunnage and access platforms are coordinated and based on unit approved, which may vary substantially from the Basis of Design. The Contractor shall take into account in their schedule the potential time impact in the sequencing of the steel drawings.

6. Steel shop drawings shall include framing plans, bolted and welded work, and details such as camber and other pertinent data not shown on job standards. Detail openings and reinforcement due to other Work. Coordinate with Drawings of other Work.

7. Indicate welds by standard AWS symbols and show size, length, and type of each weld in accordance with AWS A2.0.

8. Identify columns using same identification system shown on Drawings.

9. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed under other Sections.

10. Shop drawings will be checked for size of material and strength of connection by the Engineer of Record, which shall not render the Engineer of Record responsible for any errors in construction dimensions, etc. that have been made in preparation of shop drawings. The Contractor shall assume full responsibility for the correctness of dimensions and fit.

11. Submit calculations for design of connections on job standard and all other connections such as moment, brace, and trusses.

12. After shop drawings are 100% complete and approved and all field changes have been made, a CD rom of the as-built drawings are to be submitted to Ownership in an AutoCad format.

C. Quality Control Submittals

1. Certificates and Affidavits

a. Furnish bolt manufacturer's test reports, covering physical and chemical tests, for each lot of high strength bolts submitted.

b. Furnish steel manufacturer's certificate certifying welders employed on the Work are current with their AWS qualifications (including having their required maintenance forms from their employer) and for work performed in the field are NYC licensed welders as per Section §28-407.1 of the NYC Administrative Code.

c. Furnish complete listing of ASTM's of materials listed in Part 2 of this Section and certification that materials supplied meet those listed.

d. For mechanical and adhesive anchors installed in concrete, submit ICC certification for use in cracked concrete.

2. Contractor Qualifications

a. Provide proof of Fabricator, Erector, Detailer/Engineer, and Adhesive Anchor Installer specified under “Quality Assurance”.

D. Sustainability Submittals

1. Recycled Content

a. Submit documentation of recycled content of structural steel; product data or manufacturer's statement as applicable.

2. Regional Content

a. Submit documentation of regional materials for structural steel; product data or manufacturer's statement as applicable

1.5 QUALITY ASSURANCE

A. Qualifications

1. Fabricator: Company specializing in the fabrication of steel products to be used in this Contract shall have a minimum of five years experience. The fabricator is to be AISC certified.

2. Erector: Company specializing in performing the Work of this Section shall have a minimum of three years experience and have done at least three projects with similar quantity of material.

3. Detailer: Company shall be specialized in the detailing and design of structural steel shop drawings with a minimum of three years experience. Connections shall be designed by and shop drawings prepared under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed by the State of NY engaged.

4. Adhesive Anchor Installer: Installer for adhesive anchors installed in a horizontal or upwardly inclined position supporting sustained tension loads shall be certified per ACI Appendix D9.2.2 as per Section BC 1912 of the 2014 NYC Building Code.

B. Regulatory Requirements

1. Building Code: Work of this Section shall conform to all requirements of the 2014 NYC Building Code and all applicable regulations of governmental authorities having jurisdiction, including safety, health, noise, and anti-pollution regulations. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.

2. Industry Standards: Standards specified herein apply to Work of this Section. Where more severe requirements then those contained in the Standards are given in this Section or the Building Code, requirements of this Section or the Building Code shall govern.

a. AISC 360 as modified by the 2014 NYC Building Code.

b. "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation (RCRBSJ) – AISC-2000.

c. "Structural Welding Code" - AWS.

3. Recommendations or suggestions in the codes and references listed in this Article and under “References” shall be deemed to be mandatory unless they are in violation of the Building Code.

C. Certifications

1. Structural steel shall conform to the material acceptance, certification, and inspection requirements of Section BC 1701.

2. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site at such intervals as to ensure uninterrupted progress of Work.

B. Deliver anchor bolts and other anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so as not to delay Work.

C. Store materials to permit easy access for inspection and identification.

1. Shop-primed steel. (Painted or galvanized): Primed steel stored in the field or shop shall be kept off ground (using pallets, platforms, or other supports) and so positioned as to minimize water-holding pockets, dust, and other contamination of the primer. Repair damage to primed surfaces due to improper storage in a manner approved by Ownership.

2. Unpainted Steel: Steel stored in field or shop shall be kept off ground (using pallets, platforms or other supports), kept clean and in general protected against damage and corrosion.

D. Do not store materials on erected structure in a manner that might cause distortion or damage to the members or supporting structures. Repair or replace damaged materials or structures as directed by Ownership.

1.7 FIELD MEASUREMENTS

A. Take field measurements as required by Drawings. Where possible take field measurements of existing conditions prior to fabrication. Verify that field measurements

are the same as those shown on Drawings and shop drawings. Report all deviations to Ownership in writing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Paint

1. Tnemec Co.

2. Sherwin Williams

B. Expansion/Screw/Adhesive Anchors, Fasteners

1. Hilti, Inc.

2. Powers Fasteners

2.2 MATERIAL

A. Structural Steel Shapes, Plates, and Bars

1. Structural steel W shapes shall have a minimum yield strength of 50 ksi conforming to the provisions of ASTM A992. For other shapes not available in ASTM A992, steel shall have a minimum yield strength of 36 ksi conforming to the provisions of ASTM A36.

2. Tube steel shall conform to the provisions of ASTM A500, Grade B, and pipe steel to the provisions of ASTM A53, Grade B.

3. Structural steel shall contain a minimum of 30% post consumer content and 15% pre-consumer content.

B. Bolts

1. Anchor Bolts (Anchor Rods): Shall conform to the provisions of ASTM F1554, Grade 36, unless different grade is specified elsewhere. Size and detailing indicated on Drawings.

2. High-Strength Bolts: Shall conform to the requirements of ASTM A325 or F1852 unless otherwise indicated on Drawings.

3. Expansion/Screw/Adhesive Anchors: Provide types as indicated on Drawings. The anchor specified shall be considered the basis of design.

a. As a minimum, all anchors exposed to weather or embedded in masonry are to be Type 316 stainless steel.

b. Anchors installed in concrete shall have current ICC-ES listing for performance in cracked concrete as per Section BC 1912.

1) Wedge Expansion and Undercut Anchors/ expansion bolts shall have an ICC-ES Evaluation Service Report (ESR) issued in accordance with ACI 355.2 or ICC-ES AC 193 for use in cracked concrete, including seismic applicability loading, and pursuant to the Office of Technical Certification and Research (OTCR) Building Bulletin 2014-018. Anchors installed in grouted masonry shall have a report issued in accordance with AC 01.

2) Adhesive anchors in concrete shall have an ICC-ES Evaluation Service report (ESR) issued in accordance with ACI 355.4 or ICC-ES AC 308 for use in cracked concrete, including seismic applicability loading, and pursuant to the Office of Technical Certification and Research (OTCR) Building Bulletin 2014-018. Anchors installed in grouted masonry shall have a report issued in accordance with AC 58.

3) Concrete Screw Anchors shall have an ICC-ES Evaluation Service report (ESR) issued in accordance with ICC-ES AC193 for use in cracked concrete and seismic loading and pursuant to the Office of Technical Certification and Research (OTCR) Building Bulletin 2014-019. Anchors installed in grouted masonry shall have a report issued in accordance with AC 106.

c. Design and installation provisions shall be based on current ICC-ES ESR report and ACI 318 Appendix D.

D. Hardware

1. Nuts for anchor bolts and unfinished bolts shall conform to the requirements of ASTM A563.

2. Nuts for high-strength bolts shall conform to the provisions of ASTM A194 or ASTM A563.

3. Washers shall conform to the provisions of ASTM F436.

E. Filler Metal for Welding

1. Welding electrode shall conform to E70XX classi- fication of AWS A5.1, except as described below.

2. Welding electrode shall be compatible with existing steel where connections are made to steel of existing building. Electrode shall be E7018 unless determined otherwise. E7018 are low hydrogen electrodes that must be kept extremely dry.

F. Structural Steel Primer Paint

Provide type of primer indicated on steel under the following application conditions.

1. General application: Acrylic rust-inhibitive type containing no lead equal to Tnemec 115 Unibond. Paint must meet SCAQMD standards for VOC emissions.

2. Cavity wall (including steel within the exterior block back-up or not separated from the cavity by a full block), exterior application, and as a primer after zinc metallizing: Epoxy paint equal to Tnemec Co. Series FC27 Typoxy or Carboline Carboguard 888.

3. Touch-up primer for cavity wall and exterior application: High adhesion high-solids epoxy coating equal to Tnemec Co. Series 135 Chembuild or Carboline Carboguard.

G. Galvanizing by the Hot-dip Method – No Finish Coating

1. Galvanize structural shapes in accordance with ASTM 123.

2. Galvanize hardware in accordance with ASTM A153.

2. Galvanizing repair paint for regalvanizing welds and damaged areas shall conform to ASTM A780 and comply with Military Specification MIL-P-21035, such as ZRC Cold Galvanizing Compound.

2.3 SHOP ASSEMBLY - FABRICATION

A. General

1. Do not fabricate until shop drawings have been approved.

2. Fabricate and assemble steel in shop to greatest extent possible. Fabricate items and assemblies in accordance with AISC Specifications and the shop drawings.

3. Properly mark members for field assembly. Fabricate items in order to match delivery sequence that will expedite erection.

4. Mill column ends at base plates, cap plates, and splices to a common plane by means of an approved milling machine.

B. Shop Connections

1. Weld or high-strength bolt shop connections as indicated on Drawings.

2. High-strength bolt connections are friction (slip-critical) connections. Install high-strength bolts in accordance with "Specification for Structural Joints using ASTM A325 or A490 Bolts" (RCRBSJ). Utilize Class A connections. If steel surface of connection area is prepared to SSPC-SP5 surface preparation, Class B

may be utilized pending inspection by the Authority's Special Inspection lab that surface meets the required preparation. Pay all costs to Ownership incurred for this inspection.

3. Welding: Comply with "Structural Welding Code" for procedures, appearance, and quality of welds and methods used in correcting welded work.

4. Holes for other Work

   a. Provide holes and openings required for securing other Work to steel framing and for passage of other Work through framing members. Coordinate with Drawings of other Work.

   b. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other Work.

   c. Cut, drill, or punch holes perpendicular to metal surfaces. Method of cutting must not produce a roughness of over 1000 microinches. Surfaces exceeding these limits must be repaired by machine grinding.

   d. Reinforce all openings with steel shapes as shown on shop drawings.

2.4 SHOP PAINTING

A. General

Apply one shop coat of primer paint on structural steel except as follows:

1. Structural steel that is encased in concrete.

2. Steelwork or portions of such to receive sprayed fireproofing. Steel that is exposed to the cavity and within the block back-up is to be painted, unless indicated to be galvanized.

3. Top flanges of structural steel members requiring stud shear connectors or supporting metal deck.

4. Contact surfaces of structural steel that are to be bolted or welded together.

5. Surfaces of structural steel within 2" of field welds.

6. Contact milled bearing surfaces.

7. Steel members, hardware, and miscellaneous pieces to be galvanized and not specified or indicated to be painted.

B. Cleaning and Surface Preparation

1. Clean all steel first in accordance with SSPC-SP1.

2. Clean steelwork not to be painted (except steel work to be galvanized) in accordance with SSPC-SP2.

3. Clean steelwork to be painted within the same day as it will be applied and in accordance with the following methods, determined by location and exposure:

a. Interior steel not exposed to view: SSPC-SP2.

b. Interior steel exposed to view: SSPC-SP3.

c. Cavity wall and exterior steel exposed to weather: SSPC-SP6.

C. Shop Coat

1. Apply structural steel primer paint (general application) at a rate to provide dry film thickness of 2.0 to 3.5 mils. Apply primer paint (cavity wall and exterior application) at a rate to provide dry film thickness of 4.0 to 6.0 mils. Provide full coverage of joints, corners, edges, and exposed surfaces.

2. Apply to dry surfaces only, when surface temperatures are above dew-point, by brush, spray, or roller, thoroughly and evenly, in strict accord with manufacturer's instructions for every detail of handling.

3. Apply second coat of the approved primer, in a darker shade, to surfaces inaccessible to painting after assembly or erection.

4. Protect machined surfaces with an approved rust-inhibiting coating that is readily removable prior to erection.

D. Concrete Contact Surfaces

Paint steelwork at least two inches into the area in contact with concrete, where applicable.

2.5 GALVANIZING

A. General

Galvanize the following members:

1. All angles supporting exterior masonry or exposed to the weather, including shelf, arch, relieving angles.

2. All connections between the above angles and the supporting structural member, including WT's, hangers, clip angles, hardware, etc.

3. All exterior steel supporting mechanical equipment (dunnage steel) and any other steel members indicated on Drawings.

B. Cleaning and Surface Preparation

1. Hardware (bolts, nuts, etc.): Clean and leave free of mill scale before galvanizing.

2. Clean all steel first in accordance with SSPC-SP1 if needed.

3. Steel members: Clean in accordance with SSPC-SP8 before hot-dip galvanizing.

4. Steel members: Clean in accordance with SSPC-SP10 before zinc metallizing. Surface shall have a 3-4 mil anchor pattern. Moisture cannot be present on steel and temperature cannot be less than 5°F above the dew point. Thermal spray must be applied within 4 hours of blasting.

C. Shop Coat - Hot-dip Galvanizing Only – Provide for galvanized items not to have finish paint coat.

1. Galvanize hardware in accordance with ASTM A153.

2. Galvanize steel shapes in accordance with ASTM A123. Apply zinc coating as per Thickness Grade specified in ASTM A123.

2.6 SOURCE QUALITY CONTROL

A. Testing

1. General

a. Structural steel work is subject to all tests required by the Special Inspection requirements of the 2014 NYC Building Code.

b. Cooperate with the Testing Laboratory in making all required tests.

2. Tests: To be performed by Ownership's Testing Laboratory.

a. Shop bolted connections: Tested in accordance with AISC specifications.

b. Shop welding: The laboratory will perform the following functions:

1) Certify welders.

2) Visually inspect all welds, record type and locations of defects, and perform tests if necessary. Check all corrected work.

3) Perform following non-destructive tests if necessary or as required by the Special Inspector. Tests used shall be at the Special Inspector's option:

a) Liquid Penetrant Inspection: ASTM E165.

b) Magnetic Particle Inspection: ASTM E709. Perform on roof pass and on finished weld.

c) Radiographic Inspection: ASTM E94 or E149. Minimum quality level 2-2T.

d) Ultrasonic Inspection: ASTM E164.

3. Welding of Critical Joints

a. All welded joints that are critical to the integrity of the structure, and require non-destructive testing to assure the adequacy of the critical weld, are indicated on the Drawings.

b. To insure general weld quality of less critical groove and butt welds, a quality control program may be required to check the welds by non-destructive testing. The Drawings specify whether non-destructive testing is required and, if necessary, the method of inspection.

c. Requirements of critical welds and non-destructive testing shall be in conformance with NYC BSA Rules for Arc and Gas Welding, Rules 16.5 through 16.5.3, and Rule 17.

B. Inspection

1. Testing Laboratory

a. Ownership will engage a Testing Laboratory or Special Inspection Agency to assist in the inspection of steel fabrication and conduct tests at the mill, shop, or foundry. The laboratory will assist in checking erection tolerances and provide shop and field testing required for all structural steel work, including metal deck and studs.

b. The Testing Laboratory will be responsible to and under the supervision of a Special Inspector.

2. Special Inspector

   a. Ownership will assign, under the requirements of Section BC 1704.3, a Special Inspector to supervise the Work listed above under "Testing Laboratory".

3. Notification: Notify Ownership before beginning fabrication of the structural steel and supply laboratory with copies of agreements, approved drawings, approved prints of all shop details, etc., and all necessary information relating thereto. Do not ship material to job site until after inspection and approval by the Testing Laboratory.

4. Discretionary Inspections: No mill, shop, foundry, or field inspection, such as is above provided for, shall be held to prohibit or preclude inspection of such materials during delivery and erection at the building by such other persons as Ownership shall direct.

5. Reports: Shop and field reports, including shipments, will be submitted by the Testing Laboratory to Ownership as the work proceeds at the shop or job site. A final report will be submitted by the Testing Laboratory when work is completed at the shop, and again when work is completed in the field. The Special Inspector reserves right to reject material not in compliance with specified requirements at any time.

6. Corrections: Correct deficiencies in work which inspections and tests have indicated to not be in compliance with requirements. Pay for additional tests, at own expense, necessary to reconfirm any non-compliance of original work and as necessary to show compliance of corrected work.

7. Contractor's Responsibility: Inspection and acceptance or failure to inspect shall in no way relieve the Contractor or the mill and shops from their responsibility to furnish satisfactory material strictly in accordance with Drawings and Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and that erection may proceed. Notify Ownership in writing of conditions that adversely affect the Work. Do not proceed with erection until conditions have been corrected. Beginning of installation means the erector accepts existing conditions.

3.2 ERECTION

A. General

1. Erection shall conform to Sections BC 2205.6.3 and BC 3305.2.

2. All work shall be erected plumb, square, and true to lines and levels in strict accordance with the structural requirements of the building.

3. Provide all machinery, apparatus, and staging required for the erection of steelwork in a thoroughly safe and efficient manner. Install, maintain and remove, without injury to other Work, such temporary bracing, scaffolding, etc. as may be necessary or required. Care shall be taken that no part of the structure is overloaded during construction.

4. Arrange for deliveries of material to facilitate the rapid and continuous progress of operation, but the site or streets adjacent to same shall not be used for the storage of material unless absolutely necessary and then only with special permission of Ownership and other authorities having jurisdiction.

5. Employ a Licensed Professional Engineer to ensure accurate erection of the steel.

6. Do not alter or cut structural members without written approval of the Engineer of Record.

B. Temporary Shoring and Bracing

1. Provide temporary shoring and bracing members with connections of sufficient strength to bear erection loads and guy wires to maintain structure plumb and in true alignment until completion of erection. Remove temporary work when permanent members and bracing are in place and final connections are made.

C. Anchors Bolts

1. Furnish to the concrete and brick masons anchor bolts and other connectors required for securing structural steel to the foundation and other in-place concrete work, together with instructions, templates, etc. necessary for setting them. Anchor bolts are to be surveyed and any approved modifications made prior to placement of columns.

2. Tighten anchor bolts after support members have been positioned and plumbed. Cut off protruding edges of wedges or shims flush with edge of base or bearing plate prior to packing with grout.

D. Base and Bearing Plates

1. Clean concrete and masonry bearing surfaces of loose and bond-reducing materials.

2. Set loose and attached base plates and bearing plates for structural members on shims and other adjusting devices, such as leveling plates, within specified tolerances. Elevations of shims and leveling plates shall be surveyed and adjusted to the correct elevation prior to placement of column or beam. Plates are to have grout holes.

3. Grouting under plates is part of the Work of Section 03610. Grouting is to be done prior to placement of any concrete on the structure.

E. Field Assembly

1. Erect structural frames accurately to lines and elevations indicated. Align and adjust members forming a part of a complete frame or structure before permanently fastening.

2. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly.

3. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

4. Level and plumb individual members of the structure within specified tolerances. Do not tighten structure until surveys verify that structure is within allowable tolerances.

5. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

6. Splice members only where indicated and accepted on shop drawings.

F. Connections

1. Field connections shall be welded or bolted, except where welding is specifically called for on the Drawing.

a. Provide high-strength bolts for bolted connections except where unfinished bolts are indicated on the Drawings. High-strength bolt connections are friction (slip-critical) connections. Install high-strength bolts in accordance with "Specification for Structural Joints using ASTM A325 or A490 Bolts."

b. Provide unfinished bolts where indicated on Drawings. Lock nuts by upsetting bolt end or by similar method when unfinished bolts are not encased in concrete. Tighten all bolts and nuts fully.

c. For ASTM A307 bolts, hardened washer shall be installed under the turned element. For ASTM A325, F1852, A490 and F2280 bolts, hardened washer shall be installed under the head and nut. This washer is not required under the head for oversized or short-slotted holes for bolts conforming to F1852 bolts (from 1/2" to 1½” in diameter) and for bolts conforming to F2280 bolts when the bolt diameter is < 1”.

d. Expansion/screw/adhesive anchors shall be installed in accordance with the manufacturer's installation instructions. Holes shall be cleaned completely using wire brush and compressed air following manufacturer's guidelines. Tighten to the torque values specified by the manufacturer. For installation in existing substrates not installed as part of the Work, have bolt manufacturer perform pullout test in each substrate to verify capacity and quality of substrate prior to final approval of anchor to be utilized.

2. Holes

a. The size of boltholes shall be in accordance with AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings."

b. Ream holes that must be enlarged to admit bolts. Burning or use of drift pins is not permitted.

G. Erection Holes

Fill erection bolt holes on exposed to view members with plug welds and grind smooth.

I. Field Touch-Up

1. Painted Members: After erection, clean all damaged areas in shop coat, exposed surfaces of bolts, bolt heads, nuts and washers, abrasions, and all field welds and unpainted areas adjacent to field welds to the same standards as the shop coat and paint with primer paint to same thickness as the shop coat. Finish painting is specified in Section 099000.

2. Galvanized Members: After erection, clean and paint all damaged areas to the galvanizing, welds, and areas adjacent to welds with the galvanizing repair paint. For galvanized members to be painted, finish painting is specified in Section 099000 and shall be the final two coats of the epoxy paint system.

3.3 TOLERANCES

A. Erection tolerances shall be in accordance with "Code of Standard Practice for Steel Buildings and Bridges", except as indicated in B below.

B. The following overall maximum deviations (tolerances) from theoretical are permitted:

a. Column location @ base plate: 1/2"

b. Base Plate, bearing plate and column splice elevation: +1/8"

c. Column Plumbness: in or out 3/4" in column length, 1¼" for total building height

d. Beam or girder elevation: +1/2”

e. Beam camber: 1/8”

3.4 FIELD QUALITY CONTROL

A. The Contractor shall cooperate with the Special Inspector and the Testing Laboratory performing Special Inspection testing by providing adequate notification for when work is performed that will require the inspection and provide all required access and means for the laboratory to perform the inspection and testing.

B. As per Section BC 1704.3, the Special Inspector will inspect erection of the structural framework and test field bolting and welding as listed in Part 2 of this Section. Where post-installed anchors are utilized, the Special Inspector will perform Special Inspection on post-installed anchors as per Section BC 1704.32. Adhesive anchors installed in concrete in a horizontal or upwardly inclined position supporting sustained tension loads shall be installed under continuous Special Inspection as required by paragraph D9.2.4 of ACI 318-11.

C. The Contractor shall engage an engineer licensed in the state of New York to check tolerances and inspect the erection.

END OF SECTION 05 12 10

LIST OF SUBMITTALS

SUBMITTAL	DATE SUBMITTED	DATE APPROVED
Product Data:		_____
1. Primer paint, repair paint		
2. Stud shear connectors		
3. Expansion/adhesive anchors		
4. Zinc metallizing		
Shop Drawings:		_____
1. Job standards		
2. Erection drawings		
3. Steel shop drawings		
4. Calculations		
5. DVD/CD rom of final approved drawings		
Certificates:		_____
1. Bolt test reports		
2. Welders qualifications & license		
3. Material listing		
4. ICC Certification for Mechanical/Adhesive Anchors		
Qualifications		_____
1. Fabricator		
2. Erector		
3. Detailer/Engineer		
4. Adhesive anchor installer		
5. Zinc Metallizer/galvanizer-coater		
Surveys:		_____

1. Anchor bolt and base plate
2. Column splice elevation
3. Column plumbness
4. Bottom of beams before concrete placement
5. Bottom of beams after concrete placement

Test Reports: _____ _____

Zinc metallizing and epoxy coating

Sustainability: _____

1. Mfr's printed literature or statement on
   a. Recycled material content
   b. Regionally extracted and manufactured material content
2. Contractor's Sustainable Materials Form

* * *

SECTION 07 25 00

SPRAYED-ON FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Patch existing fireproofing

1.2 DESCRIPTION OF THE WORK.

A. Repair to existing structural member fireproofing disturbed by the work or addition of fireproofing missing, uncovered as a field condition.

1.3 SUBMITTALS

A. Evidence of Acceptable Testing: Submit for each fire-resistance rated assembly to be constructed. Listing of the assembly to be used in the current edition of the Underwriters Laboratories Inc. "Fire Resistance Directory" will be considered evidence of acceptable testing. In lieu of such a directory listing, official printed notification from Underwriters Laboratories Inc., stating that the assembly in question has been tested and approved, will also be considered evidence of acceptable testing.

B. Product Data: Submit complete product and system description, including installation instructions and limitations on use.

C. Certificate of Acceptability of Substrates: Submit fireproofing manufacturer's certification that substrates to receive fireproofing are acceptable to fireproofing manufacturer. Where fireproofing manufacturer recommends use of a bonding agent to ensure adequate bond for fireproofing, follow manufacturer's instructions.

D. Materials Certificate: Submit fireproofing manufacturer's certification that products to be supplied conform to requirements of the contract documents and are recommended by the manufacturer for application indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in dry, protected area in manufacturer's original shipping containers bearing labels which include UL fire resistance ratings, manufacturer's name, product name, date of manufacture, and shelf life instructions where required.

B. Do not use products beyond manufacturer's indicated shelf life.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. Minimum ambient and substrate temperatures for 24 hours immediately preceding, during, and for 24 hours after fireproofing installation: 40 degrees F.

2. Provide adequate air circulation to ensure proper curing of fireproofing materials.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work of this section with other work as required to ensure that installed materials are not damaged during construction period and that fire resistance ratings are not compromised by work of other trades.

B. Schedule fireproofing installation sufficiently in advance of other work to permit field quality control testing and any required corrective procedures to be completed before construction which might interfere with these operations is started.

1.8 GUARANTEE

A. Submit a guarantee, executed by the Contractor and co-signed by the installer, agreeing to repair/ replace fireproofing work performed under this Contract which has cracked, flaked, dusted excessively, peeled, or has fallen from the substrate due to defective workmanship for a period of two (2) years from the date of acceptance of the building.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For all of each distinct fireproofing product indicated, provide materials produced by one manufacturer, factory-mixed, suitable for sprayed application, and requiring addition at the site of no other materials other than water.

B. Fireproofing: Provide products as specified for the UL (Underwriters Laboratories Inc.) designs indicated, or provide acceptable substitutes listed by UL, having equivalent fire resistance ratings, and approved by the Architect and by authorities having jurisdiction.

C. Prohibited Products:

1. Mineral fiber fireproofing, i.e, spray fireproofing assemblies classified in the "800 Series" in the UL Fire Resistance Directory, will not be considered for substitution.

2.2 ACCESSORIES

A. Provide products which strictly comply with UL requirements for fire resistance rated designs indicated, including the following items where required:

1. Bonding agent/substrate primer.

2. Topcoat/sealer: Provide where needed to comply with performance requirements indicated or where recommended by fireproofing manufacturer for application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrates are in satisfactory condition to receive fireproofing.

B. Verify that items required to penetrate fireproofing are in place and properly fastened.

C. Perform fireproofing manufacturer's recommended test procedures wherever substances which might affect adhesion of fireproofing are suspected on substrates.

D. Notify the Architect in writing of any substrate conditions requiring correction by other than normal cleaning methods, prior to installation of fireproofing.

E. Do not begin work until unsatisfactory conditions have been corrected; commencement of fireproofing installation indicates acceptance of conditions.

3.2 PREPARATION

A. Provide drop cloths, masking, or other suitable coverings for materials not to receive fireproofing.

B. Take necessary precautions to protect workmen, the public, and the environment during installation.

C. Prepare substrates as required to result in permanent bonding of fireproofing material. Strictly follow fireproofing manufacturer's instructions for cleaning and preparation of substrates.

D. Primed Steel: Where required by fireproofing manufacturer for proper bond, apply fireproofing manufacturer's recommended bonding agent/substrate primer.

3.3 INSTALLATION

A. Install in strict accordance with UL (Underwriters Laboratories Inc.) "Fire Resistance Directory" instructions for designs indicated and with fireproofing manufacturer's instructions.

B. Install fireproofing in a manner which will maximize adhesion between fireproofing and substrate and continuity of fire-resistive protection; use a single course of fireproofing unless otherwise recommended by fireproofing manufacturer.

C. Spray material on substrate wherever conditions permit.

3.4 PATCH EXISTING FIREPROOFING

A. Patch existing fireproofing material where existing fireproofing has been damaged due to demolition or construction operations.

3.5 FIELD QUALITY CONTROL

A. Measure thickness and density in accordance with ASTM E 605 procedures for rating required.

3.6 CLEANING

A. Completely remove fireproofing from surfaces not designated to receive fireproofing while material is still wet and before it has begun to set.

3.7 PROTECTION

A. Follow instructions of fireproofing manufacturer to prevent damage to fireproofing.

END OF SECTION 07 25 00

SECTION 07 84 00

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.

1.03 REFERENCES

A. (New York City Building Code)

B. National Fire Protection Association (NFPA)

1. NFPA 101 (Life Safety Code)

C. 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

D. 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.

E. 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)

F. Omega Point Laboratories (OPL)

1. Building Products, Materials & Assemblies – Volume II

G. 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. 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. In high-rise buildings or in buildings assigned to Risk Category III or IV, Special inspection for through-penetrations, membrane penetration firestops, fire-resistant joint systems and perimeter fire barrier systems shall be conducted by an approved agency.

M. 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.						

END OF SECTION 07 84 00

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes surface preparation and field painting of the following:

1. Exposed exterior items and surfaces.

2. Exposed interior items and surfaces.

3. Surface preparation, priming and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface as directed by the Architect. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels as described in Article 2.05A.

1.2 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

1. Federal Specifications (FS)

2. American Society of Testing and Materials (ASTM)

3. N.Y.S. Department of Environmental Conservation

4. U.S. Department of Labor

5. Occupational Safety and Health Administration (OSHA)

6. Steel Structures Painting Council (SSPC)

1.3 DEFINITIONS

A. The term "Painting" as used in this Section, means the application of all coatings such as paint, primer, enamel, varnish, shellac, oil, etc. as listed in the Painting Schedules.

B. The term "Painting" also includes preparation of surfaces for such applications, and the clean-up as hereinafter specified.

E. Finishes:

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.

2. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.

3. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.

4. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

F. Concealed: The term “concealed” refers to surfaces, piping, ducts or conduit which cannot be accessed without moving a building element such as within a chase, wall or ceiling.

1. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Furred areas.

b. Ceiling plenums.

c. Duct shafts.

d. Elevator shafts.

H. The term “exposed” refers to any item which is not concealed.

1. The term “exposed to public view” means situated so that it can be seen from eye level from a public location. A public location is that which is accessible to persons not responsible for operation or maintenance of the building.

1.4 SUBMITTALS

A. Product Data

Provide manufacturers' product literature for all materials specified and material manufacturer's printed directions and recommendations for environmental conditions,

surface preparation, priming, mixing, reduction, spreading rate, application, storage and VOC content, as applicable for each of the materials specified.

B. Samples

1. Initial Selection

a. Submit manufacturer's color charts for each type of finish for approval by the Project Architect. Verify colors specified with manufacturers' color charts for availability and notify the Project Architect if any discrepancies should occur.

2. Verification prior to installation

a. Contractor shall furnish color chips for surfaces to be painted.

b. Submit two samples of each color and finish selected on 12" x 12" hardboard.

c. Two samples of finish on concrete masonry and metal surfaces where applicable.

3. All samples of cabinetry and/or other woodwork shall be labeled; and include the following information:

a. Manufacturer's name

b. Type of paint/stain/hardener

c. Manufacturer's stock number

d. Color: name and number

e. Federal Specification number, as specified

f. Federal regulations for amount of lead in paint.

g. VOC content

C. Quality Assurance

1. Certification that materials for each system are obtained from a single manufacturer.

2. Certification that Work shall be performed by personnel with a minimum of three years experience who meet the qualifications set forth in OSHA, 29 CFR 1926.62 (Lead In Construction Standard).

3. Certification that material meets or exceeds the performance requirements of Federal Specifications.

4. Certification that materials comply with N.Y.C. and N.Y.S. regulations for Volatile Organic Compounds.

D. Guarantee

Provide Guarantee per Article 1.08.

E. Low Emitting Materials Compliance Submittals:

1. Provide documentation for each coating to be used on the building interior indicating that the coatings comply with low V.O.C. requirements.

1.5 QUALITY ASSURANCE

A. General

1. All painting materials shall arrive at the job ready-mixed.

2. Varnish containers shall not exceed 5-gallon capacity.

3. Remove all rejected materials from the premises immediately.

4. All thinning and tinting materials shall be as recommended by the manufacturer (Wood frames and stains). Generally, all paints shall not require additional thinning.

5. Verify that the specified shop prime paint for each applicable item in this Project is compatible with the total coating system, prior to application.

6. Materials selected for each system type shall be products of a single manufacturer.

B. Qualifications

1. Work of this Section shall be performed by personnel with a minimum of three years experience in performing this type of Work.

2. The Contractor shall ensure that all employees meet the qualifications set forth in OSHA, 29 CFR 1926.62 (Lead In Construction Standard).

C. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

D. Regulatory Requirements

1. N.Y.C. Building Code, latest edition

2. N.Y.S. Department of Environmental Conservation -Part 205 on "Architectural Surface Coatings" - for (VOC) Volatile Organic Compounds.

3. Steel Structures Painting Council (SSPC).

4. U.S. Department of Labor, Occupational Safety and Health Administration, Construction Industry Standards (29 CFR 1926/1910) Revised 10/1/79, Washington, D.C.

5. Occupational Safety and Health Administration (OSHA) 29 CFR 1926.62 (Lead In Construction Standard).

6. New York State Department of Environmental Conservation regulations, 6 NYCRR part 364.

7. New York City Department of Environmental Protection Waste water disposal permitting requirements.

E. Certifications

Federal Specifications: When materials are specified to comply with Federal Specifications, products will be accepted which meet or exceed the performance requirements of such Federal Specifications and comply with all regulations currently in effect.

1. Indicate that material complies with Federal Specifications by including the Federal Specifications number on the container label or on the product literature, or submit a statement with the Product Data stating that material meets or exceeds the performance requirements of the Federal Specifications.

F. Field Samples

1. Provide samples of each color and finish, under natural lighting conditions, in a location where each finish is to be applied.

2. Authority will request review of first completed room, space or item of each color scheme required by the Project Architect for color, texture and workmanship.

3. First acceptable room, space or item will be used as project standard for each color scheme, or finish.

4. Primer coat is to be inspected and approved in all locations before any subsequent finish coats are applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery

Deliver materials to the site in original, unopened containers bearing manufacturers name and label containing the following information:

1. Product name or title of material

2. Manufacturer's stock number, batch number, VOC content in grams per liter and date of manufacture.

3. Manufacturer's name

4. Federal Specification number, if applicable.

5. Federal regulations for amount of lead in paint (less the 0.06% lead in non-volatile ingredients)

6. Contents by volume for major pigment and vehicle constitutions

7. Thinning instructions

8. Application instructions

9. Color name and number

B. Storage

1. Owner/Architect's representative will designate space on premises with the coordination of the Contractor for storage of materials. Contractor shall restrict storage in this area to paint materials and related equipment, and provide the following:

a. Provide one (1) approved chemical dry fire extinguisher equal to 20 lb. CO_2 rating in all assigned rooms or locations where painting materials are stored. Fire extinguisher shall bear the label of the National Board of Fire Underwriters and tag of most recent inspection.

b. Provide three (3) standard size red fire pails with clean sand in above locations. At the completion of project, fire extinguishers and pails shall become property of Contractor.

2. Maintain storage area in clean condition, store materials not in use in tightly covered containers. Remove oily rags, waste and empty containers from site each night.

3. Provide Owner/Architect's Representative with one key for each space if spaces are to be kept locked when not in use.

4. Protect all materials from freezing.

1.7 PROJECT CONDITIONS

A. Environmental Requirements

1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.

2. Do not apply finish in areas where dust is being generated or will be generated while the material is drying.

3. Provide paint and coating products to comply with applicable environmental regulations, VOC requirements and local authorities.

4. In all areas, spaces and rooms being painted, the Contractor shall ensure that there is adequate ventilation to ensure proper paint drying, along with minimizing paint odors.

5. The Contractor shall ensure that all requirements of OSHA 29 CFR 1926.62 (Lead in Construction Standard) are adhered to during the project. In addition, the Contractor shall ensure that proper work area protection and clean-up procedures (as described in this Section) are strictly adhered to during all phases on the project.

1.8 GUARANTEES

A. Adherence of workmanship and materials to Specifications requirements shall be maintained for the one-year Contract guarantee period. These requirements shall include the following:

1. There shall be no evidence of blistering, peeling, crazing, alligatoring, streaking, staining, or chalking.

2. Dirt shall be removed without blemishing the finish by washing with mild soap and water.

3. Colors of surfaces shall remain free from serious fading; the variation, if any, shall be uniform.

B. Correct all defects, appearing within the guarantee period, by removal of the defective work and replacement as directed.

C. All corrective measures shall be the Contractor's responsibility, and shall be made at no extra cost to the Owner. The requirements set forth in Part 3 of these Specifications shall be strictly adhered to.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with specified requirements, provide "First Line" or "Top Quality" products of one of the following manufacturers:

1. Benjamin Moore and Co.

2. PPG Industries, Pittsburgh Paints Inc.

3. Pratt and Lambert

4. The Sherwin-Williams Co.

2.2 MATERIALS

A. Provide products which meet all N.Y.S. Part 205-VOC requirements for applications outlined herein and comply with low V.O.C. requirements.

B. Provide products which meet all Federal regulations for amount of lead in paint (less than 0.06% lead in non-volatile ingredients).

C. Provide best quality grade of various types of coatings as regularly manufactured by the paint materials manufacturers. Materials not displaying manufacturers' identification as a standard, best-grade product will not be acceptable.

D. Use only thinners approved by paint manufacturers for applications intended and use only within recommended limits.

2.3 REFERENCE STANDARDS

A. Paint materials shall meet or exceed the requirements of the following standards:

Federal Specifications

1. Primers, Sealers, Undercoats

a. Metal Primer for Galvanized surfaces: FS TT-P-001984 FS TT-P-650-C

b. Metal Primer Aluminum or Steel surfaces: FS TT-P-57B

c. Primer Sealer, Latex Base: FS TT-P-650C

d. Alkyd Primer (Corrosion Inhibiting) Lead and Chromate Free, VOC Complying: FS TT-P664C

e. Acrylic Primer TT-P-650-C

2. Finish Paints

a. Exterior Alkyd Modified Paint; Gloss: FS TT-P-102E, Type II and Type III

b. Ext. Acrylic Latex Paint; Flat: FS TT-P-19

c. Gloss Acrylic Latex Enamel: FS TT-P-1511-B

d. Flat Vinyl Acrylic Latex Interior: TT-P-29J

e. Semi-Gloss Vinyl Acrylic Latex Enamel, Interior: TT-P-1511-B

f. Alkyd Odorless Semi-Gloss Enamel: FS TT-E-509C for white and tints; Class A for deep colors. FS TT-E-529

g. Aluminum Paint (where applicable) (Ready Mixed): FS TT-P-38D.

h. Heat Resistant Semi-Gloss Enamel (400°F max. surface temperature): FS TT-E-496

i. Smokestack Black Paint: FS TT-E-496

4. Floor Finishing Systems (applications where applicable)

a. Rubber Base Paint: For use over concrete and masonry FS TT-P-91

b. Cement Floor Hardener - Magnesium Zinc and Fluosilicate type as specified in Section 03300 of this Specification.

c. Urethane Floor Paint: FS TT-C-542, Type II

d. Polyamide Epoxy Paint FS TT-C535B Type II

5. Lettering Enamel: Interior/Exterior full gloss enamel: FS TT-E-489

6. Fire Retardant Paint: Latex Fire Retardant Paint: FS TT-P-26P Rated Class A by Underwriters Laboratories.

7. Miscellaneous Materials: (where applicable where wood finishes are used on site)

a. Mineral Spirits (Petroleum Paint Thinner): FS TT-T-291

b. Color Pigments: Pure, non-fading, finely ground pigments, at least 99 percent passing a 325 mesh sieve. Color pigments that are to be used on masonry, concrete and plaster shall be lime proof - FS-TT-P-381.

c. Putty: Linseed-Oil type for Wood Sash Glazing -FS-TT-P-791B.

d. Shellac: Two pound cut shellac, FS TT-S-300

e. Paste Wood Filler: FS TT-F-336

f. Plastic Wood Filler: FS TT-F-340C.

c. Surface Sealer: Pigmented Oil for Plaster & Wallboard - FS-TT-S-179.

d. Linseed Oil: (Boiled) FS A-A-371A

e. Linseed Oil: aw) FS A-A-379A

f. Lacquer (Brushing) Clear and Pigmented: FS-TT-L-26C.

g. Lacquer, Rubbing, Clear: FS-TT-L-57C

h. Lacquer, Spraying Clear and Pigmented for Interior and Exterior Use: FS-TT-L-58E.

B. Miscellaneous Standards and Requirements

1. Turpentine: ASTM D13.

2. Cold Galvanizing Compound: Single component material conforming to ASTM A780 giving 96% pure zinc in the dried film.

3. Cleaning Solvents: Low toxicity; flash point in excess of 100°F.

4. Spackling Compound: ASTM C475.

5. Polyester Filler: Polyester resin base autobody filler standard weight or finishing grade required by conditions; Marson's "White Lightning" and "Topcoat."

2.4 COLORS

A. Selection

1. Paint colors, surface treatments and finishes will be selected by the Project Architect.

2. Color Schedule will be issued to the Contractor by the Architect’s representative.

a. Final acceptance of colors will be from actual job applications.

B. Maximum Number of Colors and Tints

1. Number of colors selected by the Project Architect will not exceed those listed in Schedule below.

2.5 INTERIOR PAINT SYSTEMS

F. Ferrous Metal (where applicable)

1. Flat Finish: jamb and head sections, coat and hat rack, metal shelves.

*1st Coat - Alkyd Modified Acrylic Rust Preventive
Latex Primer -- 1.6 Mils DFT

2nd & 3rd Coats
Flat Acrylic Latex -- 1.3 Mils DFT
each coat

2. Flat Finish (only as approved at shop drawing submittal review by the Owner/Architect's representative): Convector enclosures, grilles, access doors, frames, Steel Doors and Frames, Trim, Partitions (where applicable and approved by the Owner/Architect's representative)

*1st Coat - Alkyd Modified Acrylic Rust Preventive
Latex Primer -- 1.6 Mils DFT

2nd & 3rd Coats -
Semi-Gloss Vinyl Acrylic Latex
Flat -- 1.3 Mils DFT
each coat

3. Flat Finish:

*1st Coat - Alkyd Modified Acrylic Rust Preventive
Latex Primer -- 1.6 Mils DFT

2nd & 3rd Coats -
Flat Acrylic Latex Enamel -- 1.2 Mils DFT
each coat

* Provide full prime coat on new surfaces. Items shop primed with modified alkyd equal to Tnemec 10-99 primer shall be touched up with same primer. See related specification sections.

G. Zinc-Coated Metal

1. Flat Finish:

1st Coat (New) - Alkyd Modified Vinyl Acrylic
Latex Primer -- 1.2 Mils DFT

*1st Coat (Repaint) - Alkyd Modified Acrylic Rust
Preventive Latex Primer
-- 1.6 Mils DFT

2nd & 3rd Coats
Flat Vinyl Acrylic Latex -- 1.3 Mils DFT

each coat

2. Flat Finish: (only as approved at shop drawing submittal review by the Owner/Architect's representative) Railings, wire-mesh work.

1st Coat (New) - Alkyd Modified Vinyl Acrylic Latex Primer -- 1.2 Mils DFT

*1st Coat (Repaint) - Alkyd Modified Acrylic Rust Preventive Latex Primer -- 1.6 Mils DFT

2nd & 3rd Coats
Flat Vinyl Acrylic Latex
Enamel -- 1.3 Mils DFT each coat

* Spot prime as needed.

2.6 EXTERIOR PAINT SYSTEMS

A. New Ferrous Metal
Structural steel, all ferrous metals, and steel window trim.

1st Coat – Touch up with epoxy Polyamide Paint
2nd Coat - Polyamide Epoxy Paint
applied at the rate of -- 4.0 to 6.0 Mils DFT.
SSPC-PS Guide 13.01

3rd Coat (Top Coat) - Acrylic Aliphatic Polyurethane applied at rate of -- 1.5 to 2.0 Mils DFT.
SSPC-PS Guide 17.00 Type 5.

B. Zinc Coated Metal Exposed to Public View

Provide for all galvanized surfaces (Zinc metallizing) exposed to public view (not just on the exposed face), except chain link fences:

1st Coat - Epoxy polyamide -- 4.0 Mils DFT

2nd Coat - Exterior Aliphatic polyurethane semi-gloss enamel -- 4.0 Mils DFT

C. Existing steel members embedded in masonry or concrete.

1st Coat - Epoxy polyamide equal to Tnemec Series 135 Chembuild (capable of painting on an SSPC-SP3 surface prep. -- 7 to 9 Mils DFT

D. Existing steel members exposed to view or the elements.

Provide the epoxy coat system, except the first coat shall be an Epoxy polyamide equal to Tnemec Series 135 Chembuild (capable of painting on an SSPC-SP3 surface prep.

E. Epoxy Coat System

1st Coat (Primer) - Epoxy organic zinc rich Primer with 85% zinc applied at rate of -- 2.0 to 4.0 Mils DFT. SSPC - PS Guide 12.00 (Organic Zinc Rich).

2nd Coat - Polyamide Epoxy Paint applied at the rate of -- 4.0 to 6.0 Mils DFT. SSPC-PS Guide 13.01

3rd Coat (Top Coat) - Acrylic Aliphatic Polyurethane applied at rate of -- 1.5 to 2.0 Mils DFT. SSPC-PS Guide 17.00 Type 5.

For factory painted items, Manufacturer/Fabricator shall provide touch-up paint in sufficient amount for Project. -- 5.0 Mils DFT

G. Aluminum – Mill Finished

1st Coat - Aluminum metal primer -- 3.0 Mils DFT

2nd and 3rd Coats - Enamel gloss paint -- 2.0 Mils DFT/each Coat

sufficient amount for Project.

2.7 LETTERING (Inscriptions where applicable)

A. Use "Normal Block" letters on all inscriptions.

B. Inscriptions shall have letter heights as indicated below.

1. Gas Valve: On doors to gas control valve enclosures. (2"high)

2. (only as approved by the Owner/Architect's representative and as necessary in the NYC Building Code) - On stair enclosures, doors across corridors and doors between stairs and passages, there shall be painted on the lock stile on the side opposite the pull (both sides of double acting doors), and at the same height as the pull, a black panel full width of stile and 18" high on paneled doors and 5" wide on flush doors. The painting at top and bottom edge of plate shall be extended as is necessary in order to surround the hardware which otherwise will be partly in and partly out of painted area. These painted push plates shall terminate in straight edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions

l. The application of painter's finish to any surface shall be taken to indicate that the Contractor considers such surfaces suitable for a first-class finish.

2. Do not apply painter's finish in any locations until the Work of other Contractors that might damage the new finish is completed.

3. Notify the Owner/Architect's representative in writing regarding Work by others that does not provide a suitable surface for the new finish.

4. In case of dispute regarding the suitability of any surface, the Owner/Architect's representative's decision shall be final and conclusive upon all concerned.

5. Contractor shall check the compatibility of previously painted surface with the new coating by applying a test panel 4 foot wide x wall height. Allow test panel to dry thoroughly; verify proper adhesion before proceeding with painting Work.

3.2 PREPARATION AND APPLICATION - EXISTING BUILDING

A. Protection (where applicable)

1. In cases where the painting of surfaces does not involve the removal or disturbance of existing paint or the paint is not lead-based as determined by testing by the Owner/Architect's representative, the following protection requirements shall apply:

a. In each area to be painted, cover and protect furniture, equipment and floors from damage with clean cloths, heavy building paper or clean plastic covering secured in place. All protection is to be carefully removed, cleaned or discarded after painting is complete.

B. Surface Preparation

1. Gently wet mist the surface to be scraped with water, then remove all loose paint with scraper and putty knife.

2. Sand surfaces to dull sheen and gloss (where applicable). Before sanding, wet mist the area to be sanded. (Power sanding without a HEPA-filtered vacuum recovery system is not allowed).

3. Remove dust by washing with water, using damp sponge or cloth.

4. After washing, spot prime grease and water stains; magic markers marks, crayon marks, lipstick marks, etc; with a quick-drying alcohol base primer sealer to prevent bleeding.

5. Fill all cracks and holes with appropriate filler material, wet mist and sand flush with adjacent surfaces and spot prime. (Power sanding without a HEPA-filtered vacuum recovery system is not allowed).

6. Apply number of finish coats specified herein or as many as may be necessary to obtain the proper finish and completely cover the substrate.

3.3 PREPARATION

A. Protection

Cover or otherwise protect finished Work of other trades and surfaces not to be painted concurrently or not to be painted.

B. Surface Preparation

1. Perform preparation and cleaning procedures in accordance with the paint manufacturer's instructions and as specified.

a. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to other cleaning procedures. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

2. Ferrous Metals (where applicable)

a. Remove dirt and grease with cleaning solvents that will not affect shop prime coat. Wipe off with clean cloths.

b. Remove rust, mill scale and defective paint down to bare metal, using scraper, sandpaper, or wire brush. Grind if necessary to remove shoulders at edge of sound paint to prevent flaws from photographing finish coats.

3. Galvanized Metal

a. Remove dust and oil with mineral spirits and wipe dry with clean cloth. Repair welded and abraded surfaces with a 2 mil (dry) minimum thick coating of cold galvanizing compound in conformance with ASTM A780; comply with manufacturer's application instructions.

b. Repair steel decks and cold-formed metal framing immediately following installation.

c. For hot-dipped galvanized surfaces, allow 6 months of weathering prior to cleaning specified in a. above. Immediately before painting, roughen surface with course sandpaper. Zinc metallized surfaces do not require sanding.

C. Materials Preparation

1. Mix and prepare painting materials in accordance with the manufacturer's directions.

2. Stir materials before and during application to produce and maintain a mixture of uniform density. Do not stir any film that may form on the surface of materials into the material; remove the film and strain the material before using.

3. Thinning: Use only thinners recommended by the paint manufacturer and use only within the recom-mended or specified limits.

D. Moisture Meter Test

1. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.

2. Reading shall be approximately 8% on meter.

3. Test surfaces with moisture meter at various areas e.g.: Top, bottom and middle of wall, especially where piping occurs and at exterior walls, in the presence of the Architect’s representative.

4. Moisture content shall be approved by the Owner/Architect’s representative before any Work is started.

3.4 APPLICATION

A. General

1. No Work shall be performed where cement or plaster is being applied or is in the process of drying.

2. No Work shall be performed in spaces that are not broom clean and free of dust and waste.

3. Apply paint materials to produce smooth finished surfaces, free of brush or roller marks, drops, runs, or sags.

4. Paint materials shall be kept at a proper and uniform consistency.

5. Thin only when necessary to achieve best results.

6. Thinners shall be material recommended by manufacturer of paint, and in quantity as recommended.

7. Excessive use of thinner as indicated by variation in absorption, lack of "hide", thickness of dry film, mottled or streaky coat, shall be cause for rejection. Correct as directed.

8. Thinning of varnish or aluminum paint prohibited.

9. Apply all coats with brush or roller, varying slightly the color of succeeding coats. Spraying will not be permitted.

    a. If recommended by manufacturer, 100% acrylic resin concrete block filler may be spray applied and shall be backrolled as necessary to work material into substrate surface.

10. Brush out or roll on first or prime coat; work well into surface.

11. Each coat shall be inspected, approved and dry before proceeding with additional coats.

12. (where applicable) Allow at least 48 hrs for enamels and exterior oil paint to dry.

13. The surfaces of interior woods and metals shall be sanded or rubbed between coats to assure smooth finish and proper adhesion of subsequent coats.

14. Avoid lapping of paint on glass, hardware, or other adjoining surfaces.

15. Apply no paint to operating units where sliding contact of metals is necessary for proper functioning of unit.

16. Painting is not required on walls or ceilings in concealed and inaccessible areas.

17. Moving parts of operating units will not require finish painting unless otherwise required.

18. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plate.

19. Finish doors (where applicable not being supplied with manufacturer’s pre finish or veneer) on tops, bottoms and side edges same as exterior faces.

3.5 FIELD QUALITY CONTROL

A. The Owner/Architect Representative reserves the right to require the following material testing procedures at any time, and any number of times during period of field painting:

1. Measurement of dry film thickness (DFT) by use of a dry film thickness gauge in accordance with use and calibration requirements of Structural Steel Painting Council [SSPC], "Method of Measurement of Dry Paint Thickness with Magnetic Gauges".

2. Engage services of an independent testing laboratory, to sample paint being used. Samples of materials delivered to construction site will be taken, identified and sealed, and certified in presence of Contractor

3. Testing laboratory will perform appropriate tests for any or all of the following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.

4. If test results show that material being used does not comply with specified requirements, Contractor shall be directed to stop painting Work, and remove non-complying paint; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

a. If the samples do not comply with requirements of the Specifications, costs of testing and remediation of rejected work shall be borne by Contractor.

b. If the tests find that the samples do comply with the requirements of the Specifications, the cost of the testing will be borne by the Owner.

3.6 CLEANING

A. General

Contractor shall clean-up behind each paint crew such that painting and clean-up will be a continuous uninterrupted operation. The practice of one general clean-up after completion of all painting will be strictly prohibited. This clean-up will include, but not be limited to the following:

1. Remove spots or defacement resulting from Work of this Section.

2. Retouch all damaged surfaces to leave Work in perfect finished condition.

3. If spots or defacement cannot be satisfactorily removed and retouched, re-finish the surfaces as directed.

4. Within the three foot work area created for removal and painting where existing paint is known or assumed to be lead-based all objects and surfaces shall be thoroughly HEPA vacuumed, wet-cleaned and HEPA vacuumed again. In rooms

where the ceiling has been painted all surfaces and objects in the room shall be cleaned in this manner.

5. The contractor shall ensure that the objects and surfaces under protective covering are free of any dust or debris created during painting activities. If necessary, these objects and surfaces shall be wet cleaned and HEPA vacuumed.

6. The contractor shall conduct any cleaning deemed necessary by the independent environmental consultant.

7. Free all operating units of painted materials and leave them clean and in proper working order.

8. Remove from premises all surplus paint materials, debris and any other rubbish resulting from the Work.

9. Leave storage space clean and in condition required for equivalent spaces in project.

3.7 PROTECTION

A. Provide "Wet Paint" signs to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their Work after completion of painting operations.

C. At the completion of Work of other trades, touch-up and restore all damaged or defaced painted surfaces as directed by the Architect’s representative.

END OF SECTION 09 90 00

SECTION 23 05 12

GENERAL PROVISIONS FOR HVAC WORK

PART 1 - GENERAL

1.1 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.

1.2 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. 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.
b. 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.
c. Glycol/Water specialties such as expansion tanks, air vents, air separators, reducing and safety valves, etc.
d. Accessories such as V-belt drives, flow measuring devices, draft gauges, machinery guards, thermostats, pressure gauges.
e. Water treatment for chilled and glycol systems.
f. Inertia blocks and vibration isolation equipment.
g. Piping, fittings, and valves.
h. Pipe, duct and equipment insulation.
i. 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, chillers, pumps, etc. by this Contractor.
j. Painting and pipe, duct and equipment identification for all work by this Contractor is previously specified under "Special Requirements for Mechanical and Electrical Work".
k. Test and balancing.
l. Sleeves, pipe inserts and anchor bolts, escutcheons, prefabricated roof curbs, etc., as hereinafter specified.
m. Identification, name plates, tags and charts.
n. Cutting and rough patching.

o. Furnishing and setting of electric motors.
p. Furnishing of vfd/starters, motor control centers and motor control devices as specified under "Special Requirements for Mechanical and Electrical Work".
q. Templates and anchor bolts for equipment bases.
r. Cap flashing for pipe and duct passing through roof.
s. Energy Management Building Automation System.
t. Concrete pads for all HVAC work.
u. All demolition work associated with HVAC systems.

1.3 WORK INCLUDED UNDER OTHER SECTIONS OF THE SPECIFICATIONS

A. The following work is included under other Sections of the Specifications:
1. Power wiring for all motors except where otherwise noted.
2. All motor disconnect switches, except where in combination starters and where otherwise noted.
3. Dunnage beams for dry-cooler towers.
4. Wiring of switches, aquastats, pressure controls in power circuit of cabinet and unit heaters.
5. Mounting of all starters, motor control centers, starter panelboards, and motor control devices: Division 26.
6. Cooling tower electric pipe tracing: Division 26.
7. Unit heaters/Electric radiant panels: Division 26.

1.4 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.

1.5 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. Heat exchangers.
7. Expansion joints, anchors and guides, including details of installation.
8. Schedule of piping and fitting materials.
9. Piping shop drawings.
10. Schedule of valves, strainers, vacuum breakers.
11. Schedule of steam pressure reducing valves.
12. Flow metering devices and systems.
13. Thermometers and pressure gauges.
14. Automatic stop-check valves.
15. Schedule of pipe and ductwork supports, including inserts, escutcheons, etc.
16. Heating systems, including unit heaters, cabinet heaters, fin tube radiation convectors, etc., as specified.
17. Water pumps including pump curves.
18. All motor starters, motor control devices and motor control centers.
19. Dry cooler including sound criteria.

20. Schedule of insulation types and samples of each type.
21. Vibration isolation schedule including inertia block details.
22. Templates for equipment bases.
23. Energy Management and Building Automation System.
24. Air vents, air separators, water strainers, reducing and safety valves for water systems.
25. Automatic Temperature Control System.
26. Concrete pad locations and sizes.

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

2.1 SPARE PARTS

A. Chilled water, condenser water, glycol pumps - For each pump listed, unless otherwise specified:
1. One set of wearing rings.
2. One set of bearings.
3. One set of packing glands complete with rings, nuts and bolts.
4. Three gaskets for casing joint.
5. Sufficient stuffing box packing for four packings.
Where pump specifications do not require packing glands of stuffing boxes, items #3 & 5 shall be omitted. Inline pumps w/stuffing box design, item #1 & 2 shall be omitted. Inline pumps w/standard mechanical seal spaces listed above except item #4 shall be omitted.

B. Filters:
1. The Contractor shall furnish a minimum of two complete spare filter sets for the filters for all air handling and package AC units. Provide 40 spare filters for fan coil units.

C. Spare Lamps:
1. Furnish ten (10) spare lamps for each size and type of lamp on instrument panels.

D. Miscellaneous Spare Parts:
1. Electrical equipment - two spare starter fuses identified for each type and size for all starters including pumps, supply, return and exhaust fan.
2. For each type and size pump furnished under this section of the contract, furnish as applicable for each type and size of pump, one set of wearing rings, one set of mechanical seals, one set of bearings, one set of shaft sleeves, one set of stuffing box bushings, one set of packing glands with rings, nuts and bolts and sufficient stuffing box packing for four packings.

E. Furnish tools required for equipment as follows:
1. One set of high grade tools as recommended and approved by the respective manufacturer for pumps, fans, refrigeration equipment 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.

2.2 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. Water Pumps
   a. Bell & Gossett
   b. Weinman
   c. Goulds
   d. Paco
   e. Grundfos
   f. Patterson
   g. Armstrong
   h. Taco
   i. or approved equal
2. Water Coils
   a. American Air Filter
   b. Trane
   c. York
   d. Carrier
   e. or approved equal
3. Heat Exchangers
   a. Alpha-Laval
   b. Bell and Gossett
   c. Patterson - Kelley
   d. Yula Corp.
   e. approved equal
4. Cabinet & Unit Heaters
   a. Stelpro
   b. Trane
   c. Modine
   d. Sterling
   e. or approved equal
5. Expansion Tanks & Flash Tanks
   a. Amtrol
   b. Bell & Gossett
   c. Adamson
   d. Buffalo
   e. or approved equal
6. Water Specialties
   a. Bell & Gossett
   b. Taco
   c. Armstrong

d. or approved equal

7. Expansion Joints
   a. Zallea
   b. Flexonics
   c. Flex Hose
   d. or approved equal
8. Flow Measuring Devices
   a. Barco Division; Aeroquip Corp.
   b. Pres O Ind.
   c. or approved equal
9. Thermometers & Pressure Gauges
   a. Ashcroft
   b. Weiss Instruments
   c. or as specified in Section 23 05 80
10. Motors
   a. Toshiba
   b. General Electric
   c. Westinghouse
   d. Allis Chalmers
   e. or approved equal
11. Starters, Motor Control Centers, Switches
   a. Allen Bradley / Rockwell
   b. Square D
   c. General Electric
   d. Westinghouse
   e. Cutler-Hammer
   f. or approved equal
12. Valves
   a. Milwaukee Valve
   b. Crane
   c. Hammond Valve
   d. or as specified under paragraph on "Valves".
13. Insulation and Acoustic Lining
   a. Owens-Corning Fiberglass Corp.
   b. CSG Snap-on
   c. Johns Manville
   d. or approved equal
14. Vibration Isolation
   a. VMC East
   b. Mason Industries
   c. Korfund Corp
   d. or approved equal
15. Automatic Temperature Controls
   a. Distech Controls
16. Water Treatment
   a. Heating Economy Services, Co., Inc.
   b. Astro Pak Corp.
   c. Okite Chemical Corp.
   d. Drew Chemical Corp.
17. Internal Cleaning & Treating of Piping
   a. Heating Economy Services Co., Inc.

b. Tower Water Management
c. The Metro Group, Inc.
d. Drew Chemical Co.
e. Or approved equal

PART 3 - EXECUTION

END OF SECTION 23 05 12

SECTION 23 05 23

VALVES FOR HVAC

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 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.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 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, at all pumps, tanks, reducing 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. Provide valve operating chain on all gate, globe, butterfly and plug valves in Mechanical Equipment Rooms - 4" and larger, which are more than 7'-0" above the operating floor. Unit shall be complete with adjustable sprocket, chain and guide (Crane "Babbit" type). Provide hook to keep chain out of the way.

J. 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.

K. 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).

L. 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.

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 on tanks, receivers, risers and 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.	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	IB444	572 593A		300 lb WSP, Bronze
	2 ½" & Larger	F-718B	351	IR116	F2981M		125 lb, WSP, Bronze Trimmed, Iron Body OS&Y
Angle Valve	2" & Smaller	T375-Y (Teflon) T375-B (Steam) T376-AP (SS Full-Plug)	16 ½	IB454T	582		300 lb. WSP, Bronze

TYPE	SIZE	NIBCO NO.	CRANE NO.	HAMMOND NO	MILWAUKEE NO.	ABZ No.	REMARKS
	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		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	IB946	515	900	150 lb WSP, Bronze
	2 ½" & Larger	F-918-B	373	IR1124HI	F2974M	900	125 lb WSP, Bronze Trimmed, Iron Body
Silent Check	All Sizes	F-910 / w-910 (CI) G-920-W (DI)	-----	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					250 lb, WSP, Iron Body, 125 lb, WSP, Iron Body

2.2 VALVES IN COPPER TUBING
*

A. Except where otherwise noted, all valves for use with copper tubing shall be as follows

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, integral test, point, thrd or swt.

2.3 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.

2.4 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.

2.5 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 250ºF.

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.

2.6 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.

2.7 HIGH PERFORMANCE BUTTERFLY VALVES

A. Butterfly valves shall be used for the gate valves for sizes 2½" and above for chilled water, glycol , and condenser water only.

B. Valves shall be similar to Bray Series 4x High Pressure High Temperature. Butterfly valves shall not be directly connected to equipment without a spool piece. All valves shall be capable of bi-directional dead-end service.

C. Valves in insulated piping shall have necks extending 2" above the flange to accommodate full thickness of insulation.

D. Operators:
1. Valves to 4" shall have lever operators with 10 locking positions and adjustable memory stop.
2. Valves larger than 4" shall be equipped with manual hand wheel gear operators.
3. In Mechanical Equipment Rooms, provide chain wheel operators on all valves located at or above 7'-0" AFF.

E. Bodies: Shall be A216-WCB carbon steel lug style.

F. Stems: Shall be 17-4PH stainless steel for maximum strength and corrosion resistance and must be blow out.

G. Discs: Shall be 316 stainless steel and double offset for tight shutoff, ease of operation and maximum seat life.

H. Seats: Shall be of reinforced PTFE and held in place by bolted on seat retainers to assure bi-directional dead end service. Seats retained by spring clips are not acceptable.

I. Shaft Bushings: Shall be PTFE impregnated 316 stainless steel on either side of the disc.

J. Packing: Shall be underneath drawn design to allow direct mounting of actuators eliminating brackets and couplings. Packing shall be a stack of multiple PTFE rings.

K. Factory Test Pressure: 120% of above working pressures.

L. Dead End Test: 100% of above working pressures.

M. Where high performance butterfly valves are used in piping with mechanical couplings (Victaulic, etc.), provide transition fittings from grooved couplings to flanges.

N. Provide valve stem handle extensions per para. 2.01.

PART 3 - EXECUTION

3.1 INSPECTION

A. The contractor 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.

3.2 INSTALLATION

A. Install valves were 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. Provide chain operators on all isolation valves located in mechanical rooms where valve is more than 7 feet above the operating floor. Provide hook on nearest wall or column to tie back chain.

E. Coordinate with other work as necessary to prevent interference of valves with other components of systems.

3.3 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 23 05 23

SECTION 23 05 48

VIBRATION ISOLATION

PART 1 - GENERAL

1.1 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.

1.2 DESCRIPTION OF WORK

A. The Work includes providing all labor, materials, equipment, accessories, services and tests to complete and make ready for operation by the Owner, all vibration isolations as shown on the Drawings and hereinafter specified.

1.3 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture 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, "Approved Manufacturer's List".

C. Provide equipment whose performance under specified conditions is certified by the manufacturer.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.7 TECHNICAL REQUIREMENTS

A. All mechanical equipment shall be mounted in accordance with the specifications below and for the specific requirements shown in the equipment schedule.

B. The isolation manufacturer shall supply all unit isolators, complete rails, fan and motor bases and structural steel forms for concrete inertia blocks, where called for and shall be responsible for the

selection of all vibration eliminators and shall guarantee to meet the requirements of these Specifications.

C. Wherever rotational speed is mentioned as the disturbing frequency, the lowest such speed in the system shall be used. All isolation devices shall be selected for uniform static deflections according to distribution of weight. Lateral motion of all isolators shall be ¼" maximum during start-up and shut-down.

D. All metal parts and hardware on outdoor isolators shall be constructed of Type 304 stainless steel. Galvanized, zinc-coated and painted steel will be rejected.

E. Isolators shall be equipped with limit stops to resist wind velocity.

F. Submittals shall show disturbing frequency, required efficiency, designed deflection and outside diameter of springs, when pertinent.

G. All horizontal pipe runs within the mechanical equipment room area, but not less than 50 feet from connected equipment shall be isolated from building structure by means of units designed for insertion in rods.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATION

A. Mountings:
1. Type A:
   a. Double deflection neoprene mountings shall have a minimum static deflection of 0.35. All metal surfaces shall be neoprene covered to avoid corrosion and have friction pads both top and bottom, so they need not be bolted to the floor.
   b. Bolt holes shall be provided for those areas where bolting is required. On equipment such as small vent sets and close coupled pumps, steel rails shall be used above the mounts to compensate for the overhang.
   c. Manufacturer/Type:

Mason Industries, Inc.:	ND or Rails RND
Vibration Eliminator Co.:	T44 or D-Rails

2. Type B:
   a. Spring isolators shall be free-standing and laterally stable without any housing and complete with 3" neoprene acoustical friction pads between the base plate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment.
   b. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.
   c. Submittals shall include spring diameters, deflections, compressed spring height and solid spring height.
   d. Manufacturer/Type:

Mason Industries, Inc.:	SLFH, on rails type ICS
Vibration Eliminator Co.	OSK

3. Type C:

a. Equipment with operating weight different from the installed weight such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, shall be mounted on spring mountings as described under Type "B" of this paragraph, but a housing shall be used that includes vertical resilient limit stops to prevent spring extension when weight is removed. The housings shall serve as blocking during erection and cooling tower mounts shall be located between the supporting steel and roof or the grillage and dunnage. The installed and operating heights shall be the same. A minimum clearance of ½" shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Mountings used out of doors shall be hot dipped galvanized.

b. Manufacturer/Type:

Mason Industries, Inc.	SLR
Vibration Eliminator Co.	KW

4. Type D:
   a. Vibration hangers shall contain a steel spring and a double deflection neoprene element in series. Neoprene elements shall have a minimum deflection 0.35". The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection and be seated in a neoprene cup with an integral molded bushing that passes through the lower hanger box.
   b. Manufacturer/Type:

Mason Industries, Inc.	DNHS
Vibration Eliminator Co.	SNRC

5. Type E:
   a. Vibration hangers shall be as described under Type "D" of this paragraph, but they shall be pre-compressed to the rated deflection so as to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after installation is complete and the hanger subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include an isolation layout hanger drawing showing the proper location of each isolator, tagging its actual loading.
   b. Manufacturer/Type:

Mason Industries, Inc.	PCDNHS
Vibration Eliminator Co.	PR

6. Type F:
   a. Vibration hangers shall contain a double deflection neoprene element manufactured as an integral part of the element design to prevent short circuiting of the rod as it penetrates the housing body. Minimum static deflection shall be .35".
   b. Manufacturer/Type:

Mason Industries, Inc.	HD
Vibration Eliminator Co.	SNC

7. Type DE:
   a. Elastomer hanger rod isolators shall incorporate the following:
      1) Molded unit type neoprene elements with projecting bushing, lining rod clearance hole.
      2) Neoprene element to be minimum 1¾" thick.
      3) Steel retainer box encasing neoprene mounting.
      4) Clearance between mounting hanger rod and neoprene bushing shall be minimum of 1/8".
      5) Minimum static deflection of 0.35".

b. Mason Type HD or approved equal.

B. Bases:

1. Type G:
   a. Vibration isolator manufacturer shall furnish integral structural steel bases for both driver and driven machines.
   b. Bases shall be rectangular in shape for all equipment other than centrifugal refrigeration machines and pump bases which may be "tee" or "L" shaped. Pump bases for split case pumps shall include supports for suction and discharge base ells. All perimeter members shall be WF beams with a minimum depth equal to 1/10th of the longest dimension of the base. Beam depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of one inch.
   c. Bases shall be WF bases as manufactured by Mason Industries, Inc. or approved equal.
2. Type H:
   a. Vibration isolator manufacturer shall provide steel members welded to height-saving brackets to cradle machines having legs or bases that do not require a complete supplementary base.
   b. Members shall be sufficiently rigid to prevent strains in the equipment.
   c. Inverted saddles shall be ICS as manufactured by Mason Industries, Inc. or approved equal.
3. Type J:
   a. Vibration isolator manufacturer shall furnish structural channel concrete forms for floating foundations.
   b. Bases for split case pumps shall be large enough to provide support for suction and discharge base ells. The base depth shall be a minimum of 1/10th of the longest span, but not less than 6" or greater than 14". Forms shall include minimum concrete reinforcement consisting of ½ on 6" centers running both ways and a layer 1½" above the bottom and a top layer of reinforcing steel as above for all bases exceeding 120" in one direction. Isolators shall be set into pocket housings which are an integral part of the base construction and set at the proper height to maintain a 1" clearance below the base. Bases shall be furnished with templates and anchor bolt sleeves as part of this system.
   c. Manufacturer/Type:

Mason Industries, Inc.	KIPWF
Vibration Eliminator Co.	SN Frames

4. Type Y:
   a. Rooftop packaged air handling units shall be installed on a spring supported isolation curb which shall combine the manufacturer's curb and the isolation base into one assembly. The system shall be designed with 1", 2" or 3" static deflection steel springs which are both adjustable, removable and interchangeable after the rooftop unit has been installed. The system shall maintain the same operating and installed height both with and without the equipment load and shall be fully restrained during wind load conditions allowing no more than ¼" motion in any direction. The isolation curb shall be designed to accept and utilize outer placement of standard 2" roof insulation to act as a sound attenuation system for the inside of the curb. The entire unit shall become an integral part of the membrane waterproofing. The entire assembly shall be dry galvanized or PVC coated. The isolation curb shall be model P-6000 as manufactured by Mason Berger East. Options for the system include an

elevation kit model EK-1 and a sound barrier pack framing kit complete with offset plenum for lightweight roof deck areas model SBC-3. Note: Where this option is utilized, General Contractor is to furnish and install sound barrier material.

b. Manufacturer/Type:
Mason Industries, Inc.: Model P-6000
Vibration Eliminator Co.:

5. Type R:
a. Rooftop fans, condensing units, exterior ducted air handling units, etc. shall be installed on continuous equipment support piers which shall combine a regular equipment support and an isolation system into one assembly. The system shall be designed with 1", 2" or 3" static deflection steel springs which are both adjustable, removable and interchangeable after equipment has been installed. The system shall maintain the same operating and installed height both with and without the equipment load and shall be fully restrained during wind load conditions allowing no more than ¼" motion in any direction. The isolation pier shall be designed to accept 2" rigid insulation and to be an integral part of the membrane waterproofing. The entire assembly shall be dry galvanized or plastic coated. The isolation rail pier system shall be model R-7000 as manufactured by Mason Berger East, Inc.
b. Manufacturer/Type:
Mason Industries, Inc. R-7000
Vibration Eliminator Co.

C. ISOLATION SCHEDULE:

Vibration Eliminator Specification Type for Equipment Location:		
Type of Equipment	With No Occupied or Unoccupied Spaces Below	Above Occupied or Unoccupied Spaces
Air Cooled Condensers (Roof Mounted)		Type R (2.0" deflection)
Dry cooler, Condensing Units	Type A (0.4" deflection)	Type B (1.0" deflection)
Pumps:		
Through 15 HP	Type A (Rail Type) (0.4" deflection)	Type B (Rail Type) (1.0" deflection)
20 HP thru 30 HP	Type G-B (0.4" deflection)	Type G-B (1.0" deflection)
40 HP and over	Type J-B (1.0" deflection)	Type J-B (2.0" deflection)
Piping in Boiler or Mechanical Equipment Rms.	See Spec. Text	See Spec. Text
Piping at PRV Station	Type E or Same as at Rotating Machines	Type E or Same as Rotating Machines

2.2 FLEXIBLE CONNECTIONS

A. Provide a flexible pipe connector at pumps, chillers and other vibrating equipment.

B. Flexible connector shall be:
1. Manufacturer of nylon tire cord and EPDM, both molded and cured with hydraulic presses.
2. Straight connectors to have two spheres reinforced with a mold-in external ductile iron ring between spheres.
3. Elbow shall be long radius reducing type.

4. Rated 250 psi at 170°F. Dropping in straight line to 170 psi at 250°F for sizes 1½" to 12". Elbows shall be rated no less than 90% of straight connections.
5. Sizes 10" and 12" to employ control cables with neoprene end fittings isolated from anchor plates by means of ½" bridge bearing neoprene bushings.
6. Minimum safety factor, 4 to 1 at maximum pressure ratings.
7. Submittals to include test reports.
8. Mason Type MFTNC Superflex, or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION AND COORDINATION

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.

C. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades following work, such as plastering or electrical, to avoid any contact which would reduce the vibration isolation.

D. Bring to the Architect's attention, prior to installation, any conflicts with other trades which may result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the responsible Contractor's expense.

E. Bring to the Architect's attention, any discrepancies between the Specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the Contractor's expense.

3.2 INSTALLATION

A. Mount floor-mounted equipment on 4" concrete housekeeping pads over complete floor area of equipment. Mount vibration isolating devices and related inertia blocks on concrete pad.

B. Each fan and motor assembly shall be supported on a single structural steel frame. Flexible duct connections shall be provided at inlet and discharge ducts.

C. The machine to be isolated shall be supported by a structural steel frame or concrete inertial base.

D. Brackets shall be provided to accommodate the isolator. The vertical position and size of the bracket shall be specified by the isolator manufacturer.

E. The minimum operating clearance between the equipment frame or rigid steel base frame and the housekeeping pad or floor shall be 1". Minimum operating clearance between concrete inertia base and housekeeping pad or floor shall be 2".

F. The equipment structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine or isolators.

G. The isolators shall be installed without raising the machine and frame assembly.

H. After the entire installation is complete and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.

I. Isolation mounting deflection shall be (minimum) as specified or scheduled.

J. Install equipment with flexibility in wiring connection.

K. Verify that all installed isolator and mounting systems permit equipment motion in all directions. Adjust or provide additional resilient restraints to flexibly limit start-up equipment lateral motion to ¼".

L. Prior to start-up, clean out all foreign matter between bases and equipment. Verify that there are no isolation short circuits in the base isolators or seismic restraints.

M. All piping and ductwork to be isolated shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork and maintain ¾" to 1¼" clearance around the outside surfaces. This clearance space shall be tightly packed with firestopping or fiberglass and caulked airtight after installation of piping or duct ductwork.

N. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation system herein specified.

O. The contractor shall not install any equipment, piping or conduit which makes rigid contact with the "building" unless permitted in this Specification. Building includes, but is not limited to, slabs, beams, columns, studs and walls.

P. Obtain inspection and approval of any installation to be covered or enclosed, prior to such closure.

Q. Diagonal thrust restraint shall be as described for Type D hanger with the same deflection as specified for the spring mountings. The spring element shall be designed so it can be pre-set for thrust and adjusted to allow for maximum of ¼" movement at start and stop. Diagonal restraints shall be attached at the centerline of thrust. Restraint shall be Mason Type WB or approved equal.

3.3 PIPING ISOLATOR INSTALLATION

A. The isolators shall be installed with the isolator hanger box attached to, or hung as close as possible to, the structure.

B. The isolators shall be suspended from substantial structural members only.

C. Hanger rods shall be aligned to clear the hanger box.

D. Horizontal suspended pipe 2" and smaller and all steam piping shall be suspended by Type DE isolator with a minimum 3/8" deflection. Water pipe larger than 2" shall be supported by Type E isolator with minimum 1" or same static deflection as isolated equipment to which pipe connects, whichever is greater.

E. Horizontal pipe floor supported at slab shall be supported via Type B, with a minimum static deflection of 1" or same deflection as isolated equipment to which pipe connects, whichever is greater.

F. Vertical riser pipe supports shall utilize neoprene elements.

G. Vertical riser guides, if required, shall avoid direct contact of piping with building.

H. Pipe sway braces, where required shall utilize two (2) neoprene elements.

3.4 FIELD QUALITY CONTROL

A. Obtain inspection and approval of any installation to be covered or enclosed, prior to such closure.

B. Upon completion of installation of all vibration isolation devices herein specified, the local representative of the isolation materials manufacturer shall inspect the completed system and report, in writing, any installation error, improperly selected isolation devices, or other faults in the system that could affect the performance of the system. Contractor shall submit a report to the Architect, including the manufacturer's representatives final report, indicating all isolation reported as improperly installed or requiring correction, and include a report by the Contractor on steps taken to properly complete the isolation work.

END OF SECTION 23 05 48

SECTION 23 05 80

HVAC SPECIALTIES

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture 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.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 THERMOMETERS

A. Furnish and install, where indicated on the Drawings and where specified herein, separable well-type dial or 9" mercury adjustable angle type in glass stem, thermometers, Model 50 EI60E as manufactured by Ashcroft or approved equal.

B. All thermometers should be installed in such a manner as to cause a minimum of restriction to flow in the pipes and so that they can easily be read from the floor.

C. Dial thermometers shall be 5 inches hermetically sealed, bimetal with stainless steel cases, antiparallax dials with raised jet black figures, stainless steel stems, and separable sockets (wells) unless otherwise specified.

D. Thermometers for duct mounting shall have union connections in lieu of separable wells.

E. Separable wells shall be stainless steel for use in steel pipe and brass for use in copper pipe. Separable wells shall be standard type for uninsulated pipe and lagging extension type of proper length for insulated pipe. Stem shall extend a minimum of 3½" into the fluid, or 75% of the inside clear diameter for smaller size pipes.

F. The accuracy of all thermometers shall be within 1% of the full-scale range.

G. All instrument wells for controls and indicators furnished by the temperature control manufacturer shall be installed under this Section.

H. Where conditions are such that thermometers would not be readable from the floor, remote bulb dial thermometers shall be mounted on panelboards. The thermometers shall be 5-inch dials and shall be vapor actuated. The thermometers shall have separable wells. Panel-mounted thermometers shall be provided with an engraved nameplate mounted below each thermometer to identify its service. The nameplates shall be chrome plated with black-filled letters.

I. A thermometer shall be installed in the hot water inlet and outlet of each heat exchanger. A thermometer shall be installed in the chilled water and condenser water inlet and outlet of each refrigeration machine. Additional thermometers shall be installed where indicated on the Drawings.

J. The scale range for the thermometers shall be as follows:

Service	Temperature Range	Remarks
Chilled Water	0 deg. F to 120 deg. F	
Glycol, Condenser Water	0 deg. F to 120 deg. F	
Dual Temperature Water	30 deg. F to 300 deg. F	

2.2 PRESSURE GAUGES

A. Furnish and install where indicated on the Drawings and where specified herein, 4½” Model 1279 pressure gauges with phenolic casings as manufactured by Ashcroft. Process connection shall be ½” MNPT. Acceptable equals include Weiss Model 4UGY1 or Noshok Model 660.

B. Gauges shall be liquid filled for systems under 150°F (chilled water, condenser water, fuel oil, etc.) and shall be dry for all heating systems (hot water, steam, condensate, etc.).

C. All gauges shall have black phenolic casings. The gauges shall have white faces with black-filled engraved numerals and adjustable pointer. The diameter of the dial shall be 4½ inches. Gauges shall have brass bronzed brushed rotary type movement.

D. The accuracy of all gauges shall be within ½% of the scale range.

E. All gauges on water lines shall be fitted with ½" filter type pressure snubbers consisting of ⅜" dia. x ⅛" thick, micro metallic stainless-steel filter, as manufactured by Operating and Maintenance Specialties or approved equal. All gauges on steam lines and high-temperature hot water lines shall be fitted with ½" diameter water-filled carbon steel siphon tubes.

F. A stainless-steel bar stock block-and-bleed type needle valve shall be installed on the fluid side of each gauge, similar to Noshok Model Series 704FFS (size ½" female NPT in and out). A stainless-steel bar stock block-and-bleed type needle valve with a water-filled siphon tube shall be installed on the system side of each steam and HTHW gauge, with the siphon tube installed between the needle valve and the pressure gauge.

G. All gauges shall be installed so as to be easily readable from the floor. Where conditions are such that gauges on piping would not be readable from the floor, the gauges shall be installed on panelboards.

H. Panel mounted gauges shall be designed for flush mounting with back connections and shall be provided with an engraved nameplate mounted below each gauge to identify its service. The nameplates shall be chrome plated with black filled letters.

I. Differential pressure switches, pressure sensing pipe taps, furnished by temperature control manufacturers shall be installed under this Section.

J. Pressure gauges shall be installed in the suction and discharge of each hot water, chilled water, condenser water, condensate return, boiler feed and fuel oil pump. A pressure gauge shall be installed in the chilled water and condenser water inlet and outlet of each refrigeration machine. A pressure gauge shall be installed in the inlet and outlet of each heat exchanger and each air handler coil. A pressure gauge shall be installed at the inlet and outlet of each water, steam or fuel oil strainer. Additional pressure gauges shall be installed where indicated on the Drawings.

K. The scale range of pressure gauges shall be as follows:

Service	Pressure Range
Chilled Water	0 to 100 PSIG
Glycol, Condenser Water	0 to 100 PSIG
Hot Water	0 to 100 PSIG

L. All other pressure gauges shall have a range at least twice the working pressure, but in no case less than 0 to 30 PSIG.

2.3 MACHINERY GUARDS

A. Moving parts of machinery exposed to contact by personnel shall be guarded by steel barrier type which complies with OSHA.

B. Exposed moving parts such as belts and couplings shall have not less than ¾" No. 16 gauge steel guards with all edges rounded and gauge, material and construction shall be in accordance with OSHA standards - paragraphs 7173.3, 7173.5 and 7174.1. Guards shall have 1¼" x 1¼" x ⅛" angle iron frame properly supported.

C. All machinery guards covering the ends of motor or equipment shafts shall have openings for the insertion of a tachometer. Machinery guards shall be painted with two coats of machinery orange enamel.

2.4 EXPANSION TANKS

A. Furnish and install as shown on the Drawings, EX-TROL Pressurized Diagram Type Expansion Tanks as manufactured by AMTROL INC. It shall be air-precharged to the initial fill pressure of the system. It shall be suitable for a maximum working pressure of 125 PSI and shall be furnished with ASME stamp and certification papers. It shall have a sealed-in elastomer diaphragm suitable for an operating temperature of 240 deg. F. (EX-TROL to be furnished with saddles for horizontal installation).

2.5 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.

F. 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.

G. 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 pipelines 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.

I. 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.

J. 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.

2.6 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 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 a 125 PSIG rated ball valve on the system side of each manual air vent. Provide access to all air vents.

2.7 STRAINERS FOR THE 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 an internal screened basket. The contractor shall not install both a Y-strainer and a suction diffuser.

B. The strainers should 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.

2.8 FLANGES FOR ORIFICE PLATES

A. The automatic control manufacturer shall furnish orifice plates for high temperature hot water lines as specified in the article of this Section entitled "Automatic Controls".

B. Install the orifice plates and furnish and install the companion flanges.

C. The orifice plates shall be installed in strict accordance with the manufacturer's recommendations.

D. Straightening vanes shall be installed if required by the automatic control manufacturer.

2.9 REDUCING AND SAFETY VALVES FOR WATER SYSTEM

A. Furnish and install pressure reducing and safety valves for makeup water systems and where indicated on the drawings.

B. The reducing valve shall be Model 7 pressure reducing valve with field adjustable setting as manufactured by Bell & Gossett or equal as approved by the Architect.

C. The safety valves shall be of size and capacity as indicated on the Drawings. The valves shall be made by Bell and Gossett or approved equal and shall have 150 pound raised face flange on the inlet and discharge for all sizes 2½" and above 2" and below shall be screwed.

D. The safety valves shall be steel valves with stainless steel trim. The bonnet shall be enclosed and equipped with a packed lifting lever. Spring shall be carbon steel rated for 450 deg. F.

E. The vertical discharge line from the safety valves shall be installed as close to the safety valves as possible and piped to drain.

2.10 PRESSURE AND TEMPERATURE TEST STATIONS

A. Furnish and install in each supply and return runout to each reheat coil and where indicated on the Drawings, a ¼" MPT fitting to receive either a temperature or pressure probe ⅛" OD. Fitting shall be stainless steel with valve core of Nordel (Max. 275 deg. F), fitted with a color-coded and marked cap with gasket, and shall be rated at 1000 PSIG.

B. In addition, the installing Contractor shall supply the Owner with six pressure gauge adapters with ⅛" OD probe and 6 five-inch stem pocket testing thermometers: 25-125 deg. F for chilled water and six 0-220 deg. F for hot water.

C. Provide one pressure and temperature test kit consisting of one 0-60 PSI, water pressure gauge and one 0-30 PSI water pressure gauge each with No. 500 gauge adapter attached, a 25-125 deg. F pocket testing thermometer, a 0-220 deg. F pocket test thermometer, a No. 500 gauge adapter,

and a protective carrying case. Provide one additional 0-60 PSI pressure gauge and one additional 0 to 30 PSI pressure gauge.

D. Test kit shall be used by the Balancing Contractor to balance the systems and then it shall be turned over to the Owner.

E. Test stations and test kit shall be manufactured by Paterson Engineering Company, Inc. or approved equal.

2.11 FLOW MEASURING DEVICES - VENTURI TYPE

A. Provide complete Venturi flow measuring system as manufactured by Barco Division, Marison Industries, Barrington, IL, or approved equal.

B. This shall be a coordinated system, including Venturi flow stations and portable master meter, supplied by one manufacturer. Each Venturi station shall be complete with pressure tap nipples, quick disconnect valves and safety shut-off valves, indented metal identification tag on chain, giving pipe side, Venturi series, station identification, and meter reading at specified flow rate. Venturi stations shall be one piece brass screwed ½" through 2". Sizes 2½" through 8" shall consist of plated cast iron Venturi insert held between specially machined self-centering 150# steel weld neck units. Sizes 10" and larger shall be fabricated steel plated, with welding ends. Venturi size and series shall be selected so that design flow rate shall be between 10" and 40 inches of water pressure differential on a 0-50" meter with permanent pressure loss of not more than 10% indicated flow rate differential pressure. Minimum flow rates of 2½ FPS are permissible. Venturi stations should be compatible with temperatures and pressure of the system.

C. Each venturi shall also include a 5-valve manifold, dP transmitter model TAD-SM with local digital readout in units of Gallons per Minute (GPM).

D. Master meter shall consist of 6" round dial, dry type meter supplied with scale reading zero to 50 inches of water differential pressure and shall be mounted in a portable water and rot-proof fiberglass carrying case complete with 10 ft. lengths of ¼" high pressure high temperature connecting hose, quick disconnect socket valves, venting valves, installation and operating instructions and capacity curves. Master meter shall become property of the Owner.

E. Upstream pipe diameters of straight pipe shall be five (5) minimum and downstream pipe diameters shall be two (2) minimum as recommended by manufacturer.

F. For location of Venturi flow stations refer to the Drawings.

G. Master Meter shall be high pressure, high temperature type rated at 50 PSIG and 400 deg. F, Venturi looseleaf charts shall be supplied for correction to master reading for HTHW.

2.12 FLOW MEASURING DEVICES - CLAMP-ON TYPE (TRANSIT TIME - ULTRASONIC)

A. The transit time ultrasonic flow measurement system shall be a digital signal processing (DSP) based transit time (time of flight) measuring type providing an electronic output signal proportional to the flow of liquid in closed piping systems as may be required. It shall consist of a transmitter and one transducer set that is either integrally connected or remotely connected by up to 990 feet of cable.

B. Provide Dynasonics Series TFXB Ultra or approved equal.

C. Certifications
1. Class I Division 2 Groups C, D T6 Hazardous Areas
2. Class I Zone 2 EEx nA IIB T6 Hazardous Areas
3. CE certification to IEC 61326-1
4. CIPJ Common Industrial Protocol certification

D. Operating principle: Two ultrasonic transducers function as both transmitters and receivers. Flow measurement is made by measuring the difference time of flight between two digitally synthesized contra propagating acoustic chirps traveling between the two ultrasonic transducers positioned lineally, a known distance apart, on the outside of a closed pipe. Difference time is proportional to fluid velocity, with system Reynolds Number, pipe roughness and speed of sound correction factors applied.

E. Transducer:
1. Primary Sensor: The compression-mode acoustic transducer shall contain a polarized PZT crystal with impedance matched wave-guide.
a. Standard transducers shall operate on pipe sizes ranging from 2" through 100" and have a center frequency of 1 MHz.
b. Large pipe transducers shall operate on pipes larger than 24" and have a center frequency of 0.5 MHz.
c. Small-pipe transducers shall operate on pipe sizes from ½" through 2" are specific to a pipe outside diameter and have a center frequency of either 1 or 2 MHz. Small-pipe transducer can be integrally mounted with the transmitter enclosure or remotely connected with coaxial cable.
d. Transducer housing shall be constructed from PVC, CPVC, PTFE, Ultem7 and/or Vespel7.
e. Transducers shall be rated for a Type 6 [IP 67] environment.
f. PVC transducers shall have a continuous operating temperature of -40° to 185°F.
g. CPVC transducers shall have a continuous operating temperature of -40° to 250°F.
h. PTFE transducers shall have a continuous operating temperature of -40° to 350°F.

F. Transmitter
1. Enclosure shall be Type 4; epoxy-coated aluminum, stainless steel and polycarbonate construction.
2. Power supply shall be 95-264 VAC @ 47-63 Hz or 10-28 VDC
3. AC power consumption shall be 17 VA maximum and DC power consumption shall be 5 VA maximum
4. Operating temperature shall be -40° to 185°F.
5. Outputs:
a. 4-20ma; 12-bit resolution, internally powered, can span negative to positive flow rates; test function allows simulated flow output to verify proper installation and span settings on receiving equipment
b. Pulse rate output, 0-1,000 Hz, 12-bit resolution, open-collector and turbine meter simulation, internal/external pull-up resistor selection, can span negative to positive flow rates
c. Control outputs; 2 independently configurable open-collector outputs, can be configured as flow rate alarm, signal strength alarm, error alarm or totalizer pulse; internal/external pull-up resistors selection
6. Industrial Communications (native):

a. RS485, 3-node, 126 units/network; Modbus RTU protocol
b. 10/100 Base-T Ethernet (ODVAJ CIPJ Compliant); Modbus TCP/IP and BACnet7/IP protocols

7. Control and Programming:
   a. All parameters and commands shall be entered via a personal computer, Windows7 software utility and standard USB A/B cable. Windows utility permits flow meter configurations to be saved and recalled.
   b. Firmware shall up field upgradeable via the USB connection
   c. Optional 4-key keypad
8. Transmitter shall output a digitally synthesized waveform from a discrete, field uploadable file.
9. Measurements shall be made by measuring differential time of contra-propogating waveforms using cross-correlation of data sets. Automatic Reynolds Number and pipe roughness corrections are applied.

G. Transmitter and Transducer Performance
1. Measuring range -40 to +40 FPS.
2. Accuracy shall be ±1% of reading at rates > 1 FPS.
3. Repeatability: 0.5% of reading.
4. Sensitivity is 0.001 FPS.
5. Maximum separation between transmitter and transducer shall be 990 feet.

H. Indication
1. Display shall be two lines: 8-digit LCD with 0.7" high numerical values and 8-digit LCD with 0.35" high alpha numeric values. Display is backlit with white LEDs.
2. Indicators for Run and Program modes and Relay 1 and Relay 2 status

I. Equipment
1. The transit time ultrasonic flow meter shall be a Dynasonics Series DTFXB transmitter and Dynasonics Series DTTN (standard temperature multi-size pipe), DTTH (high-temperature multi-size pipe) or DTTS (standard temperature small-pipe) ultrasonic transducer.

J. PC Software
1. A software utility can be utilized to configure, calibrate, backup and conduct diagnostics on the flow meter. The software shall be compatible with the current version of Windows.

K. Operator Functions
1. Calibration/Verification
   a. Flow meter calibration data shall be entered via a personal computer, Windows software utility and USB A/B programming cable. No additional equipment shall be required.
   b. Internal self-diagnostics shall be available to assist in installation and maintenance of the flow meter.
2. Transmitter Function Details
   The following functions shall be provided:

   a. The flow meter shall output, via USB port, flow rate, positive, negative and net flow accumulations and diagnostic data.
   b. A local display shall display flow rate and total accumulated flows.
   c. The transducers shall transmit and receive acoustic signals to accurately measure liquid flow.

d. Operational range shall be adjustable by entering new data via USB port or optional keypad.
e. The flow meter shall be capable of zero to full scale 4-20 mA output simulation to ensure proper operation with receiving equipment.
f. There shall be no internal potentiometers used in programming or adjusting the transmitter.
g. The power to operate the transducers shall come solely from the transmitter over the transducer interconnection cable.
h. If the flow meter is equipped with dual control signal outputs it shall be programmable for rate of flow, batch/total accumulation, loss of signal strength or system error.
i. The flow meter shall have a FLASH memory and shall not require a battery to ensure protection of stored data.
j. Flow meters shall provide automatic Reynolds Number, pipe roughness and speed of sound compensation.

L. Installation
1. Follow manufacturer's recommendation upstream and downstream straight pipe diameters and transducer orientation to achieve optimum performance.
2. Enter pipe and liquid configuration information into the flow meter. The flow meter will calculate transducer separation from the data entered.
3. Mount the transducers onto the pipe at the calculated separation distance B if required.
4. Additional cable for the transducers shall be RG59 coaxial. All connections shall be 75 Ohm.

M. Warranty
1. The manufacturer of the above specified equipment shall guarantee for twelve (12) months from date of shipment that the equipment shall be free from defects in design, workmanship or materials.
2. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall promptly repair or replace the defective part at no cost to the owner.

N. Additional Required Features
1. USB A/B cable
2. Transducer mounting track: 10" or 16" transducer separation
3. 10/100 Base-T Ethernet (native)
4. Keypad

O. Spare Parts to be Provided
1. Acoustic couplant
2. 0.5 A Time Lag Fuse (AC powered units only)

2.13 FLOW/ENERGY MEASURING DEVICES - CLAMP-ON TYPE (TRANSIT TIME ULTRASONIC

A. The transit time ultrasonic energy/flow measurement system shall be a digital signal processing (DSP) based transit time (time of flight) measuring type providing an electronic output signal proportional to the liquid thermal energy and/or flow delivered/utilized in closed systems as may be required. It shall consist of a transmitter, flow transducer set that is either integrally connected or remotely connected by up to 990 feet [300 meters] of cable and temperature sensor set.

B. Provide Dynasonics Series TFXE Ultra or approved equal.

C. Certifications
1. Ordinary Area
2. CE certification to IEC 61326-1
3. CIPJ Common Industrial Protocol certification

D. Operating principle: Two ultrasonic transducers function as both transmitters and receivers. Volumetric flow measurement is made by measuring the difference time of flight between two digitally synthesized contra propagating acoustic chirps traveling between the two ultrasonic transducers positioned lineally, a known distance apart, on the outside of a closed pipe. Difference time is proportional to fluid velocity, with system Reynolds Number, pipe roughness and speed of sound correction factors applied. Energy measurement is provided by integrating supply and return difference temperature with system mass flow, including compensation for the specific heat capacity of the fluid.

E. Transducers:
1. Flow Transducers: The compression-mode acoustic transducer shall contain a polarized PZT crystal with impedance matched wave-guide.
   a. Standard transducers shall operate on pipe sizes ranging from 2" through 100" and have a center frequency of 1 MHz.
   b. Large pipe transducers shall operate on pipes larger than 24" and have a center frequency of 0.5 MHz.
   c. Small-pipe transducers shall operate on pipe sizes from ½" through 2" are specific to a pipe outside diameter and have a center frequency of either 1 or 2 MHz. Small-pipe transducer can be integrally mounted with the transmitter enclosure or remotely connected with coaxial cable.
   d. Transducer housing shall be constructed from PVC, CPVC, PTFE, Ultem and/or Vespel.
   e. Transducers shall be rated for a Type 6 [IP 67] environment.
   f. PVC transducers shall have continuous operating temperature of -40 deg. F to 185 deg. F.
   g. CPVC transducers shall have continuous operating temperature of -40 deg. F to 250 deg. F.
   h. PTFE transducers shall have continuous operating temperature of -40 deg. F to 350 deg. F.
2. Temperature Transducers
   a. Temperature sensors shall be class A or B, 1,000 ohm, 3-wire, TCR 0.00385 platinum RTD devices
   b. Insertion or surface mount RTDs shall be acceptable

F. Transmitter
1. Enclosure shall be Type 4 rated; epoxy-coated aluminum, stainless steel and polycarbonate construction.
2. Power supply shall be 95-264 VAC at 47-63 Hz or 10-28 VDC
3. AC power consumption shall be 17 VA maximum and DC power consumption shall be 5 VA maximum
4. Operating temperature shall be -40 deg. F to 185 deg. F.
5. Outputs:

a. 4-20ma; 12-bit resolution, internally powered, can span negative to positive energy/flow rates; test function allows simulated energy/flow output to verify proper installation and span settings on receiving equipment

6. Industrial Communications (native):
   a. RS485, 3-node, 126 units/network; Modbus RTU protocol
   b. 10/100 Base-T Ethernet, RJ45 connection, (ODVAJ CIPJ Compliant); Modbus TCP/IP and BACnet7/IP protocols
7. Control and Programming:
   a. All parameter and commands shall be entered via a personal computer, Windows software utility and standard USB A/B cable. Windows utility permits flow meter configurations to be saved and recalled.
   b. Firmware shall up field upgradeable via the USB connection
   c. Optional 4-key keypad permits entry of standard configuration parameters
   d. 10/100 Base-T Ethernet communication port shall contain an integrated HTML application utilized for configuration of the Ethernet port
8. For the purpose of flow measurement, the transmitter shall output a digitally synthesized waveform from a discrete, field up loadable file.
9. Transmitter shall permit individual calibration of RTDs
10. Flow measurements shall be made by measuring differential time of counterpropagating waveforms using cross-correlation of data sets. Automatic Reynolds Number and pipe roughness corrections are applied. Energy measurements will integrate flow, difference temperature and specific heat capacity parameters.
11. Rate and accumulated measurement units shall be user selected. Flow measurement units will include: gallons, ft3, barrels, lbs., m3, liters and kg. Energy measurement units shall include: tons, BTU, MBTU and MMBTU.

G. Transmitter and Transducer Performance
1. Flow measuring range B40 to +40 FPS [-12 to +12 MPS]; accuracy shall be ±1% of reading at rates > 1 FPS.
2. Temperature measuring ranges between -40 deg. F and +350 deg. F shall be accommodated, with difference temperature accuracy to 0.09 deg. F.
3. Repeatability: 0.5% of reading
4. Sensitivity is 0.001 FPS.
5. Maximum separation between transmitter and transducers shall be 990 feet.

H. Indication
1. Display shall be two lines: 8-digit LCD with 0.7" high numerical values and 8-digit LCD with 0.35" high alpha numeric values. Display is backlit with white LEDs.
2. Indicators for Run and Program modes

I. Equipment
1. The transit time ultrasonic energy/flow meter shall be a Dynasonics Series DTFXE transmitter and Dynasonics Series DTTN (standard temperature multi-size pipe), DTTH (high temperature multi-size pipe) or DTTS (standard temperature small-pipe) ultrasonic transducer. Dynasonics offers pre-wired RTD kits in both clamp-on and insertion configurations.

J. PC Software
1. A software utility can be utilized to configure, calibrate, backup and conduct diagnostics on the energy/flow meter. The software shall be compatible with the current version of Windows.

K. Operator Functions
1. Calibration/Verification
a. Energy/flow meter calibration data shall be entered via a personal computer, Windows7 software utility and USB A/B programming cable. No additional equipment shall be required.
b. Internal self-diagnostics shall be available to assist in installation and maintenance of the energy/flow meter.
2. Transmitter Function Details
The following functions shall be provided:

a. The energy/flow meter shall output, via USB port, flow rate, positive, negative and net flow accumulations and diagnostic data.
b. A local display shall display energy/flow rate and total accumulated energy/flows. Supply and return temperature readings can be accessed.
c. The flow transducers and transmitter shall transmit and receive acoustic signals to accurately measure liquid flow rate.
d. The flow and temperature transducers and transmitter shall permit the accurate measurement of liquid thermal energy delivered.
e. Operational range shall be adjustable by entering new data via USB port or optional keypad.
f. The flow meter shall be capable of zero to full scale 4-20 mA output simulation to assure proper operation with receiving equipment.
g. There shall be no internal potentiometers used in programming or adjusting the transmitter.
h. The power to operate the transducers shall come solely from the transmitter over the transducer interconnection cable.
i. The energy/flow meter shall have a FLASH memory and shall not require a battery to ensure protection of stored data.
j. Energy/flow meter shall provide automatic Reynolds Number, pipe roughness and speed of sound compensation.

L. Installation
1. Follow manufacturer=s recommendation upstream and downstream straight pipe diameters and transducer orientation to achieve optimum performance.
2. Enter pipe and liquid configuration information into the energy/flow meter. The meter will calculate transducer separation from the data entered.
3. Mount the transducers onto the pipe at the calculated separation distance B if required. Additional cable for the transducers shall be RG59 coaxial. All connections shall be 75 Ohm.
4. Mount the temperature transducers onto the supply and return pipes.

M. Warranty
1. The manufacturer of the above specified equipment shall guarantee for twelve (12) months from date of shipment that the equipment shall be free from defects in design, workmanship or materials.
2. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the manufacturer shall promptly repair or replace the defective part at no cost to the owner.

N. Additional Required Features
1. USB A/B cable

2. Transducer mounting track: 10" or 16" transducer separation
3. 10/100 Base-T Ethernet (native)
4. Keypad

O. Spare Parts to be Provided
1. Acoustic couplant
2. 0.5 A Time Lag Fuse (AC powered units only)

PART 3 - EXECUTION

3.1 INSPECTION

A. The contractor 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.

3.2 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.

3.3 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 23 05 80

SECTION 23 05 93

TESTING AND BALANCING

PART 1 - GENERAL

1.1 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.

1.2 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 pumps and 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.

I. 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.

J. 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).

1.3 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.

1.4 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

3.1 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
Chilled water, dual temperature water	100 psi
Glycol, Condenser water	100 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 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).

3.2 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.

3.3 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.

3.4 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 23 05 93

SECTION 23 07 00

INSULATION FOR HVAC WORK

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 PIPE INSULATION

A. The following pipes shall not be insulated. Insulate all other piping:
1. Automatic air vent drain pipes.
2. Drain pipes embedded in concrete.
3. Instrument air piping.

PART 2 - PRODUCTS

2.1 COLD AND DUAL TEMPERATURE PIPING INSULATION

A. The following piping shall be covered with fiberglass insulation with vapor barrier:

Service	Thickness
Chilled Water Supply & Return	
All pipe diameters	1½"
Hot-Chilled (Dual Temperature) Water Supply & Return	
Up to 1¼ "	1½"
1½" and above	2"
Chemical Treatment (Boiler Water, Hot Water, Chilled Water)	1½"
Glycol and Condenser Supply and Return Outside Building	2"
Glycol and Condenser Water Supply Return Inside Building	1½"

B. Insulation on any piping, fitting, flange and valve located in areas exposed to freezing (in unheated areas, at cooling towers and where noted on the Drawings as to provide "Frost Insulation") shall be increased by one inch with the same finish as specified for the particular service when not subject to freezing. Insulation shall always be a minimum of 2½" inches in thickness.

C. Insulation shall be glass fiber complying with ASTM C547, Type I with a maximum K factor of 0.23 BTU in/hr ft^2 F at 75 degrees F. mean temperature with factory-applied all service vapor barrier jacket with self seal lap meeting the requirement of ASTM C-1136 Type I.

D. Insulation shall be heavy density fiberglass sectional pipe insulation as made by Owens-Corning Fiberglass Corp. or Johns-Manville Micro-Lok fiberglass insulation.

E. Ends of pipe insulation shall be sealed off at all flanges, fittings, valves and at intervals of 21 feet on continuous runs of pipe, with Foster fire-resistant vapor barrier coating Foster 30-65 or Childers CP-34 or equal.

F. 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 as made by Johns Manville, applied per manufacturer's recommendation, except as specified in 2.01 H.

G. All fittings, valves and flanges for pipe sizes 4" and larger shall be insulated with fabricated mitered segments of pipe insulation 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 fitting covers as made by Johns Manville installed per manufacturer's recommendation, except as specified in 2.01 H.

H. Finish for Exposed Pipe Insulation:
   1. The term "exposed" is hereby defined as any place outdoors, as well as any place indoors in Mechanical Rooms, Storage Rooms, Janitor's Closets, etc., where located within 7 feet of floor or access platforms.
   2. All exposed pipe, valve and fittings insulation shall have 0.016 inch thick corrugated aluminum jacket banded with ½" s.s. bands spaced 12" 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).
   3. All calcium silicate pipe insulation, all insulated condenser water piping exposed to weather and all other insulated pipe exposed to weather shall have 0.016 inch thick aluminum jacket banded with ½" s.s. bands spaced 12" o.c. This shall include pipe, fittings and valves.

I. All below ambient, coated molded fittings and mitered segments shall be vapor sealed with a layer of open weave glass fabric embedded between two 1/16" thick coats of Foster 30-65 or Childers CP-34 vapor barrier coating and lap seal at least 1" for molded type and 2" for mitered type on itself and adjoining insulation.

J. Direct contact between pipe and hanger shall be avoided. Hanger shall pass outside of a metal saddle which shall support a section of high density insulation equal thickness to adjacent insulation (such as calcium silicate) and 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
½"- 2"	10" Long
3"-6"	12" Long
8"-10"	16" Long
12" & Over	22" Long

K. At pipe supports, insulation shield protection saddles and matching hanger shall be used.

L. *All strainers for chilled water and insulated condenser water piping shall be insulated and boxed in with galvanized sheet metal cover. The insulated metal covers shall be segmented and shall be made removable.

M. As an alternative to fiberglass insulation, on cold pipes, elastomeric closed-cell insulation may be used.

1. Insulation material shall be a flexible, closed-cell elastomeric insulation in tubular or sheet form: AP Armaflex, AP Armaflex W, AP Armaflex SS, or AP Armaflex SA. These products meet the requirements as defined in ASTM C 534, "Specification for preformed elastomeric cellular thermal insulation in sheet and tubular form."
2. Insulation materials shall have a closed-cell structure to prevent moisture from wicking which makes it an efficient insulation.
3. Insulation material shall be manufactured without the use of CFC's, HFC's or HCFC's. It is also formaldehyde free, low VOC's, fiber free, dust free and resists mold and mildew.
4. The insulation material shall contain MICOBAN Antimicrobial additive to aid in the prevention of mold and mildew.
5. Materials shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests.
6. Materials shall have a maximum thermal conductivity of 0.25 Btu-in./h-ft2- °F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions.
7. Materials shall have a maximum water vapor transmission of 0.05 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.
8. The material shall be manufactured under an independent third party supervision testing program covering the properties of fire performance, thermal conductivity and water vapor transmission.
9. Valves, Flanges and Fittings:
    a. Armacell Fabricated Fittings can be used on all fittings. 2 and 3 Pieces 90s, 45s, Ts, P traps and couplings along with grooved fittings are available.
    b. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seam and mitered joints shall be adhered with Armaflex 520, 520 BLV or 520 Black Adhesive. Screwed fittings shall be sleeved and adhered with a minimum 1" overlap onto the adjacent insulation. Armaflex HT 625 Adhesive shall be used with UT Solaflex.
    c. Valves, flanges, strainers, and Grooved couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.
10. Adhesives and Finishes

a. Adhesive shall be the insulation manufacturer's recommended contact adhesive: Armaflex 520, Armaflex 520 BLV, Armaflex 520 Black, Low VOC Spray Adhesive or Armaflex HT 625 Adhesive.
b. Insulation finish shall be the insulation manufacturer's recommended finish: Armaflex WB Finish.
c. Accessories such as adhesives, mastics and cements shall have the same properties as listed above and shall not detract from any of the system ratings as specified above.

N. Insulation on any piping, fitting, flange and valve located in areas exposed to freezing (in unheated areas, at cooling towers and where noted on the Drawings as to provide "Frost Insulation") shall, in addition to above covering, be increased by one inch with the same finish as specified for the particular service when not subject to freezing. Insulation shall always be a minimum of 2½" inches in thickness.

O. 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.).

P. 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.

Q. Longitudinal jacket laps and butt strips shall be smoothly secured per manufacturers recommendations.

R. 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.

S. All fittings, valves and flanges for pipe sizes 4" and larger shall be insulated with fabricated mitered segments of pipe insulation 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 by Johns Manville, except as specified in 2.02 H.

T. 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. All calcium silicate pipe insulation, all insulated condenser water piping exposed to weather and all other insulated pipe exposed to weather shall have 0.016 inch thick aluminum jacket banded with ½" s.s. bands spaced 12" o.c. This shall include pipe, fittings and valves.
3. The term "exposed" is hereby defined as any place outdoors, as well as any place indoors in Mechanical Rooms, Storage Rooms, Janitor's Closets, etc., where located within 7 feet of floor or access platforms.

U. Insulation shall be protected by saddles from hangers, guides and rollers.

V. Strainers on hot pipes shall not be insulated.

W. 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

X. At pipe supports, insulation shield protection saddles and matching hanger shall be used.

2.2 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. On fittings where the operating temperature exceeds 250 deg. F, 2 or more layers of the Hi-Lo Temp insulation inserts shall be applied prior to the installation of the PVC fitting cover. The first layer shall be applied with a few wrappings of fiber glass yarn to eliminate voids or hot spots.

D. Cold Systems: Fittings shall be insulated by applying the proper factory precut Hi-Lo Temp insulation insert to the pipe fitting. The ends of the Hi-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. All fittings and elbows shall be coated with vapor barrier coating and reinforcing mesh before PVC covers are applied.

E. A vapor barrier mastic compatible with the PVC shall be applied around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. The PVC fitting cover is then applied and shall be secured with pressure sensitive pearl gray Z-Tape along the circumferential edges. The tape shall extend over the adjacent pipe insulation and have an overlap on itself at least 2" on the downward side.

F. 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.

G. Glycol systems located outdoors: Fittings shall be insulated to a full thickness the same as the adjacent pipe insulation, with insulation which has been mitered. An intermediate vapor barrier shall be applied, completely sealing the insulation and on the fitting cover overlap seam. 0.016" aluminum cladding shall be applied and shall be secured with pressure sensitive pearl gray Z-Tape

along the throat seam and the circumferential edges overlapping itself 2" on the downward side with aluminum bands on 12” intervals.

H. Qualifications for Using Insulation: When the pipe insulation thickness is greater than 1½” or the pipe temperature is greater than 250°F or less than 45°F, additional insulation inserts should be used. Use one Hi-Lo Temp insert for each additional 1" of pipe insulation.

I. 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.

J. Where insulated piping is exposed (indoors up to 7 feet above the floor or platform) or any place outdoors, the PVC covers shall be omitted since the use of 0.016” thick aluminum cladding is required on all piping, fittings and valves.

2.3 CALCIUM SILICATE PIPE INSULATION

2.4 PIPING EXPOSED TO FREEZING

A. Insulation on any piping, fitting, flange and valve located in areas exposed to freezing (in unheated areas, at cooling towers and where noted on the Drawings as to provide "Frost Insulation") shall, in addition to above covering, be increased by one inch with the same finish as specified for the particular service when not subject to freezing. Insulation shall always be a minimum of 2½" inches in thickness.

B. Weatherproofing of Piping:
1. Weatherproof all insulated outdoor piping.
2. Where weatherproofing is required, in addition to insulation and finishes specified for frostproofing, cover with Tedlar Film Jackets as made by ALPHA Assoc, Inc. (Woodbridge N.J.).
3. Fittings insulation shall be heavily coat with Childers CP-10/11 or Foster 46-50 weather barrier mastic for hot piping; Childers CP-34 or Foster 30-65 vapor barrier coating for cold piping. Embed into the wet coat a layer of open weave glass cloth and finish with a second coat of same mastic over entire surface.
4. In addition to insulation and finishes specified for frostproof, cover all piping, including fittings and valves, with corrugated aluminum sheet cladding, 0.016 inch thick with lock seams at longitudinal seams, and preformed straps at transverse joints at 12” intervals. 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).

2.5 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.

2.6 EQUIPMENT INSULATION

A. Over the insulation, 2" hexagonal mesh wire shall be tightly stretched in place and secured by wiring to anchors with edges tied together.

B. Equipment insulation shall be finished with .016" aluminum jacketing banded in place with ½" aluminum bands 12" on center.

C. Chilled and dual temperature water pump casings shall be constructed by utilizing a frame of 2" wide 0.05" thick galvanized sheet metal corner angles assembled with pop rivets or welded. This frame shall encompass the lower half of the pump and shall have a split removable cover frame for the top sections of the pump. Entire top of bottom frame shall be closed with 18 gauge galvanized sheet metal either by spot welding or structural screws. Provide 2” thick 1 lb. density fiberglass blanket lining for top and bottom half of the frame. Frame sidings shall be cut for pipes, flanges, pump shaft and instrumentation/gauges. The innermost layer shall be aluminum in order to protect the insulation from damage.

D. Chilled water expansion tank, chilled water air separator and chemical treatment tanks other than condenser water tank shall be covered with 2" thick fiberglass U.L. labeled pipe and tank insulation with vapor barrier. Finish shall be 0.016" aluminum cladding as described above for equipment and piping insulation cladding.

PART 3 - EXECUTION

3.1 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.

3.2 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. Insulation for factory-fabricated air handling units, furnished as part of units.

E. At all openings in insulation and acoustical duct lining, insulate edges neatly and protect with sheet metal nosing. Use sealant as well.

F. 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.

G. 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.

H. 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.

I. Where packaged type units are called for in the Specifications, or as scheduled on the Drawings, the insulation shall be as herein specified for the specific system.

J. 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.

K. Where insulation on existing piping, equipment, etc., has been cut, removed or damaged, this Contractor shall reinsulate as herein specified.

L. All insulation of access doors shall be set in sheet metal double-pan construction.

M. 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.

N. 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. On cold piping, insulation shall be adhered directly to the piping at the high end of the run and every 18 feet, using a two-inch strip of Armaflex 520, 520 BLV or 520 Black Adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with Armaflex 520, 520 BLV, or 520 Black Adhesive. All penetrations through the insulation and termination points must be adhered to the substrate to prevent condensation migration.
      f. 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.

g. 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.

O. Finish for Exposed Insulation:
   1. The term "exposed" is hereby defined as any place outdoors, as well as any place indoors in Mechanical Rooms, Storage Rooms, Janitor's Closets, etc., where located within 7 feet of floor or access platforms.
   2. All exposed pipe, valve and fittings insulation shall have 0.016 inch thick corrugated aluminum jacket banded with ½" s.s. bands spaced 12" 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).
   3. All calcium silicate pipe insulation, all insulated condenser water piping exposed to weather and all other insulated pipe exposed to weather shall have 0.016 inch thick aluminum jacket banded with ½" s.s. bands spaced 12" o.c. This shall include pipe, fittings and valves.
   4. As an alternative to the use of 0.016" aluminum cladding on outdoor duct insulation, if AP Armaflex insulation is used, the ArmaTuff laminated sheet and roll insulation may be used. ArmaTuff laminated Armaflex sheet and roll insulations may be used for insulating exterior applications such as duct, tanks, vessels and large pipes. Refer to section 3.06 for further installation details. ArmaTuff is a laminate of white polymeric material on Armaflex insulations, which offers durability and resistance to weathering, ultraviolet, acid rain and chemicals. The laminate is 0.013 inches (13 mils) thick. The seams must be

installed in compression and sealed with Armaflex 520, or 520 Black contact adhesive. Cover the seams using ArmaTuff 6" Seal Tape.

3.3 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 23 07 00

SECTION 23 08 00

COMMISSIONING OF HVAC SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION:

A. The purpose of this section is to specify the Division 23 responsibilities and participation in the commissioning process.

B. Work under this contract shall conform to requirements of Division 01, General Requirements, Conditions of the contract, and Supplementary Conditions. This specification covers commissioning of HVAC mechanical systems which are part of this project.

C. Commissioning work shall be a team effort to ensure that all HVAC mechanical equipment and systems have been completely and properly installed, function together correctly to meet the design intent, and contract document system performance parameters for fine tuning of control sequences and operational procedures. Commissioning shall coordinate system documentation, equipment start-up, control system calibration, testing and balancing, and verification and performance testing.

D. The trades represented on the commissioning team shall include, but not be limited to, sheet metal, piping and fitting, controls, test and balance, and electrical. The lead person for each trade who will actually perform or supervise the work is to be designated as the representative to the commissioning team. Responsibility for various steps of the commissioning process shall be divided among the members of the commissioning team, as described in this section.

E. The Commissioning Authority shall have responsibility for coordinating and directing each step of the commissioning process.

F. HVAC Mechanical system installation, Start-up and checkout testing, balancing, preparation of O&M manuals, and operator training are the responsibility of the Division 23 Contractors, with coordination, observation, verification and commissioning the responsibility of Division 1, Section 01 91 13. The 01 91 13 commissioning process does not relieve Division 23 from the obligations to complete all portions of work in a satisfactory and fully operational manner.

G. Start-up and Checkout procedures/tests shall be those listed or detailed in other sections of the Specifications, to be performed by the Contractors or equipment manufacturer representatives. These procedures/tests shall be completely independent from the procedures and checklists (Verification and Functional Performance) called for in this Section.

H. The following are common abbreviations used in the Specifications
1. CA: Commissioning Authority.
2. A: Architect of Record.
3. E: Engineer of Record (Mechanical Design Professional).
4. TAB: Test, Adjust and Balance.
5. O&M: Operation and Maintenance.
6. O: Owner
7. MC: Mechanical Contractor.

8. EC: Electrical Contractor.
9. DDC: Direct Digital Controls
10. AC: Automatic Controls System Contractor
11. CM: Construction Manager

1.2 RELATED SECTIONS:

A. Commissioning - General Requirements Section 01 91 13

1.3 CITIED STANDARDS:

A. ASHRAE Guideline 4-1993

1.4 SCOPE OF WORK:

A. Commissioning work of Division 23 shall include, but not be limited to:
1. Providing documentation of the Start-up and Checkout procedures and tests of the equipment.
2. Providing testing, adjusting and balancing of systems to be commissioned.
3. Cooperation with the Commissioning Authority.
4. Providing qualified personnel for participation in commissioning tests, including seasonal testing required after the initial testing.
5. Providing equipment, materials, and labor as necessary to correct construction and/or equipment deficiencies found during the commissioning process.
6. Providing operation and maintenance manuals, and as-built drawings for the equipment/system to be commissioned to the Commissioning Authority for verification.
7. Providing training and demonstrations for the systems specified in this Division.

B. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of the following components, systems, and sub-systems:
1. Pumps
2. Heat Exchangers
3. VFD
4. Unit Heater & Cabinet Heaters
5. Piping System
6. TAB
7. Controls

C. Timely and accurate documentation is essential for the commissioning process to be effective. Documentation required as part of the commissioning process shall include but not be limited to:
1. Progress and status reports, including deficiencies noted.
2. Minutes from all commissioning meetings.
3. Start-up and Checkout procedures and tests.
4. Training agenda and materials.
5. As-built records.
6. Commissioning report.
7. Operation and maintenance (O & M) manuals.

D. Detailed Verification and Functional Performance testing shall be performed on all installed equipment and systems to be commissioned to ensure that operation and performance conform to

Contract Documents and Design Intent. All tests shall be witnessed by the Commissioning Authority and shall be detailed in Sections 23 08 00-1 and 23 08 00-2.

E. Comprehensive training of O&M personnel shall be performed by the Mechanical Contractor, and where appropriate by other sub-contractors, and vendors prior to turnover of building to the owner. The training shall include classroom instruction, along with hands-on instruction on the installed equipment and systems.

1.5 ROLES AND RESPONSIBILITIES

All parties involved in the construction process shall be involved in the commissioning process. Following is a description of the responsibilities of each party:

A. Owner
1. Assign maintenance personnel and schedule them to participate in meetings, training sessions and inspections as follows:
   a. Construction Phase coordination meetings.
   b. Initial Owner training sessions at initial placement of major equipment and subsequent training sessions.
   c. Maintenance orientation and inspection.
2. Attend meetings with TAB contractor as scheduled by the Commissioning Authority. Participate with the Commissioning Authority, the MC, the Mechanical Contractor, the Design Professional and the TAB Contractor to implement the TAB checklist, part of Section 23 08 00-1. The purpose is to verify that the TAB Contractor understands the TAB requirements. The TAB Contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.
3. Participate in final review at acceptance meeting.

B. Commissioning Authority (CA)
1. Develop the commissioning requirements and all related testing, and quality control sections.
2. Include list of all contractors for commissioning events.
3. Execute the mechanical commissioning program, through organization of meetings, tests, demonstrations, training events and performance verifications. Organizational responsibilities include preparation of agendas, attendance lists, arrangements for facilities and timely notification to participants for each commissioning event. The Commissioning Authority shall act as chairman at all commissioning events and assure execution of all agenda items. The Commissioning Authority shall prepare minutes of every commissioning event and send copies to all attendees and the Owner within 5 workdays of the event.
4. Review the design documents for their affect on the commissioning process and the final performance of the HVAC system. This includes ensuring that appropriate commissioning guidelines have been followed, and that there are adequate devices included in the design to ensure the ability to properly test, adjust, and balance the systems, and to document the performance of each piece of equipment and each system. Any items required but not shown shall be brought to the attention of the Contractor prior to submittal of shop drawings.
5. Schedule the first of the Construction Phase commissioning coordination meetings, at some convenient location and at a time suitable to the Contractor and the CM. Subsequent meetings shall be scheduled as required. These meetings shall be for the purpose of

reviewing the mechanical orientation and inspections, O&M submittals, training sessions, test, adjust and balance (TAB) work.

6. Schedule the initial Owner training session so that it will be held immediately before the mechanical system orientation and inspection. This session shall be attended by the Owner's O&M personnel, the mechanical Contractor and equipment suppliers as necessary, the Design Professional, the CM and the Commissioning Authority. The Design Professional shall conduct this session giving an overview of the system, the system design goals and the reasoning behind the selection of the equipment. Subsequent training sessions need not be attended by the Design Professional. The format shall follow the outline in the O & M manuals and shall include hands-on training.
7. Supervise and Conduct periodic inspection of work in progress to ensure that systems and equipment to be commissioned are installed according to approved shop drawings.
8. Supervise the Mechanical system orientation and inspection following the initial training session. The Mechanical system orientation and inspection shall be conducted by the mechanical Contractor. The emphasis of this Mechanical system orientation and inspection shall be an observation of the equipment location with respect to accessibility. Prepare minutes of this meeting, with separate summary of deficiency findings by the Owner and Commissioning Authority. Distribute to attendees and the Owner.
9. Adequate accessibility for maintenance and component replacement or repair is the CM responsibility and shall be checked by the Commissioning Authority.
10. Submit detailed Verification test procedures and data sheets.
11. Submit detailed Functional Performance Test procedures and data sheets.
12. Witness the implementation of the Verification and Functional Performance Tests as indicated in the specified commissioning checklists for equipment and system to be commissioned. Ensure the results are documented (including a summary of deficiencies), and incorporated in the O&M manuals.
13. Supervise to ensure installation of calibrated test instrumentation to monitor and record data as necessary.
14. Supervise and witness verification tests.
15. Submit Verification test checklists report implementation to the CM for review and acceptance.
16. After Verification Checklist test/acceptance, the Commissioning Authority shall confirm to CM that the mechanical systems are ready for Functional Performance Testing.
17. Supervise and witness Functional Performance Tests.
18. Submit Functional Performance Test checklists report implementation to the CM, for review and acceptance.
19. Supervise and witness the re-test if deficiencies are found, corrected, and additional testing is requested.
20. Receive and review the Operation and Maintenance (O&M) manuals as submitted by the contractor, ensuring that they follow the specified outline and format. Insert systems description as provided by the Design Professional.
21. Prior to initiating the TAB work, the Commissioning Authority shall meet with the Owner, mechanical Contractor, Design Professional and TAB Contractor in preparation for implementing the TAB Plan Checklist (start-up and checkout), part of Section 23 08 00. The purpose is to verify that the TAB Contractor understand the TAB requirements. The TAB Contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.

    The TAB report, per the Specifications, shall be submitted by the TAB contractor along with the filled-in check list "Functional Performance Test-TAB Plans" Spot check

verification of the TAB report shall be according to "Functional Performance Test B TAB".

22. Upon receipt of notification from the CM that the mechanical systems have been completed and are operational, the Commissioning Authority shall proceed to verify the TAB report and operation of the control systems in accordance with the Commissioning Specification.
23. Review as-built drawings for equipment and systems to be commissioned for accuracy. Request revisions to achieve accuracy.
24. Ensure that the O&M manuals, and all as-built records have been updated to include all modifications reported to CA made during the construction phase.
25. Repeat the supervision of Functional Performance Tests to accommodate seasonal tests and/or correct any performance deficiencies. Revise and re-submit the related report implementation to the CM for review and acceptance.
26. Prepare the final commissioning report.
27. Assemble the final project documentation which shall include the commissioning report, and all as-built records. Submit this documentation to the CM for review and acceptance.

C. Architect (A)
1. Provide support to all parties providing a service as a part of the commissioning process. This shall include providing adequate space for equipment installation and maintenance.
2. Include Section 01 91 13 regarding commissioning in Division 1-General Requirements alerting all parties to the need to participate.

D. Mechanical Design Professional (E)
1. Prepare contract documents, of the mechanical system.
2. The Design Professional shall specify and verify adequate maintenance accessibility for each piece of equipment in shop drawings and the actual installation.
3. The Design Professional retains responsibility for the system evaluation, adequacy of the system to meet design intent, capacity of the system, quality control check or any of the other elements of the system design.
4. Attend the initial Owner training sessions. Conduct the mechanical training session pertaining to the overview of the system design, the system design goals and the reasoning behind the selection of equipment.
5. Participate with the Commissioning Authority, the Owner, the Mechanical Contractor, the Design Professional and the TAB contractor to implement the TAB checklist, part of Section 23 08 00. The purpose is to verify that the TAB contractor understands the TAB requirements. The TAB contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.
6. Review Verification and Functional performance testing reports for deficiencies in meeting the finalized Design Intent.
7. Review as-built records as required by contract documents and turn them over to the Commissioning Authority for inclusion in final project documentation.
8. Review and comment on the final commissioning report.

E. Construction Manager (CM)
1. Ensure that cost for commissioning requirements is included in the contract price.
2. Ensure that commissioning requirements are included in the mechanical, electrical, and controls contracts, as wells as in other sub-contractors, to ensure full cooperation of all parties in the mechanical commissioning program.

3. Ensure acceptable representation, with the means and authority to prepare and coordinate execution of the mechanical commissioning program as described in the contract documents.
4. Participate in O&M personnel orientation and inspection at the final construction stage.
5. Attend the O&M training sessions. These training sessions are to be attended by the Owner, Commissioning Authority, CM, Contractors and equipment suppliers as necessary. The Design Professionals shall attend only the initial training sessions. The format shall follow the outline in the O&M manuals. This mechanical system orientation and inspection should include hands on training.
6. Participate with the Commissioning Authority, the Owner, the Mechanical Contractor, the Design Professional and the TAB contractor to implement the TAB checklist, part of Section 23 08 00. The purpose is to verify that the TAB contractor understands the TAB requirements. The TAB contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.
7. Follow up with AC to receive from him a statement that control systems have been calibrated. Distribute that statement to CA.
8. Follow up with TAB to receive from him a statement that TAB work has been completed and submit the final TAB reports to CA for review.
9. Participate in any deficiency resolution (See item 3.03).

F. Mechanical Contractor (MC)
1. Include cost to complete commissioning requirements for mechanical systems in the contract price.
2. Include requirements for submittal data, O&M data, and training in each purchase order or sub-contract written.
3. Ensure cooperation and participation of specialty sub-contractors such as sheet metal, piping, refrigeration, and TAB.
4. Ensure participation of major equipment manufacturers in appropriate training and related videotaping and testing activities.
5. Attend Construction Phase coordination meeting scheduled by the Commissioning Authority.
6. Participate with the Commissioning Authority, the Owner, the CM, the Design Professional and the TAB contractor to implement the TAB checklist, part of Section 23 08 00. The purpose is to verify that the TAB contractor understands the TAB requirements. The TAB contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.
7. Prepare preliminary schedules for mechanical system orientation, inspections, O&M manual submission, training sessions, pipe system testing, flushing and cleaning, duct testing, equipment Start-up and Checkout, TAB Plan Meeting, Verification and Functional Performance tests and task completion schedules for same for use by the Commissioning Authority. Update schedules as appropriate throughout the construction period. Notify the Commissioning Authority a minimum of two weeks in advance of any scheduled event.
8. Provide to the CA Start-up and Checkout procedures and checklists documenting their successful completion.
9. Assist the commissioning Authority in Verification and Functional Performance tests, as indicated in the specified checklists.
10. Attend initial training session.
11. Conduct mechanical system orientation and inspection at the equipment placement completion stage.
12. Update drawings to the record condition to date, and review with the Commissioning Authority.

13. Gather O&M data on all equipment, and assemble in binders as required by the Commissioning Specification. Submit to Commissioning Authority prior to the completion of construction.
14. Participate in and schedule vendors and Contractors to participate in the training sessions as set up by the Commissioning Authority.
15. Provide written notification to the CM and Commissioning Authority that the HVAC and controls work have been completed in accordance with the contract documents, and that the equipment, systems, and sub-systems are operating as required.
16. Provide a complete set of as-built records to the Commissioning Authority.

G. Test, Adjust, and Balance Contractor (TAB Contractor)
1. Include cost for commissioning requirements in the contract price.
2. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
3. Be part of the implementation of the Verification and Functional Performance tests, as indicated in the specified Commissioning Checklists.
4. Participate with the Commissioning Authority, the Owner, the CM, the Mechanical Contractor and the Design Professional to implement the TAB Plan Checklist, part of Section 23 08 00. The purpose is to verify that the TAB contractor understands the TAB requirements. The TAB contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.
5. At the completion of the TAB work, and submittal of final TAB report, notify the mechanical Contractor and CM.
6. Participate in training sessions as scheduled by the Commissioning Authority.

H. Automatic Controls System Contractors. (AC)
1. Include cost for commissioning requirements in the contract price.
2. Attend commissioning coordination meetings scheduled by the Commissioning Authority.
3. Be part of the implementation of the Verification and Functional Performance tests, as indicated in the specified Commissioning Checklists.
4. Review design for controllability with respect to selected manufacturers equipment.
   a. Verify that proper hardware exists for functional performance required by specification and sequence of operation.
   b. Verify that proper safeties and interlocks are included per the design.
   c. Verify proper selection of sensor ranges.
   d. Clarify all questions of operation.
5. Provide the following submittals to the Commissioning Authority.
   a. Sequences of Operation Submittals. The Controls Contractor=s submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
      1) An overview narrative system of the system generally describing its purpose, components and function.
      2) All interactions and interlocks with other systems.
      3) Detailed delineation of control between any packaged controls and the Automatic Temperature Control (ATC) listing which points the ATC monitors only and which points it controls, and which points are adjustable.
      4) Written sequences of control for packaged control equipment. (Equipment manufacturers= stock sequences may be included but will generally require additional narrative).
      5) Start up sequences

6) Warm up mode sequences
7) Normal operating mode sequences
8) Unoccupied mode sequences
9) Shutdown sequences
10) Capacity control sequences and equipment staging
11) Temperature and pressure control: setbacks, setups, resets, etc.
12) Detailed sequences for all control strategies, e.g. economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
13) Effects of power or equipment failure with all standby component functions.
14) Sequences for all alarms and emergency shut downs
15) Seasonal operational differences and recommendations
16) Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff, and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
17) Daily weekly, and monthly schedules of start, run and end times.
18) To facilitate referencing all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections.

b. Control Drawings Submittal
1) The control drawings shall have a key to all abbreviations.
2) The control drawings shall contain graphic schematic depictions of the systems and each component, superimposed on diagrams of the physical layout.
3) The schematic will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4) Provide a full points list, of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand-alone control unit. The list shall have the following as a minimum included for each point:
a) Controlled system
b) Point abbreviation
c) Point description
d) Display unit
e) Control point or setpoint (Yes/No)
f) Monitoring point (Yes/No)
g) Intermediate point (Yes/No)
h) Calculated point (Yes/No)

Key:

Point Description: DB temp, airflow, etc.

Control or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)

Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset)

Monitoring Point: Point that does not control or contribute to the control equipment, but is used for operation, maintenance, or performance verification.

Calculated Point: AVirtual@ point generated from calculations of other point values.

The Controls Contractor shall keep mechanical, electrical, TAB contractors, A, E, CA and CM informed of all changes to this list during programming and setup

c. Hardware and software submittals including the logic diagram showing the logic flow of the system.
d. Control panel construction shop drawings.
e. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should also explain individual math or logic operations that are not clear from reading the software listing.
f. Hardware Operation and Maintenance manuals.
g. Application software and project applications code manuals.

6. An updated, as-built version of the control drawings and sequence of operations shall be provided for inclusion in the final controls O&M Manual submittals.
7. Verify proper installation and performance of controls/ATC hardware and software provided by others.
8. Integrate installation and programming schedule with construction and commissioning schedules.
9. Provide thorough training to operating personnel on hardware operations and programming, and the application program for the system.
10. Provide control system technician for use during system verification and functional performance testing.
11. Provide system modifications as required.
12. Provide support and coordination with TAB contractor on all interfaces between their scopes of work. Provide all devices, such as portable operators terminals, for TAB use in completing TAB procedures. This support and coordination shall be in the following manner:
    a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.)
    b. Provide qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
13. The controls contractor shall prepare a written plan indicating in a step- by-step manner, the procedures that will be followed for Start-up and Checkout and adjust the control system prior to commissioning testing. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:
    a. System name
    b. List of devices
    c. Step by step procedures for testing each controller after installation, including:
        1) Process of verifying proper hardware and wiring installation.
        2) Process of downloading programs to local controllers and verifying that they are addressed correctly.
        3) Process of performing operational checks of each controlled component.
        4) Plan and process for calibrating valve and damper actuators and all sensors.

5) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.

d. A copy of the log and field checkout sheets that will document process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has Apassed@ and is operating within the contract parameters.

e. A description of the instrumentation required for testing.

f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the MC, A.E and TAB contractor for this determination.

14. The controls contractor shall have all required Start-up and Checkout checklists, calibrations, tests of the system completed and approved by the E. The E shall determine if this submittals meet his/her requirements and requirements of the Contract Documents. Once the E accepts these submittals, they shall be forwarded to CA who will forward them to the A for record prior to TAB.

15. Assist and cooperate with CA, MC, in the following manner:

a. Using a licensed technician who is familiar with this building's systems, execute the Verification and Functional testing of the controls systems. Provide two-way radios during the testing.

16. List and clearly identify on the as-built duct and piping drawings the locations of all sensors utilized in the start-up and checkout and commissioning processes.

I. Equipment Suppliers and Miscellaneous Contractors

1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual section(s).
3. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
4. Participate in training sessions as scheduled by the Commissioning Authority.
5. Demonstrate performance of equipment as applicable.

1.6 DOCUMENTATION:

A. The Commissioning Authority shall oversee and maintain the development of commissioning documentation. The commissioning documentation shall be kept in three ring binders, and organized by system and sub-system when practical. All pages shall be numbered, and a table of contents page(s) shall be provided. The commissioning documentation shall include, but not be limited to, the following:

1. A detailed description of the design intent for the project, listing operating parameters, control sequences, occupancy conditions, etc.
2. A complete description of how the HVAC system is intended to operate.
3. Approved TAB report.
4. All accepted shop drawings of mechanical equipment to be commissioned. Shop drawings shall be full size sheets folded as required to fit in binders.
5. All Start-up and Checkout procedures and tests signed.
6. All verification and functional performance test checklists/results, signed by indicated personnel organized by system and sub-system.
7. Three copies of the operation and maintenance (O&M) manuals specified in other sections of these specifications shall be included with the commissioning documentation. The manuals shall be incorporated in the commissioning documentation prior to commencement of O&M training required in this and other sections of the specification. Preparation of O&M manuals shall be as specified in section 3.07 of these specifications.

PART 2 - PRODUCTS

2.1 TEST TOOL EQUIPMENT:

A. The appropriate Contractor(s) shall furnish all special tools and equipment required during the commissioning process. A list of all tools and equipment to be used during commissioning shall be submitted to the Commissioning Authority for approval. The Owner shall furnish necessary utilities for the commissioning process.

2.2 TEST EQUIPMENT B PROPRIETARY:

A. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate it's use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.

PART 3 - EXECUTION

3.1 GENERAL

A. The first meeting of the commissioning team members shall be held at a time and place designated by the CM. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

B. The Contractor shall complete all phases of work so the systems can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, piping, ductwork, controls, etc., per the contract documents and related directives, clarifications, and change orders and Design Intent.

C. A Commissioning Plan shall be developed by the Commissioning Authority. The CM shall assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the schedule of actual equipment installation, and their tests.

D. Acceptance procedures are normally intended to begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Division 23 contractor. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule.

3.2 PARTICIPATION IN ACCEPTANCE PROCEDURES:

A. The Contractor shall provide skilled technicians to start-up and debug all systems within Division 23. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program. Work schedules, time required for testing, etc., shall be requested by the Commissioning Authority and coordinated by the CM and Contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. System testing problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians shall include expert knowledge relative to the specific equipment involved and a willingness to work with the Commissioning Authority. Contractor shall provide adequate documentation and tools for Start-up and Checkout tests and commissioning tests for the equipment, system, and/or sub-system to be commissioned.

3.3 DEFICIENCY RESOLUTION:

A. In some systems, misadjustments, misapplied equipment, and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work shall be completed under the direction of the Owner and CM, with input from the Contractor, equipment supplier, the design professional and Commissioning Authority. Whereas these members shall have input and the opportunity to discuss, debate, and work out problems, the Owner shall have final jurisdiction over any additional work done to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit the completion of the commissioning process. Experimentation to demonstrate system performance may be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Authority shall notify the Owner and the CM, indicating the nature of the problem, expected steps to be taken, and suggested deadline(s) for completion of activities. If the deadline(s) pass without resolution of the problem, the Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner shall be the contractor's responsibility.

3.4 ADDITIONAL COMMISSIONING:

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The contractor(s) suppliers, and Commissioning Authority shall include a reasonable reserve to complete this work as part of their contractual obligations.

3.5 SEASONAL COMMISSIONING:

A. Seasonal commissioning pertains to testing under full load conditions during peak heating and peak cooling seasons, as well as part load conditions in the spring and fall. Initial commissioning shall be done as soon as contract work is completed, regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.

B. Heating equipment shall be tested during winter design extremes. Cooling equipment shall be tested during summer design extremes with a fully occupied building. Each contractor and supplier shall be responsible to participate in the initial and the alternate peak season tests of the systems as required to demonstrate performance.

3.6 ACCEPTANCE PROCEDURES:

A. Equipment or system shall be deemed accepted after its Verification Test and Functional Performance Test have been accepted by the Commissioning Authority.

B. Verification Tests
1. Verification tests are primarily static in nature to ascertain and prepare the equipment or system for operational modes under Functional Performance Testing. These Verification tests shall begin only after the Start-up and checkout tests have been successfully completed.
2. Tests shall be performed for the items indicated on the checklists with participants as shown. Participants shall include in their proposals all costs to do the work involved in these tests.
3. The Commissioning Authority shall coordinate and witness the Verification Tests, see Section 23 08 00-1. A TAB Plan Checklist is included.

C. Functional Performance Tests
1. Functional performance tests are primarily dynamic in nature and shall be performed under operation and various modes to verify all the sequences of operation and interlocks. These tests shall begin only after the Verification tests have been successfully completed.
2. Tests shall be performed for the items indicated on the checklists, with participants as shown. Participants shall include in their proposals all costs to do the work involved in these tests.
3. The Commissioning Authority shall coordinate and witness the Functional Performance Tests, see Section 23 08 00-2.

D. Instrumentation
1. The test, adjust and balance contractor shall provide all instrumentation required for the commissioning tests. Instruments shall have been calibrated within the six month period prior to these tests. The calibration shall be traceable to National Institute of Standards and Technology standards. For the accuracy of the automatic controls commissioning instrumentation, refer to Section 23 08 00-2.

E. Tests For Deficiencies
1. Any identified deficiencies need to be evaluated by the Design Professional and CM to determine if they are part of the contractor=s or sub-contractor=s contractual obligations. Construction deficiencies shall be corrected by the responsible contractor(s), and the specific test repeated.
2. If it is determined that the HVAC system is constructed in accordance with the contract documents, and the performance deficiencies are not part of the contract documents, the Owner must decide whether any required modifications needed to bring the performance of the HVAC system up to the finalized design intent shall be implemented, or if the test shall be accepted as submitted. If corrective work is performed, the owner shall determine if a portion or all required tests should be repeated, and a revised report submitted.

3.7 OPERATING AND MAINTENANCE MANUAL:

A. Shall be in accordance with ASHRAE Guideline 4-1993 (Preparation of Operating and Maintenance Documentation for Building Systems).

B. The operating and maintenance manual shall consist of a sturdy binder with 8-1/2" x 11" sheets containing the following major sections.

1. System Descriptions:
   a. Each major system shall be described, type-written, in general terms, including major components, interconnections, theory of operation, theory of controls, unusual features and major safety precautions. This information should correlate with information provided in the manufacturers' instructions book. This section shall include, but not be limited to, the following data:
      1) Detailed description of each system and each of its components showing piping, valves, controls, and other components, with diagrams and illustrations where applicable.
      2) Wiring and control diagrams with data to explain detailed operation and control of each component.
      3) Control sequences describing start-up, all modes of operation, and shut down.
      4) Corrected shop drawings.
      5) Approved product data including all performance curves and rating data.
      6) Copies of approved certifications and laboratory test reports (where applicable).
      7) Copies of warranties.
   b. Updated as-built version of the control drawings and sequences of operation, detailed in article 1.05 H. shall be reduced in size and folded to usefully fit into the Manual, and submitted.
2. Operating Instructions:
   a. Condensed, typewritten, suitable for posting, instructions shall be provided for each major piece of equipment. Where more than one (1) common unit is installed, one instruction is adequate. The instructions shall provide procedures for:
      1) Starting up the equipment/system.
      2) Shutting down the equipment/system.
      3) Operating the equipment in emergency or unusual conditions.
      4) Safety precautions.
      5) Trouble shooting suggestions.
      6) Other pertinent data applicable to the operation of particular systems or requirement.
   b. The instructions shall be suitable for posting adjacent to the equipment concerned.

      The Contractor shall provide instructions for:
      1) Equipment and systems listed under 1.04 Scope of Work.
3. Ongoing and Preventive Maintenance:
   a. Condensed, typewritten procedures for recommended ongoing and preventive maintenance actions shall be provided for each category of equipment and systems listed under 1.04 Scope of Work. This information shall include, but not be limited to the following:
      1) Maintenance and overhaul instructions.
      2) Lubricating schedule including type, grade, temperature, and frequency range.
      3) Parts list, including source of supply and recommended spare parts.
      4) Name, address, and 24 hour telephone number of each subcontractor who installed equipment and systems, and local representative for each type of system.
      5) Other pertinent data applicable to the maintenance of particular systems or equipment.

b. These recommended preventive maintenance actions shall be categorized by the following recommended frequencies:
   1) Weekly
   2) Monthly
   3) Quarterly
   4) Semi-Annual
   5) Annual
   6) Other

C. Postal Operating Instructions and Diagrams:
   1. Operating Instructions:
      a. Copies of operating instructions provided in the operating manual shall be posted in the near vicinity of each piece of applicable equipment. The instructions shall be mounted neatly in frames under Plexiglas, where they can be easily read by operating personnel. Instructions mounted outdoors shall be suitably protected from weather.
   2. Posted Systems Diagrams:
      a. Simplified one (1) line diagrams of the systems listed shall be developed of conveniently adequate size and posted neatly under Plexiglas in the main or most appropriate equipment room for easy reference by operating and maintenance personnel. These drawings shall be done in a professional manner which is acceptable to the DDC. The diagrams shall show each component including all valves installed in the system, with name and identifying number. If space does not permit valves installed in the system, with name and identifying numbers on the diagrams, valve charts shall be provided. Explanatory notes, where needed, shall be provided. This shall apply to equipment and systems listed under Article 1.04 Scope of Work.
      b. These diagrams shall be suitable for reduction in size and use in the operating manual system descriptions previously covered.

3.8 AS-BUILT DRAWINGS:

A. The Commissioning Authority shall review the as-built contract documents pertaining to the equipment/system to be commissioned to verify incorporation of both design changes and as-built construction details. Discrepancies noted shall be corrected by the appropriate party.

3.9 OPERATING AND MAINTENANCE TRAINING AND VIDEOTAPING:

A. The Mechanical Contractor, TAB Contractor, Automatic Controls and appropriate sub-contractors, shall provide comprehensive operating and maintenance instructions on building systems prior to delivery. The instructions and shall include classroom instruction delivered by competent instructors based upon the contents of the operating manual. Emphasis shall be placed upon overall systems diagrams and descriptions, and why systems were designed as they were. The classroom instruction shall also include detailed equipment instruction by qualified manufacturer representatives for all equipment listed in Article 1.04 Scope of Work for which operating instructions are provided. The manufacturer representative training shall emphasize operating instructions, and preventing maintenance as described in the operating manual. Videotaping of these instructions shall be by CA. At a minimum, the training sessions shall cover the following items:
   1. Types of installed systems
   2. Theory of operation

a. Design intent
b. Occupied vs. unoccupied or partial occupancy
c. Seasonal modes of operation
d. Emergency conditions and procedures
e. Comfort conditions
f. Indoor air quality
g. Energy efficiency
h. Other issues important to facility operation.

3. System operations.
4. Use of control system
   a. Sequence of operation
   b. Problem indicators
   c. Diagnostics
   d. Corrective actions
5. Service, maintenance, diagnostics and repair.
6. Use of reports and logs.
7. Troubleshooting, investigation of malfunctions, and determining reasons for the problem.

B. Each classroom training period shall be followed by an inspection, explanation and demonstration of the system concerned by the instructors. All equipment shall be started up and shut down.

C. The contractor shall be responsible for organizing, arranging, and delivering this instruction in an efficient and effective manner on a schedule agreeable to the owner.

D. The contractor shall provide, at or before substantial completion, a proposed agenda and schedule of the above training for approval by the Commissioning Authority and the Owner.

END OF SECTION 23 08 00

SECTION 23 09 00

AUTOMATIC TEMPERATURE CONTROLS - ELECTRIC

PART 1 - GENERAL

1.1 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.

1.2 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-electronic fully modulating type unless otherwise indicated, all as hereinafter specified. Control equipment shall be as manufactured by Distech Controls. All controls 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.

C. The system shall be compatible with BACNET. The system shall have a graphic system which is compatible with the system currently installed, which is a Distech Control system, installed and maintained by ADVANTEX Solutions; contact Giovanni Natale from ADVANTEX Solutions (T: 718-278-2290, C: 917-682-2521, E-mail: gnatale@advantexsolutions.com).

D. The system shall have a new graphic.

E. The control system shall include all necessary sensors, thermostats, damper motors, transmitters, transducers, relays, switches, etc., and all necessary equipment for a complete control system, regardless of whether or not specifically mentioned, including electric relays and contactors required for control interlocking.

F. The control system shall include motor control wiring including all control and interlock wiring from switches, freezestats, firestats and relays, to motor controllers, variable frequency drives, contactors, etc. and all other motor control wiring.

G. 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.

H. Terms ATC subcontractor, BAS subcontractor and temperature control Contractor refer to the CONTRACTOR providing work under this section of the specification. The BAS 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, automatic control valves, wells, automatic dampers, combination fire smoke dampers and smoke dampers, to be mounted in pipes or ducts shall be mounted in such pipe or ducts by the CONTRACTOR providing the piping or ducts. This subcontractor, the ATC subcontractor, shall supply these devices to the CONTRACTOR performing the mounting in a timely manner so as not to inhibit or delay his work. The final installation of these devices, i.e. connection, shall be the responsibility of this section.

J. Wiring between the fire alarm system and the automatic temperature control system shall be provided by the CONTRACTOR providing the fire alarm system. The subcontractor shall provide terminal points for the CONTRACTOR to wire to in local temperature control panels and in smoke damper panels. The subcontractor shall provide the Sub-Contractor with a wiring diagram and the location of all the interface terminal points.

K. All temperature sensors, humidity sensors, actuators and DDC controllers and all associated wiring including power wiring, damper (including fire and smoke) wiring and wiring to control duct terminal units, i.e., automatic dampers, reheat coil, VAV and CAV boxes, 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. Provide control wiring required to other equipment provided under this contract.

M. All automatic controls required for AHUs for all projects shall comply with this section.

N. The BAS 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.

O. As-built sequence of operation shall be provided in BAS software. When viewing a control schematic on the BAS, the operator shall have the option of having the system display the sequence of operation.

P. Provide a display controller or panel-mounted controller with display screen with touch control or keypad, as specified herein, at each AHU and pumping/heat exchanger system and other systems provided with control under this contract. The touch/display screen shall allow hospital maintenance staff to monitor systems temperatures, pressures, and status and to modify setpoints.

1.3 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 complete in all respects by competent mechanics, regularly employed by the manufacturer of the control system.

1.4 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.

1.5 RELATED WORK UNDER ELECTRICAL WORK

A. All power wiring for pumps, fans, unit heaters, clocks, etc. See Special Requirements for Mechanical and Electrical Work.

1.6 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.7 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

2.1 VALVE AND DAMPER OPERATORS

A. All operators shall be of totally enclosed type in dustproof housings of pressed steel or approved cast metal. All motors shall be of a permanently lubricated type with oil immersed gear train or internal servo relief valve. 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 NEMA 3R rated.

2.2 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 3EF. Control point shall be adjustable 15E above and below intended setting, with a minimum scale of at least 50EF. 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.

2.3 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. All control valves shall be Bray Series 41 High Performance High Temperature.

2.4 DAMPERS

A. Control dampers shall have galvanized frames of not less than 2" in width and blades of #16 galvanized steel and shall be adequately braced to form a rigid assembly, where required in galvanized ductwork. In aluminum ductwork, damper material shall be 16-gauge aluminum. No dampers shall have blades more than 10" wide. Dampers shall be painted with two coats of black enamel.

B. All dampers shall be of the proportioning or opposed blade type. Dampers shall have continuous stops to avoid leakage. Bearings shall be of oilite nonferrous sleeve type. Outside air and exhaust air dampers shall be provided with continuous neoprene gasketing around perimeter of frame and at interlocking blade edges, to form airtight seal.

2.5 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

2.6 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.

2.7 ROOM THERMOSTATS

A. All proportioning thermostats shall have adjustable throttling range. All thermostats shall be provided with an adjustable range of 55E - 85E., key operated, non-indicating, locked cover type. Finish and final locations shall be approved by the Architect.

2.8 LOCAL PANELS

A. Furnish and install adjacent to each water system and each H & V unit and AC unit as herein specified, locked enclosed local control panel of 14 gauge steel or a face of plywood board with bonded aluminum sheets on each side set in an extruded aluminum enclosure and with welded angle iron brackets, wall or floor type, in which shall be mounted the associated temperature controls, relays, thermostats, etc., and on which shall be flush mounted the associated switches, gauges, thermometers, etc., as previously and hereinafter described. The basic background color of the panel shall be as approved by the Architect. Provide canopy light on top of local control panel with light switch.

B. Panels shall be prewired to terminal strips.

C. Details of panel shall be submitted for approval prior to fabrication. Locations of local panel are to be convenient for adjustment and service and all such locations are to be approved prior to installation. Provide engraved nameplates beneath panel mounted control device and gauge, clearly describing the function of said device and the range of operation. Provide a laminated color coded schematic control diagram on panel face. Provide a key for local panel.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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 - Test and Balancing

3.4 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.

END OF SECTION 23 09 00

SECTION 23 09 01

BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.1 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.

1.2 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 system shall be compatible with BACNET. The system shall have a graphic system which is compatible with the system currently installed, which is a Distech Control system, installed and maintained by ADVANTEX Solutions; contact Giovanni Natale from ADVANTEX Solutions (T: 718-278-2290, C: 917-682-2521, E-mail: gnatale@advantexsolutions.com).

C. The Building Automatic System shall be provided by the same manufacturer as the automatic temperature controls, Section 23 09 00. The existing BMS is Distech Controls and the basis of design is Distech Controls.

D. The Automatic System Subcontractor shall furnish and install all equipment, accessories, wiring and instrument piping required for a complete and functioning system.

E. 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.

F. The automation system shall be of a fully modular architecture permitting expansion by adding computer memory, application software, operator peripherals and field hardware.

G. 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. This shall be accomplished by using removable, compatible disk cartridges.

H. Systems which require the existing user-defined data base to be re-entered through the operator's terminal shall not be acceptable.

I. 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.

J. The system as specified shall monitor, control, and calculate all of the points and functions as listed in the Building Automation Schedule.

K. 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.

L. The entire system of Automatic Temperature Controls and the Building Automation System shall be powered from the building=s emergency 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 and terminal unit controls including VAV boxes. 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).

1.3 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 "Approved Manufacturer's List".

E. Provide equipment which performance, under specified conditions, is certified by the manufacturer.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work and submit shop drawings.

1.5 COORDINATE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 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

2.1 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-in to 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.

2.2 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 32E to 120EF 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.

2.3 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.

2.4 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.

2.5 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. 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 user name 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 user name 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) user name 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.

C. 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 70EF, 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.

D. 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; user name(s) assigned to that group, time increment in real-time, and associated values per time increment.
   a. Profile Report
      1) Boiler Profile Report
   b. The automation systems shall include a software program that will provide a boiler profile report (BPR).
   c. The BPR program shall automatically print a boiler summary report over a day, week or month's time. The boiler profile report shall be capable of reporting the following:
      1) Boiler output in BTU's
      2) Boiler output in tons of steam
      3) Energy input in proper units of fuel
      4) Boiler efficiency
      5) Hours of operation
      6) Heating degree days
      7) Energy Cost
   d. The boiler profile report shall be automatically printed at an operator defined time.
      1) Chiller Profile Report

e. The automation system shall include a software program that will provide a chiller profile report (CPR).
f. The chiller profile report shall be automatically printed at an operator defined time.

4. Totalization Logs
   a. A log shall be provided including any and all points as defined in the point list. Log shall include user name(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 user name 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).

E. 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 user name.
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.

F. 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".

G. Powerfail/Automatic System Restart:
1. Power failures affecting the Central Processing Unit (CPU) shall cause the CPU to go into an orderly shut down 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.

H. Energy Management Control Functions:
1. The following energy management software shall be provided as a minimum for the purpose of optimizing energy consumption while maintaining occupant comfort.
2. Time of Day Scheduling:
    a. A comprehensive program shall be provided to automatically start and stop designated points according to a stored time.
    b. It shall be possible to individually command a point or group of points. For points assigned to one common load group it shall be possible to assign variable time delays between each successive start or stop command within that group.
    c. The system shall have the capacity to accommodate a minimum of 500 uniquely defined schedules. Each load group shall be capable of accommodating a minimum of 250 loads.
    d. The operator shall be able to define the following information:
        1) Time, day, dates.
        2) Commands such as on, off, auto, etc.
        3) Load or loads assigned to groups.
        4) Time delays between successive commands.
    e. There shall be provisions for manual overriding of each schedule by an appropriate operator.

f. The following reports shall be provided:
   1) Report of any and all defined time schedules.
   2) Loads assigned to each time schedule.

3. Start/Stop Time Optimization:
   a. The Automation System shall include a software program to perform optimized start-up and shut-down of selected equipment. The SSTO program shall start HVAC equipment at the latest possible time that will still allow the equipment to achieve the desired zone conditions by occupancy time. The SSTO program shall also shutdown HVAC equipment at the earliest possible time before the end of the occupancy period, and still maintain desired comfort conditions. The program shall be self-correcting via stored memory and will not require manual operator updating.
   b. The SSTO program shall operate in both the heating and cooling seasons. It shall be possible to apply the SSTO program to individual fan systems.
   c. The SSTO program shall operate on both outside weather conditions as well as inside zone conditions, and empirical factors. The empirical factors shall relate to the dynamic responsiveness of each particular zone such as heat retention and transfer coefficients.
   d. The SSTO program shall meet the local code requirements for minimum outside air while the building is occupied.
   e. The automation system operator shall be able to, for each zone under control of the SSTO program, establish and modify the following parameters:
      1) occupancy period
      2) desired occupancy temperature
      3) heating/cooling transfer coefficients
      4) heating/cooling retention coefficients
      5) primary equipment lag time

4. Peak Demand Limiting
   a. The automation system shall include a software program to perform Peak Demand Limiting (PDL). The PDL program shall monitor the rate of electrical power consumption and forecast the total demand during each demand interval. If the predicted demand exceeds a user-defined demand limit, the PDL program shall automatically shed loads to reduce the demand.
   b. The PDL program shall be able to accommodate a minimum of 32 demand meters. It shall be possible to define a minimum of 32 separate service areas, each of which may have different power company demand interval pulse times.
      1) It shall be possible for the operator to set load schedules and demand limits in each service area separately. Each service area shall perform demand prediction and subsequent load shedding and restoring independently.
      2) It shall be possible to assign unique scaling factors to each KWH meter to convert pulses to KWH. It shall also be possible to assign a default value factor to each meter should that meter or associated monitoring hardware fail.
   c. Loads shall be divided into user defined load shed schedules, that include a minimum of four priority levels. All loads in the lowest priority level must be shed in a rotational manner before any load in the next priority level is shed. Each load shall be defined as to its rated power consumption in KW or HP and its maximum off time, minimum off time and minimum on time. These time parameters shall ensure load is not shed or restored too frequently to cause damage to a load.
      1) The PDL program shall be designed to accept sliding window metering systems as well as time of day metering. The demand interval length shall be set according to the electric rate schedule.

d. The demand shall be predicted each minute, and loads shed as needed. If all sheddable loads are shed by the PDL program and it is forecast that the user-defined demand limit will be exceeded, an alarm message shall be printed.

e. The automation system operator shall be able to request the following reports.
   1) Meter area load table detailing assigned load parameters such as load name, KW rating, minimum on time, minimum off time, etc.
   2) Meter report for a meter area detailing name of meter, scaling factor, default failure rating.

f. The automation system shall provide the following automatic reports.
   1) 24 Hour Energy Summary: This summary will list the demand versus time for each shed set point in the last 24 hours.
   2) Monthly Summary Report: This summary list the peak demand occurrences for each meter area for a one month period.
   3) Printed Plot of Actual Demand versus Time: For the previous 24 hours the system shall print a plot for each meter area detailing time, KWH used and set point.

5. Duty Cycle Control:

a. The automation system shall include a Duty Cycle Control Program (DCCP). The DCCP shall periodically stop and start loads according to various on/off patterns. The loads shall be cycled such that there is a net reduction in both the electrical demand and the energy consumed.

b. The DCCP shall be capable of cycling loads differently at various times throughout the day as well as various schedules from day to day. The DCPP shall be capable of monitoring space temperatures and automatically altering specified duty cycle patterns to maintain comfort limits.

c. It shall be possible to designate loads which are supplied power from one electrical feeder. A time delay between successive starts to these loads shall be provided to prevent demand peaks.

d. For each load, the operator shall be able to assign:
   1) % off time (0% - 100%)
   2) Control intervals (15-120 minutes)
   3) Maximum off time
   4) Minimum off time
   5) Time and day load is to be cycled
   6) Feeder identifier
   7) Time delay between successive starts

e. The following reports shall be provided detailing.
   1) Loads assigned to DCCP
   2) Loads operating parameters
   3) Strategy report detailing cycle strategies, time and day strategies are activated.

6. Enthalpy Optimization

a. The automation system shall include a software program to perform enthalpy optimization (EO) of air handling units. The EO program shall calculate the enthalpies of both the outside air and the return air, and shall control the mixture of outside air and return air to minimize energy consumption.

b. The EO program shall compute enthalpy from the dry bulb temperature and relative humidity of the outside and return air. The program shall use all necessary tables and equations to calculate the proper enthalpies.
   1) The EO program shall control the mixture of outside air to return air, based on the desired supply air temperatures and the relative outside and return air conditions.

c. The automation system operator shall be able to:
   1) select whether each air handler is to be controlled by the EO program or the mixed air local loop controller.
   2) request a display showing the outside and return air temperatures, humidities, enthalpies and control mode for each air handler under the EO program control.
   3) adjust the minimum interval at which the EO program computes enthalpies and optimizes the operation of the air handlers.

I. Chilled Water Reset and Chiller Plant Optimization
1. The automation system shall include a software program to perform chilled water reset (CWR). The CWR program shall optimize the use of chilled water in either of two ways. The chilled water supply reset shall be based on either maintaining a constant return temperature or supplying sufficient cooling to satisfy zone requirements.
   a. When the CWR program is based on maintaining a constant chilled water return temperature, the software shall incrementally adjust the supply water set point to achieve the desired space conditions. It shall be possible to individually monitor and control each chilled water loop.
   b. When the CWR program is based on supplying sufficient cooling to satisfy zone requirements, the software shall incrementally adjust the chilled water set point upwards until at least one zone is requiring additional cooling.
   c. The system operator shall be able to define, modify and delete the following parameters:
      1) loops to be enabled/disabled for CWR
      2) high and low reset limits
      3) incremental adjustment magnitude
      4) sampled time interval
   d. A log shall be provided detailing each parameter associated with a chilled water reset loop.
      1) The purpose of this application program shall be to control the chiller plant in the most efficient way by: Optimizing the selection and loading of chiller sets to match the cooling load.
      2) The decision whether to have one or two or more chiller sets on-line shall be optimized by comparing actual chiller plant load and the refrigerant head to a calculated changeover load schedule. The calculated changeover shall be based on the capacity limit or break even efficiency between one or two chillers or two or three chillers, etc., for different load conditions. The Automation Subcontractor shall obtain from the chiller manufacturer partial load characteristics of kw or lbs stm/hr vs load for the design refrigerant head conditions. This information shall be arranged in a kw or lb/hr per ton vs plant load for each alternate plant line-up such that the program can select the most efficient chiller combination for the current load and head conditions. The chillers that are on-line shall be run in unison for maximum efficiency. Provide all software to monitor the status and operation of the specified chillers, under fully automatic control for chiller loading optimization.
      3) Program shall monitor the total air conditioning load by measuring the flow rate and supply and return temperatures of the chilled water distribution system and shall reset the chilled water supply temperature to the highest value that will satisfy the load. The program shall raise or lower the chilled water temperature incrementally magnitude and time interval shall be adjustable from the keyboard.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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 23 09 01

SECTION 23 09 93

CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Control Contractor shall furnish and install a complete Building Automation System including all equipment, accessories, wiring and instrument piping, control devices and components required for a complete and functioning system.

B. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and shall not be custom designed especially for this project. All components shall have been thoroughly tested and proven in actual use.

C. The building control system shall possess a fully modular architecture, permitting expansion through the addition of more stand-alone control units, sensors, actuators, and/or operator terminals.

D. The system shall be compatible with BACNET. The system shall have a graphic system which is compatible with the system currently installed, which is a Distech Control system, installed and maintained by ADVANTEX Solutions; contact Giovanni Natale from ADVANTEX Solutions (T: 718-278-2290, C: 917-682-2521, E-mail: gnatale@advantexsolutions.com).

E. The equipment, components, and accessories used should be suitable for environment as well as operating condition.

F. The manufacturer's wiring diagram shall identify and color code all internal and external wires.

G. Control equipment, valves, panels, and dampers shall bear the manufacturer's name plate.

1.2 RELATED WORK

A. Work of this section shall comply with the requirements of the Contract Conditions (General and Supplementary), with sections of Division 1 - General Requirements, with the drawings, and all other Contract Documents.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.3 REFERENCES

A. NFPA 70, NFPA 90A - National Fire Protection Association

B. SMACNA - Low Pressure Duct Work

C. ASHRAE 15

D. ANSI B31.1; ANSI B31.5; ANSI B31.9; ANSI C12

1.4 SUBMITTALS

The Contractor shall submit the following to the Architect/Engineers for approval:

A. Submittals/Drawings
   1. The Control Contractor shall submit prior to installation a set of installation drawings and control strategies for review by the consultant and/or owner's representative. These drawings shall include the physical location of building control system equipment and system architecture. The complete sequence of operation of the control system shall be provided.
   2. Upon completion of the installation and final system adjustment, the Control Contractor shall provide a full set of as-built drawings of the installation and the control strategies.

B. Manufacturer's Data
   1. Dampers, valves, and operators
   2. Controllers, including complete wiring and connection diagrams
   3. Temperature sensors, including complete wiring and connection diagrams
   4. Temperature and pressure indicators
   5. Switches, relays, transducers, including complete wiring and connection diagrams
   6. Control Panels

1.5 QUALITY ASSURANCE

A. The Control System Contractor shall provide a list of no less than ten similar projects which have building control systems as specified. These projects must be on-line and functional such that the Owner's representative would observe a direct digital control system in full operation.

B. The control system shall be installed complete in all respects by competent mechanics, regularly employed by the manufacturer of the control system.

C. Bids by Wholesalers, Contractors, Franchised Dealers or any firm whose principal business is not that of manufacturing and installing automatic temperature control systems shall not be acceptable.

D. Single source responsibility of supplier shall be the complete installation and proper operation of the BAS and control system, and shall include debugging and calibration of each component in the entire system.

E. All electronic equipment shall conform to the requirements of FCC regulation Part 15, Section 15, governing radio frequency electromagnetic interference and be so labeled.

F. All system components are to be designed, built, and installed to be fault tolerant as follows:
   1. Satisfactory operation without damage at 110% above and 85% below rated voltage and at ±3 hertz variation in line frequency.
   2. Static, transient, and short circuit protection on all inputs and outputs.
   3. Communications lines protected against incorrect wiring, static transients, and induced magnetic interference.
   4. All real time clocks and data file RAM shall be battery backed for a minimum of 72 hours in the host, and 8 hours in the SAC panels.
   5. Bus connected devices to be AC coupled or equivalent so that any single device failure will not disrupt or halt bus communication.

G. All pressure piping, valves, and accessories should be hydraulically/pneumatically tested to 1.5 times the operating pressure.

H. Performance test should be carried out for all instruments, control equipment, and accessories as required.

I. Factory performance test results should be submitted with the equipment drawings.

1.6 SYSTEM TURN-OVER AND SERVICE

A. Upon completion of the installation, the Control System Contractor shall start up the system and perform all necessary testing and run diagnostics to ensure proper operation. 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. The acceptance test shall consist of verifying the ability of the SAC panels to communicate with each other, communicate with the central system (located in the power plant), verifying calibration of each sensor and/or transmitter, verifying the operation of each control point and verifying the operation of the control algorithms. The contractor shall provide all equipment and support to demonstrate these items.

1.7 TRAINING/OWNER'S INSTRUCTION

A. The Control System Contractor shall provide two copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the system. The Control Contractor 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 40 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.

1.8 WARRANTY

A. The building control system, including all hardware, software components and end devices shall be warranted for a period of one (1) year following the date of beneficial use. Any manufacturing defects arising during this period shall be corrected without cost to the owner.

1.9 APPROVED MANUFACTURERS

Distech Controls

PART 2 - PRODUCTS

2.1 SOFTWARE

A. The Control System Subcontractor shall provide all software required for efficient operation of all the control system functions required for this Specification. Software shall be modular in design for flexibility in expansion or revision of the system. Software shall be loaded into the system via a compact "floppy" disk from the operator's terminal. The operator's terminal shall also be capable of copying the system software on a "floppy" disk for archival purposes.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions and with recognized practices, to ensure that equipment complies with requirements and serves intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

3.3 WATER SIDE ECONOMIZER FOR NORTH SIDE FAN COILS

A. SUMMER: In SUMMER MODE, the operation of the Waterside Economizer is disabled. The isolation valves CV-C-1 and CV-C-2 located in the Cellar C pump room are CLOSED. The bypass valve CV-C-3 located on the North Side Return Pipe is OPEN.

B. WINTER:

1. In Winter Mode, the operation of the Waterside Economizer is ENABLED. The chiller plant is DISABLED.
2. When the BMS operator enables chiller #1 or chiller # 4 (electric chiller), the chiller plant shall initiate the standard startup procedure: turn ON the primary water pumps, the CHW boosters (P-3C and P-4C) for North Side Fan Coil System and the Waterside Economizer system shall be DISABLED. All the cooling valves at the AC units across the campus should be CLOSED.
3. When the Outdoor Temperature is below 45 deg F (adjustable), the BMS should alert the BMS operator to disable the chiller plant and to enable the Waterside Economizer System. After 30 minutes (adjustable) if the operator did not DISABLE the chiller plant, the BMS shall issue a critical alarm and shall initiate the standard shutdown procedure for the chiller plant. After the chiller plant shutdown is complete, the BMS shall initiate the startup procedure described in Waterside Economizer Sequence of Operation.

C. Waterside Economizer System
1. Startup procedure: When the Waterside Economizer is ENABLE, the isolation valves CV-C-1 and CV-C-2 shall OPEN, and the bypass valve CV-C-3 shall CLOSE. The CV-10-4 and CV-10-5 shall OPEN. After the position of the valves is proven, all the fan coils valves for the North Side should OPEN, the CHW pumps P-3C, P-4C, P-17B, P-18B, and the Glycol Pumps P-19B and P-20B shall start. After 30 minutes (adjustable), the Waterside Economizer should operate in temperature control.
2. Shutdown procedure: When the Waterside Economizer System is disabled, the Glycol Pumps P-19B and P-20B and the CHW pumps P-3C, P-4C, P-17B, P-18B shall turn OFF

and the DC-1 and DC-2 fans shall be OFF. The CVs shall maintain their default NO or NC position.

D. Dry-cooler DC-1, DC-2 and Glycol Pumps P-19B and P-20 B control

1. The Glycol Pumps P-19B and P-20B and the Dry Coolers DC-1 and DC-2 should operate in a lead/lag mode and should alternate every 168 hours.
2. When the Waterside Economizer is ENABLE, the CHW Booster Pumps P-3C, P-4C, P-17B , and P-18B should start. The CV valves on the Glycol Loop shall OPEN. After the CV valves are confirmed OPEN, the Pumps P-19B and P-20B should start at minimum speed and the DC-1 and DC-2 should operate the fans to maintain the setpoint.
3. The Dry-cooler system shall maintain the Glycol Supply Temperature (GST) set point of 45 deg F (adjustable). The Dry cooler system shall turn ON/OFF the fans to maintain the GST setpoint. When all the fans are OFF the Glycol Pumps P-19B and P-20B should modulate the speed to maintain the GST setpoint. The Pump speed should decrease as the GST drops and should increase when the GST increase above the GST setpoint. When the Glycol Pumps speed is at 30% and the GST continues to drop, the system shall turn OFF one pump.
4. With ONE Glycol Pump running and the speed is 85%, the system should turn ON the second pump and both pumps should be at 50%.
5. When ONE pump is at 30% speed and the GST is 1 deg F (adjustable) below the setpoint, the System should CLOSE the CV to DC-1 or DC-2 and should maintain only ONE Dry Cooler in operation. When the GST increases 1 deg F above the setpoint, the system should OPEN the CV valve and should be in Glycol Pump control described above at 2. and 3.
6. When the CHW Booster Pumps P-3C, P-4C, P-17B, and P-18B are OFF, the DC-1 and DC-2 fans should be OFF, the Glycol Pumps P-19B and P-20 B should be OFF.
7. When the CHW Booster Pumps P-3C, P-4C, P-17B, and P-18B are ON, the DC-1 and DC-2 fans should be ON and the Glycol Pumps P-19B and P-20B should be ON and the Glycol Loop should be in control of the GST.
8. The GST setpoint shall be reset as follows: When the Outdoor Temperature is 45 deg F (adjustable) or above, the GST setpoint should be set to 50 deg F (adjustable). When the Outdoor Temperature is 35 deg F (adjustable) or below, the GST setpoint should be 45 deg F(adjustable). The GST setpoint should be linear between 45 deg F and 35 deg F.

E. CHW Booster Pumps Control P-17B and P-18B

1. The CHW P-17B and P-18B speed shall be the same and shall follow P-3C and P-4C speed and shall operate in lead /lag mode. The pumps shall alternate every 168 hours. The Pump P-17B should follow P-3C command (adjustable) and P-4C should follow the pump P-4C command (adjustable).

F. CHW Booster Pumps Control P-3C and P-4C

1. The dual temperature pumps P-3C and P-4C operate on lead-lag and shall alternate every 168 hours. The CHW Booster Pumps shall operate when the chiller is ON or when the Waterside Economizer system is ENABLE. The dual temperature pump speed shall be adjusted as follows:

2. The BMS shall count the number of OPEN fan-coil valves, Count (OPEN).
3. The BMS shall Count the number of CLOSED fan-coil valves, Count (CLOSED).
4. When the Count (OPEN) is less than 10 (adjustable), the Dual Temperature Pump shall reduce the speed at a slow rate.
5. When the Count (OPEN) is higher than 20 (adjustable), the Dual Temperature Pump shall increase the speed at a slow rate.
6. When the Count (OPEN) is between 10 (adjustable) and 20 (adjustable), the Dual Temperature Pumps speed shall remain unchanged.
7. When the CHW Pumps Speed is 30% (adjustable), the system should turn OFF one CHW pump. If ONE pump is operating at 30% (adjustable) and all the fan-coil valves position are below 5% (adjustable), the CHW boosters should turn OFF. When a minimum of 20 (adjustable) fan coil valves are open 20% (adjustable) or more, all CHW boosters should be turn ON and should start to control as described above item 4, 5, and 6.

G. Alarms

1. The BMS should send a critical alarm when the pump status is different than the pump command.
2. The BMS should send a critical alarm when the CV valve status is different than the CV command.
3. When a pump fails or is commanded OFF by the operator, the second pump should be started, and a critical alarm is sent.

3.4 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 requirements.

B. When possible, field correct malfunctioning controls, then retest to demonstrate compliance. Replace controls which cannot be satisfactorily corrected. Refer to Section "Testing and Balancing".

C. Checkout of the installation shall be conducted by the Contractor with a representative of the Owner and Architect. The checkout shall consist of verifying the ability of the S.A.C. panels to communicate with the operator's console, verifying calibration of each sensor and/or transmitter, and verifying the operation of each control point.

D. All software processes shall be thoroughly demonstrated to the Owner's representative and Architect. Alarm conditions shall be simulated for conformance. Analog control points shall be exercised through their entire range. All control interlocks and sequences shall be completely verified. The checkout shall be a thorough and exhaustive review of the installation to assure proper operation of the total system.

3.5 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.

B. The Control System contractor shall provide two copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the system. The Control System contractor 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 24 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 23 09 93

SECTION 23 20 00

PIPING FOR HVAC

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 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 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.

1.4 SUBMITTALS

A. Refer to Section 01 31 46, "Special Requirements for Mechanical and Electrical Work", and submit shop drawings.

1.5 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 New York.

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.

1.6 WARRANTY

A. Refer to Section 01 31 46, "Special Requirements for Mechanical and Electrical Work".

PART 2 - PRODUCTS

2.1 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. High temperature hot water (HTHW) supply and return piping shall be ASTM A-106 Grade B.

D. All brass piping shall be standard or extra heavy weight 85% red brass semi-annealed seamless-drawn, in conformance with the ASTM B-43, as manufactured by Anaconda, American Brass Co., Chase Brass and Copper Co., or Revere Copper and Brass, Inc.

E. 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.

F. All galvanized steel piping shall be standard or extra strong weight, as specified, in conformance with the ASTM A-53 Grade B. Pipe shall be hot-dripped galvanized with Prime Western smelter and not wiped.

G. 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.

H. 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.

I. Welding Piping
1. All fittings for welded piping shall be as manufactured by Tube Turn, Grinnell, Bonney Forge or equal as approved by the Architect. The fittings shall be of the same weight and material as the piping to which they are attached.
2. For piping 2½" and larger, full size branch connection shall be made with manufactured welding tees, branch connections for less than full size, shall be made with welding tees or with Weldolet forged branch outlet fittings. Fish mouthing, shaped nipples, and stubbing is not permitted.

J. Welding outlet fittings shall be Weldolets as manufactured by Bonney Forge, Inc., or approved equal 2 or 3 and smaller branches shall be made with thredolets as made by Bonney Forge or approved equal.

K. Weld ells shall have a center line radius not less than diameter of the pipe.

L. All flanges shall be weld neck type, ANSI B16.5 ASTM 181 Grade I. All systems, except where otherwise noted, shall be 150 lbs. Class, forged steel.

M. Instrumentation connections on all systems shall be provided by welding threaded 2000# forged steel half couplings to the pipe.

N. All pipe to be welded shall be cut off clean and beveled. All welding shot shall be removed.

O. Composition of welding electrodes shall be in accordance with manufacturer's recommendations.

P. Backing rings shall be used for all welded piping for high temperature hot water (HTHW). HTHW piping to be butt welded in sizes 2" and larger, socket welded in sizes 1½" and smaller. Rings shall be carbon steel with knock off spacer pins, for Schedule 40 and/or Schedule 80 pipe dimensions, as manufactured by Tube Turn, Inc. or Robven Backing Ring Co. Smaller branches on HTHW shall be made by using "Weldolets" or approved equal fittings. Ells for HTHW systems shall be long radius. All flanges shall be welding neck flanges ASA B16,5 ASTM 181 Grade L,300 lbs. Class, forged steel.

Q. Pipe welding shall comply with the provisions of the latest revision of the applicable code, whether ASME Boiler and Pressure Vessel Code, ANSI Code for Pressure Piping B31, or such state or local requirements as may supersede codes mentioned above.

R. Before any pipe welding is performed, submit a copy of the welding procedure specifications together with proof of its qualification as outlined and required by the most recent issue of the code having jurisdiction. Submittal shall comply with ANSI/ASME B31.1/B31.9.

S. Before any operator shall perform any pipe welding, also submit the operator's qualification record in conformance with provisions of the code having jurisdiction, showing that the operator was tested and certified under the Procedure Specification as before mentioned. Submittal shall comply with ANSI/ASME B31.1/B31.9.

T. Assume responsibility for the quality of welding done and repair or replace any work not in accordance with these specifications.

U. In addition, all pipe welding procedures and procedures for qualification of pipe welding operators shall comply with the requirements of the American Welding Society.

V. Cut weld test plugs at locations selected at random by the Architect. The test plugs shall be tested by the testing agency approved for this project. Failure of the test plugs to meet the standards of the specified codes and agencies shall result in the complete removal and replacement of the joint and retesting of the operator who performed the welding. The removal and replacement of the joints shall be at no additional cost to the Owner.

W. Pipe Schedule: Pipe for the various services shall be as follows:

Service	Material	Schedule
Overflow & Drain	Galv. Steel	40
Chilled Water & Dual Temperature Water	Steel	40
Glycol	Steel	40
Vent (water discharge) above ground	Copper Tubing	Type "L" (soft)

X. The Contractor shall have the option to use Type K copper for hot water and chilled water piping up to and including 2", and brazed Type L copper for glycol water piping up to and including 2”.

2.2 FITTINGS

A. Fittings shall be specified under "Fitting Schedule" for various services.

B. Welding fittings shall be of the same material and schedule as the pipe to which they are welded. Welding elbows shall be long radius pattern unless clearance conditions necessitate the use of standard radius pattern. Welding fittings shall be as made by Tube-Turn.

C. 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

D. All fittings used at expansion loops or bends shall be extra heavy.

E. Cast-iron, malleable-iron and bronze fittings shall be of Crane manufacturer or approved equal.

F. 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.

G. 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. Unions shall be manufactured by Crane or approved equal.

H. Brass pipe threads shall be cut with special brass treading dies, and the joints shall be made up with lubricant. Strap wrenches, or equivalent, shall be used in making up brass pipe. Wrenches which gouge or scar the pipe will not be used.

I. Solder for each solder-type fitting shall be of 95% tin and 5% antimony or silver solder, as specified herein. Refrigerant piping joints shall be made with silver solder.

J. Unless otherwise specified, all flanged joints shall be fitted with Manville or equal ring gaskets designed for the intended service.

K. Fitting Schedule: Fittings for the various services shall be as follows:

Service	Size	Material	Weight	Type
Cold Water	ALL	Bronze Wrought Copper	125# 125#	Brazed Solder Grooved
Chilled Water and Dual Temperature Water	2" & Below 2½" & Above	CI Steel DI	125# Sch. 40	Screwed Welding Grooved
Glycol	ALL	Steel or Wrought Copper	Sch. 40 125#	Welding Solder

2.3 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. All vertical piping shall be anchored by means of heavy steel clamps securely bolted or welded to the piping, and with end extension bearing on the building.

F. All vertical piping shall be guided at each floor by use of clamps fastened to building structure. Provide 360° protective saddle at guides. Saddles shall be fastened to pipe or insulation.

G. Vertical runs of pipe not over 15 feet long shall be supported by hangers placed not over one foot from the elbows on the connecting horizontal runs.

H. Vertical runs of pipe over 15 feet long but not over 60 feet long and not over 6 inches in size, or not over 30 feet long and not over 12 inches in size, shall be supported on heavy steel clamps. Clamps shall be bolted tightly around the pipes and shall reset securely on the building structure without blocking. Clamps shall be welded to the pipes or placed below couplings. Clamps shall be B-Line Fig. B3373 or equal.

I. For all chilled water, dual temperature water, makeup water and insulated refrigerant piping, provide "Insulshield" as made by Insulcoustic Corp. or pipe covering protection shield B-Line Fig. B3151 (C&P Fig. 265P) with steel shield min. 9 inches long, with vapor barrier jacket. For all chilled water, dual temperature water, makeup water and insulated refrigerant piping supported using standard clevises, provide a segment of rigid insulating block below the pipe in order to prevent the crushing of insulation at the clevis hanger. For steam, condensate, hot fuel oil and hot-water heating piping 2 inches and smaller, same as above. For steam, condensate and hot-water heating and HTHW piping 2½ inches and larger, provide steel pipe protection saddles such as B-Line Fig. B3160 (C&P Fig. 353 series).

J. 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")
4 inch 5 inch	⅝ inch	12'-0"
6 inch	¾ inch	12'-0"
8 inch & above	⅞ inch	12'-0"

K. 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".

L. 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.

M. 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.

N. All water piping connected to rotating equipment within all mechanical spaces shall be isolated from the building structure by means of vibration hangers inserted in the hanger rods. The vibration hangers shall consist of a steel spring in combination with a double deflection neoprene element within a rectangular steel housing. Combined static deflection shall be 1.375" minimum. Hangers shall have capability of supporting the piping at a fixed elevation during installation and shall incorporate an adjusting device to transfer the load to the spring. Deflection shall be indicated by means of scale. Vibration hangers shall be type PCDNHS made by Mason Industries. Provide flexible pipe connectors at all pump suction and discharge piping.

O. Where additional steel is required for the support of hangers, furnish and install same subject to the approval of the Architect. Piping and ductwork shall not be suspended from concrete slab construction.

P. 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.

Q. 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.

R. All heavy piping is defined as follows:
1. individual pipes having a nom. dia. greater than 12 inches.

2. groups of pipes consisting of more than three 8 inches, or more than two 10-inch nom. 1 dia. pipes,
3. Any combination of closely spaced pipes weighing more than the equivalent of above or 15 lb. per lin. ft., shall be supported at all cross points with overhead floor beams by fastening to the flange of such beams with steel clamps or other suitable means.

S. Where such heavy piping runs parallel with the floor beams properly designed auxiliary steel must be provided. The spacing of such auxiliary steel supports shall in no case be greater than the spacing of the floor beams running perpendicular to the corrugations of the permanent slab steel forms.

T. 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.

U. Rigid type grooved mechanical couplings shall be complete with reverse-angle bolt pads to meet support and hanging requirements corresponding to ANSI B31.1, B31.9, and NFPA 13.

PART 3 - EXECUTION

3.1 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.

3.2 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 ensure 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 pipe supports within 12” of every elbow.

J. 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.

K. 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.

L. 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.

M. 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.

N. 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.

O. Vertical sections of main risers shall be constructed of pipe lengths welded together. No couplings shall be used.

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.

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.

AA. Miscellaneous drains, vents, reliefs, and overflows from tanks, equipment, piping, relief valves, pumps, etc., shall be run to the nearest open sight drain or roof drain. Provide capped drain valves whenever required for complete drainage of piping, including the system side of all pumps.

BB. All drain piping from condensate drain pans shall be properly trapped in accordance with the static pressures involved. Provide cleanout at first change in direction or before the trap. Condensate drain piping sizes shall, as a minimum, shall meet or exceed the connection size on the equipment and be not less than 1½" except that fan coil unit drains may be 1”.

CC. Contractor shall utilize a Smog-Hog (or similar) type local exhaust system vented to the outdoors, when welding steel pipe and/or soldering pipe inside the building.

3.3 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 23 20 00

SECTION 23 21 23

PUMPS FOR HVAC

PART 1 - GENERAL

1.1 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.

1.2 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 pumps as shown and scheduled on the Drawings and hereinafter specified.

1.3 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in the manufacture 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 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.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 IN-LINE PUMPS

A. Furnish and install in-line pumps where shown on the plans and as specified.

B. The pumps shall be of the horizontal, oil-lubricated type, specifically designed and guaranteed for quiet operation. Suitable for 125# working pressure.

C. The pumps shall have a ground and polished steel shaft with a hardened integral thrust collar. The shaft shall be supported by two horizontal sleeve bearings designed to circulate oil. The pumps are to be equipped with a watertight seal to prevent leakage. The motor shall be non-overloading at any point on pump curve. Impellers shall be of bronze construction.

D. The motor shall be of the open, drip-proof, sleeve-bearing, quiet-operating, rubber-mounted construction.

E. Motor efficiencies must meet or exceed that specified in Section 01 31 46.

F. All pumps in VFD application must have flexible couplings and inverter-duty motors.

2.2 HORIZONTAL SPLIT CASE PUMPS

A. The casing shall be cast iron, double suction, horizontally split. Pumps shall be assembled on heavy duty fabricated structural steel base plates, which bases must include drip rim with tapped drain connections which shall be piped to nearest floor drain. It shall incorporate replaceable bronze casing rings locked in place and protected against rotation by two monel pins; a vent in the highest point in the casing and a drain in the lowest point; standard 125# ANSI suction and discharge flanges. Impellers shall be bronze, double suction, enclosed type and cast in one piece, hydraulically and statically balanced, keyed to the shaft. Impeller and casing castings shall be clean and show no visual signs of non-homogeneity. Pumps shall have capacities as scheduled on the Drawings. Pumps shall be selected to operate at or near their point of peak efficiency thus allowing for operation at capacities of approximately 25% beyond design capacity. In addition, the design impeller diameter shall be selected so that the design capacity of each pump (GPM and TDH) shall not exceed 90% of the capacity obtainable with maximum impeller diameter at the design speed for that model. Efficiency and unit design BHP shall be quoted and guaranteed. Maximum head shall occur at and only at the no-flow condition. Stuffing box housing be deep enough to allow for a single John Crane type (1) mechanical seal. Each pump shall be flexibly coupled to a motor, Class B insulation, DP enclosure. Shaft shall be stainless steel. Bearings shall be single row, ball type and oil lubricated. Maximum BHP shall not exceed nominal motor nameplate rating.

B. In all cases, motor sizes shall be selected to be completely non-overloading over the entire performance range of the particular pump involved. A flexible coupling with coupling guard shall be used. Provide John Crane cyclone separator to insure clean water flushing of the seal faces.

C. Pumps shall have replaceable case wear rings.

D. Seals to be capable to withstand system condition for water temperature and chemical treatment content as hereinafter specified under "Water Treatment".

E. Casings shall be provided with suitable steel lifting lugs.

F. Pump shall be drawn down slightly on foundation bolt nuts. Provide a form or dam around the contour of the bed plate. Pour grout through holes, provided for this purpose, in sufficient

quantity to reach a level of :" to 1" above the bottom of the bed plate. Allow grouting to set thoroughly then proceed with pipe connection.

G. Provide OSHA rated steel coupling guard.

H. Motor efficiencies must meet or exceed that specified in Section 01 31 46.

I. All pumps in VFD applications must have flexible couplings and inverter-duty motors.

2.3 END SUCTION PUMPS

A. The casing and suction head of the pump shall be of cast iron material and end suction, vertical split type. Casing and suction head shall be equipped with 125# ANSI flanges. Pumps shall be assembled on heavy duty fabricated structural steel base plates, which bases must include drip rim with tapped drain connections, which shall be piped to nearest floor drain. The impeller shall be of the enclosed type and shall be bronze. The impeller shall be statically and hydraulically balanced and keyed to the shaft. Efficiency and unit maximum BHP shall be quoted and guaranteed. Maximum head shall occur at and only at the no flow condition. The shaft shall be of steel material and removable shaft and shall be stainless steel. Bearings shall be single row, ball type and oil lubricated.

B. Pumps shall have replaceable case wear rings.

C. Stuffing box housing shall be deep enough to allow for a single John Crane type (1) mechanical seal. Each pump shall be flexibly coupled to a motor, Class B, DP enclosure. A flexible coupling with coupling guard shall be used. Except where otherwise noted, bearings shall be grease lubricated. Seals to be capable to withstand system condition for water temperature chemical treatment content as hereinafter specified under "Water Treatment". Provide John Crane cyclone separator to insure clear water flushing of the seal faces.

D. Pumps shall have capacities as scheduled on the Drawings. Pumps shall be selected to operate at or near their point of peak efficiency thus allowing for operation at capacities of approximately 25% beyond design capacity. In addition, the design impeller diameter shall be selected so that the design capacity of each pump (GPM and TDH) shall not exceed 90% of the capacity obtainable with maximum impeller diameter at the design speed for that model or as approved.

E. Casings shall be provided with suitable steel lifting lugs.

F. Pump shall be drawn down slightly on the foundation bolt nuts. Provide a form or dam around the contour of the bed plate. Pour grout through holes, provided for this purpose, in sufficient quantity to reach a level of :" to 1" above the bottom of the bed plate. Allow grouting to set thoroughly, then proceed with pipe connections.

G. Provide OSHA rated steel coupling guard.

H. Motor efficiencies must meet or exceed that specified in Section 01 31 46.

I. All pumps in VFD applications must have flexible couplings and inverter-duty motors.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall examine location where pumps 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.

3.2 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. Add concrete under structural members of pump base and grout around the base as required by manufacturer's written instruction.

C. Coordinate with other work as necessary to interfere installation of equipment with other components of systems.

D. Install all pumps with a minimum of five (5) pipe diameters of straight pipe upstream of pump suction connections or provide a suction diffuser. If the suction diffuser is provided, it must contain an integral strainer and the Y-strainer required on the suction piping to the pump shall be omitted.

E. For any pump which, through balancing, the Contractor is not capable of achieving the design flow and pressure, impeller trimming, a new impeller and/or a new motor shall be provided at no additional cost. If a new motor is provided of larger horsepower, then any required electrical work shall also be included at no additional cost. If necessary, larger motor starters, VFDs or disconnects shall be provided along with any larger conduits, wire sizes or fuses.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment and after motor has been 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 - Test and Balancing.

B. All pump casings shall be hydrostatically tested at 1 ½ times design working pressure. The pump manufacturer shall be responsible for his service department aligning in the field prior to start-up of all flexibly coupled units. Alignment shall be with dial indicator with accuracy of plus or minus .002 inches. The pump manufacturer must submit a written report certifying that the alignment work had been performed by his personnel and that the pumps are ready for operation.

END OF SECTION 23 21 23

SECTION 23 25 00

WATER TREATMENT AND CLEANING

PART 1 - GENERAL

1.1 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.

1.2 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 water treatment and cleaning as shown on the drawings and hereinafter specified.

B. The Contractor shall engage the services of a water treatment contractor who shall provide a complete water treatment service. The service shall include furnishing and application of all chemicals, at least one visit a month to collect samples for chemical analysis at the water treatment company's laboratory, and all necessary inspection, adjustment, and maintenance of the chemical treating devices. Complete chemical control of the treatment shall be included. Reports shall be furnished to Architect after each visit.

C. Water treatment shall be applied concurrently with the operation of each circulating water system for a period of one year. An initial dose of treatment chemical shall also be applied immediately after each system is initially filled with water if operation is to be delayed after filling.

D. In addition to the chemicals indicated, slimicides and algaecides shall be provided as necessary. Chromate and phosphate will not be acceptable. All chemicals shall be approved by local and state agencies having jurisdiction for discharge to the sewer system.

E. The firm's water treatment laboratory shall be equipped to analyze water in accordance with the statement methods of the American Public Health Association.

F. Water treatment contractor shall provide chemical feeding devices during the period of this contract. At the termination of the contract, the treatment equipment shall belong to the Owner.

G. Provide a water treatment program for the following systems:
1. Glycol and Chilled water closed system.

H. The new boiler water treatment system shall be connected to existing boilers water treatment system. Provide piping and valves as required.

1.3 QUALITY ASSURANCE

A. Firms regularly engaged in the 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.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

B. Submit documentation of acceptability of chemicals for discharge to the sewer system.

1.5 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 CHEMICAL TREATMENT CLOSED CHILLED AND GLYCOL SYSTEMS

A. Provide a Nitrite based material to maintain the following conditions in each closed water system.

	Glycol & Chilled Water
pH	7.5 - 9.0
Nitrite as NO2	300 - 400 ppm

2.2 CHEMICAL TREATMENT - CLEANING - DEGREASING

A. Provide a supervised program of cleaning and degreasing chemicals used in the specified systems prior to start-up. Sufficient chemicals shall be added to each system to establish a concentration of 120 ppm degreasing chemicals containing 20% dioctysulfocuccinate and a concentration of 240 ppm of cleaning chemical containing 15% polyacrilate and 25% diphosphonate in the water. Systems shall then be circulated for a minimum of 8 hours, dumped, flushed, and refilled, with the correct corrosion inhibitors added for operation. Strainers are to be hand-cleaned after flushing.

2.3 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. Chilled Water and Glycol Systems:
1. Clean these systems as described for the hot water heating systems with the following exceptions:
2. Circulate the chemically treated water at ambient temperature.
3. Accomplish the chemical cleanout during a minimum of three (3) 8-hour periods.

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. If the outdoor ambient temperature drops to 32°F., and the danger of freeze-up exists, drain water systems.

2.4 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, steam piping, hot water heating and cooling, chilled water and condenser water systems and components.

B. This method of treating is to be applied to all piping supplies 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

3.1 INSPECTION

A. The 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.

3.2 INSTALLATION

A. Install water treatment equipment were shown or specified, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that water treatment systems comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of water treatment equipment with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts of motors and equipment within tolerances recommended by the manufacturer.

3.3 FIELD QUALITY CONTROL

A. Upon completion of the 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 23 25 00

SECTION 23 57 19

PLATE AND FRAME HEAT EXCHANGERS

PART 1 - GENERAL

1.1 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.

1.2 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 plate and frame heat exchangers as shown on the drawings and hereinafter specified. The plate heat exchanger manufacturer shall not sub-contract or purchase the plates for resale.

1.3 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.

1.4 REFERENCES

A. ASME Section II - Material Specification

B. ASME Section V - Non-Destructive Testing

C. ASME Section IX - Welding and Brazing qualifications

D. ASME Section VIII - Pressure Vessel Code

E. AHRI Standard 400 - Liquid to Liquid Heat Exchangers

1.5 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.6 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.7 CERTIFICATION

A. AHRI Certification
1. Plate heat exchangers shall be certified according to AHRI Standard 400 and listed on the AHRI.org site http://www.ahridirectory.org/ahridirectory/pages/llhe/defaultSearch.aspx. If heat exchanger is not AHRI certified, then the manufacturer shall provide an independent third-party field performance test using the mapped ratings, limits and tolerances of AHRI Standard 400 to verify performance to specification. Any and all cost associated with correcting a non-performing heat exchanger to meet the performance requirements shall be the responsibility of the supplier. Any cost associated with the field performance test shall be included in the price of the heat exchanger.
2. As alternate, if heat exchanger is not AHRI certified, then the manufacturer shall provide 110% of the heat transfer area of an AHRI certified heat exchanger and provide written verification of performance to specification. Any and all cost associated with correcting a non-performing heat exchanger to meet the performance requirements shall be the responsibility of the supplier.

B. ASME Certification
1. Plate heat exchangers shall be designed, constructed, and tested in accordance with Section VIII, Division I of the ASME Pressure Vessel Code, and shall be code stamped.

1.8 GUARANTEE

A. The warranty period shall be 3 years from date of shipment for AHRI certified plate heat exchangers.

PART 2 - PRODUCTS

2.1 PLATE/FRAME HEAT EXCHANGERS

A. Furnish and install, where shown on the Drawings, a plate and frame heat exchanger(s).

B. Capacity of heat exchanger shall be as scheduled on the Drawings.

C. Heat exchanger shall be Alfa Laval, Tranter, Mueller or approved equal.

D. A nameplate shall be securely attached to the exchanger in a location that is easily accessible and visible after installation. The nameplate must include working pressure, design temperature, closing dimension, surface area, media, and plate/gasket material.

E. The plate heat exchanger shall be flushed clean at factory prior to shipment. All connections shall be factory sealed to prevent the entrance of foreign material during transit.

F. Frame Components:
1. Preference will be given to single pass designs with all connections on the fixed cover.
2. The fixed and movable covers shall be of sufficient thickness for the design pressure and code requirements and shall have no welded reinforcements or stiffeners.

3. The movable cover shall be provided with a steel roller bearing for units greater than 50" in height (from bottom of feet). This allows the movable cover to be moved without additional rigging or handling equipment.
4. The carrying and guide bars shall be designed to allow for expansion of at least 15%.
5. The carrying and guide bars guiding system shall be precision manufactured of stainless steel to prohibit corrosion and facilitate movement of the plates. Painted or plated surfaces are not permitted.
6. Entire frame shall be bolted together to allow unit to be field assembled to permit rigging into place. Welding of the frame components is not permitted.
7. Plate and carrying bar design shall permit the removal or access to any plate in the plate pack without the need to remove any other plates.
8. Provide lifting lugs designed to allow lifting of the entire units flooded weight.
9. All steel surfaces shall be thoroughly cleaned and prepared for painting per SSPC-SP1063T, painting over mill scale is not acceptable. All steel components shall be Aliphatic Acrylic Polyurethane coated.

G. Connections:
1. Connections equal to or less than 2" shall be stainless steel NPT type.
   a. To avoid leakage on port area, studded port design should be provided on heat exchangers with connections greater than 2". Flanged nozzle connections are not acceptable.

H. Compression Bolts:
1. Compression bolts shall not require special tools and shall be equipped with lock washers at the movable cover to facilitate opening and closing of the unit from the fixed cover.
2. Compression bolts shall be equipped with captive nuts at the fixed cover and threaded nuts at the movable cover. Welding of the nut to the closure bolt is prohibited.
3. Bolts shall be provided with rolled threads to reduce galling and double width hex nuts to adequately distribute the load, plus ball bearing box washers at all critical closing bolts on all units greater than 50" in height.
4. Bolts shall be liberally coated with LUBRIPLATE FML-2 for lubrication and rust prevention, and covered with a plastic protective sleeving for protection from the environment and to prevent bodily injury. Zinc plating is prohibited.
5. The bolting system shall be designed so that only (4) compression bolts are required opening and closing of the unit.

I. Plates:
1. The plate and frame heat exchanger shall consist of pressed type ALLOY 304 to provide the required heat transfer area to meet the operating conditions specified.
2. Individual plates shall be pressed from a homogeneous single metal sheet in one step. No multi-stage pressing of one sheet is allowed.
3. Each heat transfer plate to be with herringbone corrugations to optimize heat transfer with nominal pressure loses. Corrugations to be designed to provide support to adjacent plates at evenly distributed support points to allow pressurization of each circuit to a full differential of 1.3 times the design pressure for one hour without buckling or deformation of the heat transfer plates.
4. All plates and gaskets shall be permanently marked to identify quality and material.
5. Each heat transfer plate shall have a built-in self-aligning system to accurately locate the plates in the frame assembly and prevent lateral plate movement and maintain maximum gasket contact under pressure.

6. Plates shall be reinforced on the upper and lower mounting slots to avoid bending hangers on the plates.
7. The plate and frame heat exchanger shall be designed to perform the capacities and pressure drops as shown on the schedule. Plates to be ALLOY 304 with 2B finish and tapered gasket grooves.
8. The plate pack shall be covered with a aluminum shroud in accordance with OSHA.

J. Gaskets:
1. Gaskets shall have relieving grooves to prevent intermixing of fluids and cause leak to flow to outside of unit.
2. One piece molded Clip-on NBRP gaskets are required and shall fit around both the heat transfer area and the port holes.
3. Preference shall be given to non-glued gasketing systems.
4. If an adhesive is necessary, it shall be compatible with the gasket material and the fluids. The adhesive shall be a 2-component epoxy glue and heat cured.

PART 3 - EXECUTION

3.1 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.

C. The plate heat exchanger shall be designed to withstand full test pressure of 390 PSI in one circuit with zero pressure in the alternate circuit.

D. Hydrostatic test shall be in accordance with ASME Section VIII, Division 1, paragraph UG-99.

E. Plate heat exchanger shall be ASME U Stamped.

3.2 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.

3.3 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 23 57 19

SECTION 23 82 13

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 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.

1.2 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.

B. Provide a separate variable frequency drive, VFD, for each motor drive.

C. Each pump shall be provided with a VFD.

1.3 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 YASKAWA 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 and an additional 16 hours of training for the Bell & Gossett pump control.

E. VFD shall be listed as UL 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).

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and 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. Pump and fan data sheets

1.5 DELIVERY STORAGE AND HANDLING

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 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. All functions of the variable speed pump control system shall be tested at the factory prior to shipment. This test shall be conducted with motors connected to VFD output and it shall test all inputs, outputs and program execution specific to this application. The manufacturer shall be fully certified by the International Standards Organization per ISO 9001. Proof of this certification shall be furnished at time of submittal.

E. Manufacturer shall be listed by Underwriter's Laboratories.

PART 2 - PRODUCTS

2.1 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. The 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 should 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 should 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 should be finger-safe.
   c. Control Stations
      1) Control stations should 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 should be equipped with a bypass switch to allow the fan or pump to operate at constant speed while the drive is being serviced. The bypasses for motors 100 HP and greater shall be solid state reduced voltage.

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 sub transient 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.

2.2 CONTROL OF VARIABLE FREQUENCY DRIVES FOR PUMPS

A. Furnish and install as shown on the plans a Powersav Variable Speed Pumping System Control model number 11D4 2P040 DPC as manufactured by ITT Bell & Gossett or approved equal for pumps with VFD.

B. The control system shall include as, a minimum, the programmable logic pump controller, variable frequency drive(s) and remote sensor/transmitters. Provide additional items as specified or as required to properly execute the sequence of operation.

C. The variable speed pump logic controller, variable frequency drive(s) and VFD bypass circuitry shall be mounted in a NEMA 12 or NEMA 3R enclosure. Unit shall not be pre-wired at the factory and shall not be arranged for a single point incoming power connection. All pumps and VFD’s

shall be separately powered. Refer to the electrical drawings for further details. Each compartment shall be isolated from other compartments. VFD manufacturers shall ship VFD to the pump controller manufacturer for incorporation of control wiring and components.

D. The pump control cabinet shall have intake fans for each VFD segment and exhaust fans for the bypass quadrant and VFD quadrants. The package shall be suitable for operation within an ambient temperature range of 0 to 40 degrees C. There shall be a fan hood over the top outlet exhaust fan. The Manufacturer shall provide certification that heat testing by the VFD manufacturer has been performed.

E. The control cabinet shall be designed and fabricated in compliance with construction code 508 of Underwriters Laboratories, Inc. The entire cabinet shall be listed by and bear the UL label. All components within the panel shall be UL-listed or recognized.

F. A door interlocked disconnect switch shall be provided for each equipment quadrant housing line voltage components.

G. The cabinet shall also include a main power disconnect switch for de-powering the entire package. This switch shall be interlocked with the power distribution compartment.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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 23 82 13

SECTION 23 82 17

COILS

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 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.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 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 .035 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.

C. Cooling coils shall have ARI Certification.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION

A. Install coils were 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.

3.3 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 23 82 17

SECTION 23 82 18

ELECTRIC DUCT HEATING COILS

PART 1 - GENERAL

1.1 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.

1.2 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 electric heating coils as shown on the drawings and hereinafter specified.

1.3 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 "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 ELECTRIC DUCT HEATING COILS

A. Furnish and install as indicated heaters as manufactured by Brasch Manufacturing Co., Indeeco, or approved equal. Voltage, size, wattage, number of steps and accessories shall be as scheduled.

B. Heaters shall be U.L. listed for zero clearance and meet all the applicable requirements of the Latest Edition of National Electrical Code or other local codes.

C. Heaters shall be made with galvanized or aluminum steel frame.

D. The terminal box shall be provided with solid hinged cover in order to minimize dust infiltration.

E. All resistance coil terminals and nuts shall be made of stainless steel, and terminal insulators and bracket bushings shall be made of high grade ceramic and securely positioned. Resistance wire shall be iron free, 80% nickel and 20% chromium. Bracket supports for the resistance wire shall be reinforced with stiffening ribs and gussets, and spaced no more than four inches apart. Heaters shall be tested dielectrically for 1000V plus twice and rated voltage or 2000V, whichever is higher. Heaters rated 150 KW and over shall be furnished with heavy duty coils, derated to 25 watts/in5 of wire surface, to insure long life.

F. Heaters shall be suitable for mounting in a horizontal or vertical duct, as shown on the Drawings, and air flow may be through the heater in either direction.

G. Electric heaters shall be of the slip-in type, unless otherwise noted. Flanged heaters shall be constructed by having a slip-in heater inserted into a flanged frame and flanges shall be independent of the terminal box.

H. Heaters shall be furnished for single or three phase power as scheduled. Three phase heaters shall be furnished with balanced three phase steps. The control voltage shall be 120 volts, internally wired through control transformer fused on the secondary.

I. Overcurrent protection shall consist of built-in and pre-wired dual element fuses with clip reinforcing springs.
   1. With one overcurrent device for each 40 ampere circuit.
   2. And with one overcurrent device for entire heater for those heaters rated 40 amperes or less only.

J. A disc type automatic reset thermal cutout in control lines, shall be furnished for primary protection. Heat limiters in all power lines shall be provided for secondary protection. In addition a disc type manual reset thermal cutout with bulb extending the length of the heater shall be furnished. Manual reset thermal cutout to be in series with automatic reset thermal cutout. All three devices shall be serviceable through the terminal box, without having to remove heater from duct. In lieu of heat limiters, disc type manual reset thermal cut-outs will be acceptable.

K. The following accessories shall be furnished and built in for each heater, except as otherwise noted:
   1. Insulated terminal box
   2. Magnetic contractors (when load exceeds control device ratings)
   3. Transformer with primary fuse protection to supply control voltage, when power supply exceeds 120 volts.
   4. Air flow switch - pressure type.
   5. P.E. switch per step, normally open, or field installed (by Electrical Contractor) electric room thermostat, as scheduled on the Drawings.
   6. Non-fused disconnect with interlocking door handle.

L. Electric duct heaters EDH-_____ shall be provided with SCR controllers. Provide transistor type room thermostat Model 701-1 as made by BRASH for each heater.

M. Electric Heaters EDH-_____ shall have Honeywell 10-step controllers Catalog No. S984F1005. Each heater shall have Honeywell 24 Volt T921A thermostat. Step controller shall have built-in transformer for 24 Volt. Terminal box of these heaters shall have fused _____ Volt connection for control voltage.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 23 82 18

SECTION 23 82 39

UNIT HEATERS

PART 1 - GENERAL

1.1 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.

1.2 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 unit heaters as shown on the drawings and hereinafter specified.

1.3 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.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 UNIT HEATERS

A. Furnish and install, where shown on the plans, propeller type unit heaters of size and type as indicated on the plans. All ratings shall be based on tests in accordance with the Standard Test

code adopted jointly by the Industrial Unit Heater Association and the American Society of Heating and Ventilating Engineers.

B. The casing shall be made of die formed steel parts, phosphatized for rust resistance, and finish with baked enamel. All hardware, both internal and external, shall be cadmium plated for rust resistance.

C. The fan blades shall be specially designed for unit heater application, and quiet operation, and shall operate in a die formed steamlined inlet. Wheels shall consist of die formed aluminum blades riveted to die formed steel spiders. Small sizes may be one piece aluminum construction. Unit heater shall have adjustable discharge louvers.

D. Unit heaters shall be properly supported from building construction with ½" diameter hanger rods and braced as required to prevent sidesway.

E. Motors used on either horizontal or projection type unit heaters shall not exceed 1750 RPM, and shall be designed for continuous operation at a temperature rise of not more than 55 deg. C. above the ambient temperature. Motor bearings where difficult to reach, shall be provided with extended oil or grease tubing.

F. Provide on-off switch with thermal overload for single phase motors.

2.2 ELECTRICAL UNIT HEATERS ONLY

A. Control box housing, all heater wiring controls and contactors shall be located at bottom of heater and equipped with swing down hinged cover. Wiring diagram shall be attached to the inside of the control box cover.

B. Units shall have a built in heavy duty 3-pole contactor.

C. Heating element shall be of non-flowing design consisting of special resistance wire enclosed in a steel sheath to which steel plate fins are brazed. Heating element shall cover the entire air discharge area for uniform heating.

D. Thermal safety cutout shall be built into system to automatically shut off heater in event of overheating.

E. Electric space thermostat shall be furnished by the unit manufacturer for installation under Division 26.

F. Disconnect switch shall be provided under Division 26.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, 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. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION 23 82 39

SECTION 26 05 00

GENERAL PROVISIONS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections wherever applicable to Mechanical and Electrical Work.

B. Section 01 31 46 – Special Requirements for Mechanical and Electrical Work shall apply.

C. "The General Conditions of the Contract for Construction" is hereby made a part of the specifications for the Electrical, Fire Signal, Security, information technology to the same extent as if written out in full. Where any article of the General Conditions is supplemented by the specifications, the provisions of such articles shall remain in effect and all the supplemental provisions shall be considered as added thereto. When any such article is amended, voided or superseded by the specifications the provisions not specifically amended, voided or superseded shall remain in effect.

D. Apply provisions of this division equally and specifically to Sections supplying labor and/or equipment and/or materials as required under Electrical Sections of Specifications.

E. Drawings are diagrammatic and are a graphic representation of contract requirements to the best available standards at the scale required.

F. Light and power and miscellaneous systems riser diagrams, as well as schematic diagrams, generally indicate connections to be used for various systems and equipment. Systems conduit and wiring shall be as required for the actual systems installed on this Project. Provide all work shown on diagrams whether or not it is duplicated on the plans.

1.2 SCOPE OF WORK

A. The Specifications and the accompanying drawings are intended to secure the provisions of all material, labor, equipment, and services necessary to install complete, tested, and ready for operation the Electrical Systems in accordance with the Specifications and Drawings. All systems shall be complete with all necessary appurtenances and minor auxiliaries, including pull boxes, offsets to clear interferences, and supports which are not shown but are needed to make each system complete in every respect. All work described in the Specifications and not shown on the Drawings, or vice versa, shall be furnished in complete working order. If mention has been omitted of any item of work or material necessary for completion of the system, then such items must be and are hereby included.
   1. Power and light distribution system (system characteristics, equipment).
   2. Panelboards lighting, power and distribution.
   3. Fuses and/or circuit breakers.

4. Installation and wiring of individual controllers including starters and VFDs. Erecting starter racks where required.
5. Installation and wiring of motor control centers.
6. Control devices, only where specifically called for.
7. Safety and disconnect switches, unless furnished with starters or on equipment. Weatherproof devices for outdoor equipment. Six (6) pole switches for two speed, three phase motors.
8. Motor power wiring.
9. Raceways and installation components.
10. Wire and Cable.
11. Electrical work in connection with equipment specified and furnished under other Sections of the Specifications or furnished by the Owner under separate contracts or direct purchase.
12. Grounding system in conformance with applicable codes.
13. Wiring devices.
14. Lighting fixtures, interior and exterior, including lamps, as described in these Specifications, and in accordance with Schedule on Drawings.
15. Furnishing, installing and connecting of electric heater cables for pipe tracing and snow melting, including controls.
16. Furnishing, installing and connecting of electric radiant panels/electric space heaters.
17. Power wiring for fan coil, incremental units.
18. 120 Volt supply to EP switches and temperature control and/or data gathering panels.
19. Hardware, such as inserts, bolts, etc., associated with concrete pads.
20. Cutting and core drilling associated with electrical work.
21. Prime painting, where required for electrical equipment and installation.
22. Removal of existing electrical work in accordance with Architectural Demolition Scheme or as directed and required. Restoration of electrical service in affected adjoining areas which are to continue to function.
23. Interconnections and interfacing with pertinent existing systems shall be as required to achieve fully integrated operation of systems, as described in these Specifications and/or shown on Drawings.
24. Provision for temporary light and power.
25. Paying all fees as required by governing agency and performing all testing as required by governing agency and adjusting and furnishing all certificates of approval, and those of Underwriters.
    a. All fan shutdown wiring and furnishing, installing and connecting equipment required for fan shutdown.
    b. Wiring and Fire Alarm equipment associated with elevator recall feature.
    c. Empty conduit system and low voltage wiring, including terminal cabinets and plywood backboards.
    d. Empty conduit system for low voltage wiring supplied and installed under other sections, including terminal cabinets and plywood backboards.
    e. Public address (paging) system.
    f. Intercommunicating system.
    g. Closed circuit television system (security and/or media).
    h. Door security alarm system.
    i. Electrical provision for building an automation system.
    j. Water detection system.

1.3 QUALITY ASSURANCE AND STANDARDS

A. The complete installation shall be in accordance with the applicable requirements and standards of National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA), New York City Electrical Code (NYCEC), National Electrical Code (NEC), Institute of Electrical and Electronic Engineers (IEEE), American National Standard Institute (ANSI), Occupational Safety and Health Administration (OSHA), National Electrical Safety Code, Insulated Cable Engineers Association (ICEA), Underwriters' Laboratories (UL), Factory Mutual (FM), Factory Insurance Association (FIA), National Electrical Contractors Association (NECA) "Standard of Installation", Local Inspection Agency, Local Power Company, Local Telephone Company, along with state and local municipal codes and all applicable codes and authorities having jurisdiction. Any items or requirements noted in the Specifications or on Drawings, which conflict with these shall be referred to the Architect for decision. All work necessary to comply with these requirements shall be performed by the Contractor at no extra cost to the Owner.

B. Where reference is made to the National Electrical Code only, without mention of the New York City Electrical Code, the requirements of the latter, where they differ from the former, shall take precedence, where applicable.

C. All electrical equipment, materials and appliances shall have the listing of the Underwriters' Laboratories, Inc., and shall bear labels attesting to UL listing, and types approved by Municipal Departments having jurisdiction.

D. NYC DEPARTMENT OF BUILDINGS ELECTRICAL DIVISION

1. Drawings and Specifications
   a. The Contract Drawings and Specifications shall be submitted by the Contractor to the Department of Building’s Electrical Division to facilitate any inspections that may be made by that agency.
   b. It is the intent of these Specifications that all electric work shall be done in strict accordance with the rules of the Electrical Division and with the 2011 NYC Electrical Code (NYC amendments to the 2008 National Electrical Code - NFPA 70-08). Where the requirement of the Drawings or Specifications exceeds the requirements of the Electrical Code, the requirements of the Drawings and Specifications shall be binding upon the Contractor.
   c. Should the Electrical Division inspect the work and issue a violation, the Contractor shall correct the Work and eliminate the violation as part of the Contract.
2. Interpretation
   a. The electric work detailed in these Specifications and shown on Drawings shall be under the jurisdiction of the Authority, subject to the approval of the Electrical Division.
   b. The Authority shall be the sole source for interpretation of the Contract Documents. Any discrepancies or conflicts shall be brought to the attention of the Authority for clarification.
3. Materials and Appliance: All materials and appliance shall be approved by the Authority's Representative and installed in accordance with the rules and regulations of the Building Department, Electrical Division; certificates of approval including the temporary light and power wiring, shall be obtained by the Contractor and delivered to the Authority's Representative before the Work is finally accepted.

1.4 REMOVAL AND RELOCATION OF EXISTING WORK

A. Disconnect, remove, and/or relocate electrical material, equipment, devices, components, and other work noted and required by demolition or alterations in existing construction.

B. Provide new material and equipment required for relocated equipment.

C. Remove conductors from existing raceways to be rewired. Clean raceways as required prior to rewiring.

D. Tape both ends of abandoned conductors, cap outlets, and abandoned raceways.

E. Cut and cap abandoned floor raceways flush with concrete floor or behind walls and ceilings.

F. Dispose of removed raceways and wiring.

G. Dispose of removed electrical equipment as directed.

H. All electrical work in adjoining areas which is indicated on the Drawings to continue to function but is affected by demolition work shall be reconnected and restored to present function as part of the electrical system of the buildings.

I. Connect new work to existing work in a neat and acceptable manner, with minimum interference to existing facilities.

J. Maintain continuous operation of existing facilities affected by the work.

K. Alarm and emergency systems are to be interrupted only with the written consent of the Owner.

L. Temporary shutdowns when required, to be made only with written consent of Owner at times not to interfere with normal operations.

M. Where indicated on the Drawings or required by the alteration scheme, the Contractor shall remove all electrical outlets, switches, and other devices, complete with associated wiring, conduit, etc., from partitions, walls, and floors that are to be removed. When the removal of these makes dead electrical wiring that is to remain, Contractor shall install junction boxes or other devices necessary to make the circuits affected continuous and ready for operation. Otherwise, wiring shall be removed back to the nearest electrical outlet box that is to remain, or to the panelboard.

N. All raceways which become exposed beyond finished surfaces because of the alteration work shall be removed and rerouted behind finished surfaces.

O. Wiring that is to be removed as a result of demolition work, but is required to continue to function, shall be interrupted at convenient locations, rerouted (new wiring and conduits) and reconnected for continuation of their original function. New wiring extensions shall match existing ones in all respects, conductor ampacity, conduit size, etc.

P. Representative in order to be included under the bypass connections allowance.

1.5 SUBMITTALS

A. Product Data and installation requirements: see Section 01 31 46.

1.6 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 the required slope.
4. Connecting raceways, cables, wireways, cable trays, and busways must 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 the location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

D. Coordinate sleeve selection and application with the selection and application of firestopping specified in Division 07.

1.7 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Ceiling Markers:
1. Provide color-coded ceiling markers indicating the location of all electrical equipment located above hung ceilings. Markers shall be provided for, but not limited to the following:
2. All pull or junction boxes, (excluding branch circuits), smoke detectors and other alarm or signal initiating devices, disconnected switches and starters were not identified by other trades.

1.8 CHANGES IN CONDUITS AND EQUIPMENT

A. Wherever field conditions are such that for the proper execution of the work reasonable changes in the location of conduits and equipment are necessary and required, the Contractor shall make such changes as directed and approved, without extra cost.

1.9 INSPECTION AND TESTS

A. Prior to commencing the testing procedure, the contractor shall submit the following information;

1. Describe methods utilized.
2. Submit information for each electrical system to be tested.
3. Advise the Owner and Engineer of the schedule.

B. At the time of the final inspection and tests, all connections at the panels and all splices, etc., must have been completed. All fuses must be in place and the circuits continuous from service switches to all receptacles, outlets, motors, etc. Each entire wiring system must test free from short circuits and grounds. When wiring systems are "megger" tested, the insulation resistance between conductors and between conductors and grounds, based on maximum load, shall not be less than that required by the National Electrical Code and local authorities having jurisdiction. A written record of all test data shall be supplied to the Architect (five copies). The tests shall cover but not be limited to the following:
1. Fire alarm, smoke detection, and sprinkler alarm systems.
2. All communications, signaling and alarm systems.
3. Power installations and motor controls.
4. Any part of the work is called for in the Specifications, or Drawings and as designated by the Architect or Engineers.
5. Test equipment for rated output as indicated on drawings. Adjust as required.

C. Provide all necessary testing equipment, instruments, and skilled personnel for the tests. If in the opinion of the Architect, the results of such tests show that the work has not complied with the requirements of the Specifications or Drawings, the Contractor shall make all additions or changes necessary to put the system in proper working condition and shall pay for all the expenses and for all subsequent tests which are necessary to determine whether the work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Owner, prior to final payment.

D. Upon completion of the testing procedures, the contractor is to submit a report for all systems tested and include all testing data.

1.10 TEMPORARY LIGHT AND POWER

A. Electric services for temporary light and power shall be obtained from the nearest existing switchboard and extended as required. Consult the Owner prior to making any connections to existing services.

B. The Electrical Contractor shall furnish, install, and maintain the temporary lighting and power system for all Contractors. The use of electricity should be kept to a minimum.

C. The Owner or Owner's Representative will pay for all energy required by the temporary lighting and power system.

D. Provide all the wiring, supports, lamp sockets, receptacle sockets and any other materials, supplies or equipment necessary for temporary light and power system.

E. Ground fault protection required by OSHA for temporary receptacle circuits shall be accomplished by providing branch circuit panels containing ground fault protection for branch circuit breakers.

F. Provide a grounding conductor connection to each receptacle grounding terminal. Minimum size branch circuit and grounding conductors shall be No. 12 AWG.

G. Install separate stringer circuits for lighting and receptacles. Provide one lamp socket and one duplex receptacle (or two single receptacles) for every 400 square feet of new general construction area. (Approximately 20 feet on centers). Furthermore, provide one lamp socket and one duplex receptacle every 20 feet along the peripheral walls of the construction areas for temporary conditions. Each lamp socket shall be provided with a 100 watt lamp. Replace burned out lamps as required as long as the temporary lighting system is maintained in operation.

H. Provide sufficient supplementary temporary lighting to permit proper execution of the work. This supplementary lighting shall consist of but not be limited to the following:
1. Construction hoist landings.
2. Stairways and stairway landings where existing illumination is inadequate due to alterations or construction.
3. Interior rooms not covered with general construction area lighting.

I. Provide power wiring to operate the construction hoist. Provide fused disconnect switch at hoist location. Fuse size, wiring size, and disconnect shall be as required.

J. Provide 50 trailer extension cords, each 25 feet long.
1. 25 of the trailer cord sets shall be receptacle-type
2. 25 of the trailer cord sets shall be trouble light type with the receptacle
3. Distribution of these cord sets to Mechanical and other contractors shall be as directed by the Owner's Representative.

K. Keep the temporary lighting and power system operational commencing fifteen (15) minutes before the established starting time of that trade which starts work earliest in the morning and ending fifteen (15) minutes after the established quitting time of that trade which stops work latest in the evening. This applies to all weekdays, Monday through Friday inclusive, which are established as regular working days for any trade engaged in the work and shall continue until Final Acceptance of the work or until these services are ordered terminated by the Owner or the Owner's Representative.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA1.

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 the 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.

END OF SECTION 26 05 00

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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

1.2 SUMMARY

A. Section Includes:
1. Copper building wire rated 600V or less.
2. Metal-clad cable, Type MC, rated 600V or less.
3. Armored cable, Type AC, rated 600V or less.
4. Connectors, splices, and terminations rated 600V and less.

1.3 CLICK DEFINITIONS

A. VFD(S): Variable-frequency Drive. (System)

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency or manufacturer's authorized service representative.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency's Field Supervisor:

B. Testing Agency Qualifications: Member company of NETA.

1. An independent agency, with the experience and capability to conduct the testing indicated 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.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alpha Wire Company
2. American Bare Conductor
3. Belden Inc
4. Cerro Wire LLC
5. Encore Wire Corporation
6. Okonite Company
7. Service wire Co
8. Southwire Company
9. Wesco

C. Standards:
1. Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B496 for stranded conductors.

E. Conductor Insulation:
1. Type NM: Comply with UL83 and UL719.
2. Type RHH and Type RHW-2: Comply with UL44.
3. Type USE-2 and Type SE: Comply with UL854.
4. Type TC-ER: Comply with NEMAWC 0/ICEA S-95-658 and UL 1277.
5. Type THHN and Type THWN-2: Comply with UL 83.
6. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
7. Type UF: Comply with UL 83 and UL 493.
8. Type XHHW-2: Comply with UL 44.

F. Shield:

1. Type TC-ER: Cable designed for use with VFDs, with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alpha Wire Company
2. American Bare Conductor
3. Belden Inc
4. Cerro Wire LLC
5. Encore Wire Corporation
6. Okonite Company
7. Service wire Co
8. Southwire Company
9. Wesco

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:
1. Single circuit and multicircuit with color-coded conductors.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors:
1. Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors

F. Ground Conductor: Insulated.

G. Conductor Insulation:
1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Aluminum, interlocked.

I. Jacket: PVC applied over armor.

2.3 ARMORED CABLE, TYPE AC

A. Description: A factory assembly of insulated current-carrying conductors with or without any equipment grounding conductor in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alpha Wire Company
2. American Bare Conductor
3. Belden Inc
4. Cerro Wire LLC
5. Encore Wire Corporation
6. Okonite Company
7. Service wire Co
8. Southwire Company
9. Wesco

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Comply with UL4.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:
1. Single circuit and multicircuit with color-coded conductors.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors:
1. Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors

F. Ground Conductor: Insulated.

G. Conductor Insulation:
1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Conductor Insulation: Type THHN/THWN-2. Comply with UL 83.

I. Armor Aluminum, interlocked.

2.4 MINERAL-INSULATED CABLE, TYPE MI

A. Description: Solid copper conductors encased in compressed metal oxide with an outer metallic sheath, rated 600V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. KME America, Inc
2. Pentair

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. UL 2196 for fire resistance.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors:
1. Copper, complying with ASTM B3 for bare annealed copper.

E. Insulation: Compressed magnesium oxide

F. Sheath: Copper.

2.5 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. 3M Electrical Products
2. AFC Cable systems
3. Gardnes Bender
4. Hubblee Power systems
5. ILSCO
6. O-Z/Gedney
7. Service wire Co.
8. TE Connectivity
9. Thomas & Betts Corp.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Aluminum
2. Type: One hole with long barrels.
3. Termination: Compression.

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.

C. VFD Output Circuits Cable: Extra-flexible stranded for all sizes.

D. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway,
1. Type THHN/THWN-2, single conductors in raceway
2. Armored cable, Type AC,
3. Metal-clad cable,
4. Type MC, Mineral-insulated, metal-sheathed cable, Type MI

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces:
1. Type THHN/THWN-2, single conductors in raceway
2. Armored cable, Type AC,
3. Metal-clad cable,
4. Type MC, Mineral-insulated, metal-sheathed cable, Type MI

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions:
1. Type THHN/THWN-2, single conductors in raceway
2. Armored cable, Type AC,
3. Metal-clad cable,
4. Type MC, Mineral-insulated, metal-sheathed cable, Type MI

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway

G. Branch Circuits Installed below Raised Flooring:
1. Type THHN/THWN-2, single conductors in raceway
2. Armored cable, Type AC,
3. Metal-clad cable,
4. Type MC, Mineral-insulated, metal-sheathed cable, Type MI

H. VFD Output Circuits:
1. Type XHHW-2 in metal conduit
2. Type TC-ER cable with braided shield
3. Type TC-ER cable with dual tape shield.

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 "Raceway 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-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.
   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 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 the 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 078400 "Firestops and Smoke Seals."

3.8 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.
2. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors and conductors feed the following critical equipment and services for compliance with requirements:
    a. Newly installed feeders from existing motor control centers.
    b. Feeders from new and existing panelboards to new motors.
    c. Fire Alarm Control and associated panels
3. Perform each of the following visual and electrical tests:
    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    b. Test bolted connections for high resistance using one of the following:

        1) A low-resistance ohmmeter.
        2) Calibrated torque wrench.
        3) Thermographic survey.
    c. Inspect compression-applied connectors for correct cable match and indentation.
    d. Inspect for correct identification.
    e. Inspect cable jacket and condition.
    f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-Vdc for 300-V rated cable and 1000-Vdc for 600-V rated cable for a one-minute duration.
    g. Continuity test on each conductor and cable.
    h. Uniform resistance of parallel conductors.
4. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice 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 switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Cables will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports 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.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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

1.2 SUMMARY

A. The section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.

1.3 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 grounding in accordance with Drawings and Specifications and as required for a complete system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Grounding sensitive electronic equipment.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

B. "Manufacturers" - Firms regularly engaged in manufacture of the type of equipment required for the application, whose products have been in satisfactory use in similar service for not less than 10 years. Refer to Approved Manufacturers in this Section.

C. Provide equipment whose performance under specified conditions is certified by the manufacturer and comply with applicable publications of NFPA and UL.

D. Grounding shall comply with New York City Electrical Code (NYCEC) for construction and installation.

PART 2 - PRODUCTS

2.1 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 UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ERICO International Corporation
2. O-Z/Gedney
3. Thomas and Betts Corporation
4. Burndy
5. Galvan Industries

2.3 CONDUCTORS

A. Insulated Conductors: Copper or tinned-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. Tinned Conductors: ASTM B 33.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 24 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.

2.4 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. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturers for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with socket set screw.

I. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

J. Straps: Solid copper, copper lugs. Rated for 600 A.

K. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

L. Water Pipe Clamps:
1. Mechanical type, two pieces with zinc-plated bolts.
   a. Material: Die-cast zinc alloy.
   b. Listed for direct burial.
2. U-bolt type with malleable iron clamp and copper ground connector rated for direct burial.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductors for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Install the bus horizontally, on insulated spacers 2 inches (50 mm) minimum from the wall, 6 inches (150 mm) above the finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route the bus up to top of door frame, across top of doorway, and down; connect to the horizontal bus.

C. 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.

3.2 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.

3.3 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:
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.

C. 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. Heat-Tracing, and Anti frost 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.

3.4 INSTALLATION

A. Grounding Conductors: Route along the shortest and straightest paths possible unless otherwise indicated or required by the Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until the tops are 2 inches (50 mm) below the finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. Use exothermic welds for all below-grade connections.

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 the 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. 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 main metal water service entrances to building. Connect grounding conductors to main 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.

E. 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.

F. Grounding for 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.

G. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
1. After installing the 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 the manufacturer's written instructions.
3. Test the completed grounding system at each location where a maximum ground-resistance level is specified, at the service disconnect enclosure grounding terminal, at ground test wells, 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 the 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.

4. Prepare dimensioned Drawings locating each test well, 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.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with a Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with a Capacity of 500 to 1000 kVA: 5 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify the Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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

1.2 SUMMARY

A. Section Includes:
1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Nonmetallic slotted support systems.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
   a. Slotted support systems, hardware, and accessories.
   b. Clamps.
   c. Hangers.
   d. Sockets.
   e. Eye nuts.
   f. Fasteners.
   g. Anchors.
   h. Saddles.
   i. Brackets.
2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.
1. Hangers. Include product data for components.
2. Slotted support systems.

3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating the finished ceiling, including the following:
a. Luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Projectors.

B. Seismic Qualification Data: Certificates, for hangers and support for electrical equipment and systems, accessories, and 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.

C. Welding certificates.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Engage a qualified professional engineer, as defined in "Quality Requirements," to design hanger and support system.
1. Design supports multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Design supports multiple raceways capable of supporting the combined weight of supported systems and its contents.
3. Design equipment supports capable of supporting the combined operating weight of supported equipment and connected systems and components.
4. Rated Strength: Adequate tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   3. Material for Channel, Fittings, and Accessories: Stainless steel, Type 316.
   4. Channel Width: 13/16 inches (20.64 mm)
   5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper B-Line, Inc.; a division of Cooper Industries.
      b. Thomas & Betts Corporation.
      c. Unistrut; Tyco International, Ltd.
      d. MKT Metal Manufacturing
      e. Flex-Strut Inc.
   2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   3. Channel Material: 6063-T5 aluminum alloy.
   4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
   5. Channel Width: 1-5/8 inches (41.25 mm)
   6. Applied according to MFMA-4.
   7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least one surface.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.

b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. Haydon Corporation
d. G-Strut

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Channel Width: 1-5/8 inches (41.25 mm).
4. Fittings and Accessories: Products provided by channel and angle manufacturers and designed for use with those items.
5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
6. Rated Strength: Selected to suit applicable load criteria.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Conduit and Cable Support Devices: Stainless-steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plugs or plugs for nonarmored 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. The body shall be made of malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

G. 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:
1) Hilti, Inc
2) ITW Ramset/Red Head
3) MKT Fastening, LLC
4) Simpson Strong-Tie Co.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened Portland cement concrete, 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:
1) B-line
2) Hilti, Inc
3) ITW Ramset/Red Head
4) MKT Fastening, LLC
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural elements.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: Stainless-steel springhead type.

7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
1. NECA 1.
2. NECA 101
3. NECA 102.
4. NECA 105.
5. NECA 111.

B. Comply with requirements in Section 078400 "Firestops and Smoke Seals" for firestopping materials and installation for penetration through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceway and Boxes for Electrical Systems."

D. EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

E. 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.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, according to NFPA 70.

C. 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 the weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their support 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: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
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.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use the same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint with brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1. Section 26 05 44 – Sleeves and Sleeve Seals for Electrical Raceways and Cabling

B. The requirements of this section apply to raceway work required for the protection of electrical conductors. Raceways are required for all wiring unless otherwise specified.

C. The work includes the furnishing and installation of completely coordinated, effectively grounded raceway systems complete with boxes, fittings, flexible connections to vibrating equipment and other accessories, as required. Conduit or tubing sizes referred to in the Specifications and on the Drawings are nominal trade sizes.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquid tight flexible metal conduit.

E. LFNC: Liquid tight flexible nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.

C. Samples for Initial Selection: For wireways, nonmetallic wireways and surface raceways with factory-applied texture and color finishes.

D. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Structural members in the paths of conduit groups with common support.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common support.

E. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article by a testing agency acceptable to authorities having jurisdiction and marked for the intended use.

C. Comply with the New York City Electrical Code (NYCEC).

a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in, NYCEC Article 100 by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch minimum.

F. EMT: ANSI C80.3.

G. FMC: Zinc-coated steel or aluminum where magnetic interference is indicated

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings for Conduit (Including all Types and Flexible and Liquid tight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch with overlapping sleeves protecting threaded joints.

J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT, TUBING AND FITTINGS

A. Nonmetallic Conduit
1. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Petroflex
b. AFC Cable Systems, Inc.
c. Anamet Electrical, Inc.; Anaconda Metal Hose.
d. Arnco Corporation.
e. CANTEX Inc.
f. CertainTeed Corp.; Pipe & Plastics Group.
g. Condux International, Inc.
h. ElecSYS, Inc.
i. Electri-Flex Co.
j. Lamson & Sessions; Carlon Electrical Products.
k. Manhattan/CDT/Cole-Flex.
l. RACO; a Hubbell Company.
m. Thomas & Betts Corporation.
3. ENT: NEMA TC 13.
4. RNC: NEMA TC 2, Type EPC-80-PVC**,** unless otherwise indicated.
5. LFNC: UL 1660.
6. Continuous HDPE: Comply with UL 651A.
7. Coilable HDPE: Preassembled with conductors or cables and complying with ASTM D 3485.
8. RTRC: Comply with UL 2515A and NEMA TC 14.

B. Nonmetallic Fittings
1. Fittings, General: Listed and labeled for type of conduit, location, and use.

2. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
   a. Fittings for LFNC: UL 514B.
3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Manufacturers: Where permitted and subject to compliance with requirements, provide products by one of the following:
   1. Arnco Corporation.
   2. Endot Industries Inc.
   3. IPEX Inc.
   4. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible type, approved for plenum and riser installation.

2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper B-Line, Inc.
   2. Hoffman.
   3. Square D; Schneider Electric.
   4. Legrand Wiremold

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, 4, 12, or 3R, unless otherwise indicated and sized according to NFPA 70
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include 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: Screw-cover type.

E. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Thomas & Betts Corporation.
      b. Legrand Walker Systems, Inc.
      c. Legrand Wiremold.

B. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Butler Manufacturing Company; Walker Division.
      b. Enduro Systems, Inc.; Composite Products Division.
      c. Hubbell Incorporated; Wiring Device-Kellems Division.
      d. Lamson & Sessions; Carlon Electrical Products.
      e. Panduit Corp.
      f. Legrand Walker Systems, Inc.
      g. Legrand Wiremold.

      a. Tele-Power Poles:
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Butler Manufacturing Company; Walker Division.
      b. Enduro Systems, Inc.; Composite Products Division.
      c. Hubbell Incorporated; Wiring Device-Kellems Division.
      d. Lamson & Sessions; Carlon Electrical Products.
      e. Panduit Corp.
      f. Legrand Walker Systems, Inc.
      g. Legrand Wiremold.
   3. Material: Aluminum with a clear anodized finish.
   4. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Listing and Labeling: boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. EGS/Appleton Electric.
   3. Erickson Electrical Equipment Company.
   4. Hoffman.
   5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
   6. O-Z/Gedney; a unit of General Signal.
   7. RACO; a Hubbell Company.
   8. Robroy Industries, Inc.; Enclosure Division.
   9. Scott Fetzer Co.; Adalet Division.
   10. Spring City Electrical Manufacturing Company.
   11. Thomas & Betts Corporation.
   12. Legrand Walker Systems, Inc.
   13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

C. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

D. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

E. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

F. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

G. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.

H. Nonmetallic Floor Boxes: Nonadjustable, round.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb. shall be listed and marked for the maximum allowable weight.

K. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

L. Box extensions used to accommodate building finishes shall be of the same material as recessed box.

M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep for quad and telecommunication installations, and 4 inches by 2-1/8 inches by 2-1/8 inches deep for single device installations.

N. Gangable boxes are prohibited.

O. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1 and UL 1773, galvanized, cast iron, or cast aluminum for high frequency applications, with gasketed cover.

P. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch for general use, or NEMA 250, Type 12, for dusty environments.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

Q. Cabinets:
1. NEMA 250, Type 1, or NEMA 250, Type 12as required, 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 were 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: Rigid steel conduit, RNC.
2. Concealed Conduit, Aboveground: Rigid steel conduit RNC.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT
2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
a. Loading dock.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms/floors.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: Rigid steel conduit.
6. Boxes and Enclosures: NEMA 250, Type 1, except use
a. NEMA 250, Type 4, stainless steel in corrosive locations, or
b. NEMA 250, Type 4, nonmetallic in damp or wet locations.

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.
2. Rigid Steel Conduits: Use only fittings listed for use with that material. Use sealant recommended by fitting manufacturer.

E. Do not install aluminum conduits in contact with concrete.

F. Install surface raceways only were indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA1 and NECA101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA102 for aluminum conduits. Comply with NFPA70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

C. Do not fasten conduits onto the bottom side of a metal deck roof.

D. 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.

E. Complete raceway installation before starting conductor installation.

F. Support raceways as specified in Section 260529 – Hangers and Supports for Electrical Systems.

G. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

H. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed. Coordinate specific requirements for conduit routing with telecommunication system installer.

I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

J. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

K. Stub-Ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

N. 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 trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. 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.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

S. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes

or terminations at distribution frames or cabinets where necessary to comply with these requirements.

T. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches 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.

U. Install raceway sealing fittings at accessible locations according to NFPA70 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 NFPA70.

V. 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 at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Conduit extending from interior to exterior of building.
4. Conduit extending into pressurized duct and equipment.
5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6. Where otherwise required by NFPA70.

W. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

a. Expansion-Joint Fittings:
2. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
3. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
d. Attics: 135 deg F temperature change.
4. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
6. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
a. Flexible Conduit Connections: Comply with NEMA RV3. Use a maximum of 36 inches of flexible conduit for recessed and semi-recessed luminaires, equipment

subject to vibration, noise transmission, or movement; and for transformers and motors.

7. Use LFMC in damp or wet locations subject to severe physical damage.
8. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. 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.

Y. 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.

Z. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. 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.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

3.3 SLEEVE 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. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 07 Section 078400 "Firestops and Smoke Seals."

3.5 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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

1.2 SUMMARY

A. Section Includes:
1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:
1. Penetration Firestopping for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

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.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

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 and with no side larger than 16 inches, thickness shall be 0.052 inch.
   b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

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, provide products by one of the following:
      a. Advanced products & systems
      b. CALPICO, Inc
      c. Metraflex Company
      d. Pipeline Seal and Insulator
      e. Proco Products
   2. Sealing Elements: Nitrile (Buna N) rubber interlocking links shaped to fit the surface of pipe. Include type and number required for pipe material and size of pipe.
   3. Pressure Plates: Stainless steel.
   4. Connecting Bolts and Nuts: Stainless steel of length is required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, water stop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber water stop collar with center opening to match piping OD.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. HOLDRITE
      b. Presealed Systems

2.4 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, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 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, non shrinking 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 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.
      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 arrangements require rectangular-sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch 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 penetration unless core-drilled holes or formed openings are used. Install sleeves during the erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
   5. Install sleeves for floor penetration. Extend sleeves installed on floors 2 inches (50 mm) above finished floor level. Install sleeves during the 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 a 1-inch 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 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 the building.

B. Install type and number of sealing elements recommended by the manufacturer for raceway or cable material and size. Position raceway or cable in the center of the sleeve. Assemble mechanical sleeve seals and install them in annular space between the 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 water stop flange to be centered in the concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around the outside of sleeve-seal fittings.

END OF SECTION 26 05 44

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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.

1.2 SUMMARY

A. Section Includes:
1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.
10. Identification for raceways.
11. Identification of power and control cables.
12. Identification for conductors.
13. Underground-line warning tape.
14. Warning labels and signs.
15. Instruction signs.
16. Equipment identification labels.
17. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

D. Submittal: Design of labeling for arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E and Section 260573 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
   1. Black letters on a white field.
   2. Legend: Indicate voltage and system or service type.

B. Warning Label Colors:
   1. Identify system voltage with black letters on an orange background.

C. Warning labels and signs 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."

D. Equipment Identification Labels:
   1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Brady corporation
      b. Champion America
      c. Emedco
      d. Grafoplast Wire Markers
      e. LEM Products
      f. Marking Services, Inc.

g. Hellermann Tyton
h. Panduit Corp.
i. Seton Edentification Products

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Brady corporation
b. Champion America
c. Marking Services, Inc.
d. Hellermann Tyton
e. Panduit Corp.
f. Seton Identification Products

C. Self-Adhesive Wraparound Labels: Write-on, 3-mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels are sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Brady corporation
b. Emedco
c. Grafoplast Wire Markers
d. LEM Products
e. Marking Services, Inc.
f. Hellermann Tyton
g. Panduit Corp.
h. Seton Identification Products
2. Minimum Nominal Size:
a. 1-1/2 by 6 inches for raceway and conductors.
b. 3-1/2 by 5 inches for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Brady corporation
b. Hellermann Tyton
c. Marking Services, Inc.
d. Panduit Corp.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Brady corporation
      b. Panduit Corp.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Carlton Industries, LP
      b. Champion America
      c. Marking Services, Inc.
      d. Hellermann Tyton
      e. Panduit Corp.

B. Tape and Stencil: 4-inch wide black stripes on 10-inch centers placed diagonally over the orange background and are 12 inches wide. Stop stripes at legends.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. LEM Products
      b. Marking Services, Inc.
      c. Hellermann Tyton
      d. Seton Identification Products

C. Floor Marking Tape: 2-inch wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Carlton Industries, LP
      b. Seton Identification Products

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Brady corporation
      b. Emedco
      c. Marking Services, Inc.
      d. Seton Identification Products

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory screened permanent designations; punched for use with self-locking cable tie fastener.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brady corporation
   b. Emedco
   c. Grafoplast Wire Markers
   d. LEM Products
   e. Marking Services, Inc.
   f. Hellermann Tyton
   g. Panduit Corp.
   h. Seton Identification Products

C. Write-on Tags:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlton Industries, LP
   b. LEM Products
   c. Seton Identification Products
2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.

2.7 SIGNS

A. Baked-Enamel Signs:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlton Industries, LP
   b. Emedco
   c. Marking Services, Inc.
2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brady corporation
   b. Emedco
   c. Marking Services, Inc.
2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Brady corporation
   b. Emedco
   c. Marking Services, Inc.

2. Engraved legend.
3. Thickness:
   a. For signs up to 20 sq. in., minimum 1/16 inch thick.
   b. For signs larger than 20 sq. in., 1/8 inch thick.
   c. Engraved legend with black letters on white
   d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting or Self-adhesive as required by project conditions.
   e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Marking Services, Inc.
   2. Hellermann Tyton
   3. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black, except were used for color-coding.

C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
   1. Minimum Width: 3/16 inches.
   2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to 185 deg F.
   4. Color: Black.

D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one-piece, and self-locking.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F.
   5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for painting materials and application requirements. Retain 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 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bonds, using materials and methods recommended by the manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout the Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify the identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finished work.

F. Install signs with an approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
   1. Secure tight to the surface of the conductor, cable, or raceway.

H. Vinyl Wraparound Labels:
   1. Secure tightly to the surface of raceway or cable at a location with high visibility and accessibility.
   2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

I. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

J. Self-Adhesive Wraparound Labels: Secure tightly to the surface at a location with high visibility and accessibility.

K. Self-Adhesive Labels:
   1. On each item, install a unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.

L. Snap-around Color-Coding Bands: Secure tight to the surface at a location with high visibility and accessibility.

M. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

N. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
   1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply the last two turns of tape with no tension to prevent possible unwinding.

P. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

Q. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

R. Underground Line Warning Tape:
   1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below the finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
   2. Limit the use of underground-line warning tape to direct-buried cables.

S. Nonmetallic Preprinted Tags:
   1. Place in a location with high visibility and accessibility.
   2. Secure using general-purpose cable ties.

T. Write-on Tags:
   1. Place in a location with high visibility and accessibility.
   2. Secure using general-purpose cable ties.

U. Baked-Enamel Signs:
   1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on minimum 1-1/2-inch high sign; where two lines of text are required, use signs minimum 2 inches high.

V. Metal-Backed Butyrate Signs:
   1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high sign; where two lines of text are required, use labels 2 inches high.

W. Laminated Acrylic or Melamine Plastic Signs:
   1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high sign; where two lines of text are required, use labels 2 inches high.

X. Cable Ties: General purpose, for attaching tags, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for the most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide a view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
   1. Apply to exterior of door, cover, or other access.
   2. 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.

E. Arc Flash Warning Labeling: Self-adhesive labels.

F. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.

G. Equipment Identification Labels:
   1. Indoor Equipment: Baked-enamel signs
   2. Outdoor Equipment: Stenciled legend 4 inches high.
   3. Equipment to Be Labeled:
      a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved**,** laminated acrylic or melamine label.
      b. Enclosures and electrical cabinets.
      c. Access doors and panels for concealed electrical items.
      d. Existing motor control center switches affected by this scope of work.
      e. Enclosed switches.
      f. Enclosed circuit breakers.
      g. Enclosed controllers.
      h. Variable-speed controllers.
      i. Push-button stations.
      j. Contactors.
      k. Monitoring and control equipment.

END OF SECTION 26 05 53

SECTION 26 05 72

SHORT-CIRCUIT STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections wherever applicable to Project Work.

B. Section 01 31 46 – Special Requirements for Project Work shall apply.

C. Section 26 05 00 – General Provisions for Electrical Work shall apply.

1.2 SUMMARY

A. The section includes requirements for the contractor to develop a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices based on equipment proposed to be provided as described herein.

B. The study shall be produced in two (2) separate submissions.
1. A first preliminary submission based on types and approximation of feeder length for existing and new to be installed feeders and sub-feeders.
2. A second finalized submission based on as build conditions.
3. For additional information see Action Submittals article.

C. The study is limited to and must include all portions, equipment and feeders, new and existing as shown in the single-line electrical diagram included with the project submission.

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 and salvaged, or removed and reinstalled. Existing to remain items shall remain functional throughout the construction period.

B. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that 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.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software programs to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

    a. Short-circuit study input data, including completed computer program input data sheets.
    b. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer licensed in the state where the project is taking place.

        1) Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies cause delay in equipment manufacturing, obtain approval from Owner’s Representative for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
        2) Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. For overcurrent protective devices to include in emergency, operation, and maintenance manuals.
2. The following are from the Short-Circuit Study Report:

    a. Final one-line diagram.
    b. Final Short-Circuit Study Report.
    c. Short-circuit study data files.
    d. 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 the 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 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton CYME International
2. ESA Inc.
3. SKM System Analysis, Inc.
4. Power Analytics, Corporation
5. ETAP.

B. Comply with IEEE 399 and IEEE 551.

1. Analytical features of power systems analysis software programs shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

C. Computer software programs 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 of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definitions of terms, and a guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, 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 and ratings.
6. Derating factors and environmental conditions.
7. Any revisions to electrical equipment required by the study.

D. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare them to available short-circuit currents. Verify that equipment withstands ratings exceed available short-circuit current at equipment installation locations.
2. Tabulations of circuit breakers, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
4. 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.
5. 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 the owner.

F. Short-Circuit Study Input Data:

1. One-line diagram of system being studied.
2. Power sources available.
3. Manufacturer, model, and interrupting rating of protective devices.
4. Conductors.
5. Transformer data.

G. Short-Circuit Study Output Reports:

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.

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 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the study.

1. Verify the completeness of data supplied on a one-line diagram. Call any discrepancies to Owner’s Representative attention.
2. For equipment included as Work of this Project, use characteristics submitted under 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. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate the required input data to support the short-circuit study. Record circuit protective device characteristics. Record all data on a Record Document copy of one-line

diagram. 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 direct supervision and control of the Owner's Representative in charge of performing the study and shall be by the Owner's Representative or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data includes, but are not limited to, the following:

1. Product Data for the 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 actual 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. Conductor sizes, lengths, numbers, conductor material, and conduit material (magnetic or nonmagnetic).
11. Derating factors.

3.2 SHORT-CIRCUIT STUDY

A. Perform the study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on device characteristics supplied by the device manufacturer.

D. The extent of the electrical power system to be studied is the complete electrical distribution system as indicated in the Summary of Work in this section.

E. Extent of the electrical power system to be studied is indicated on the Power Riser and Single Line Diagram that are included in the Drawings.

F. Begin short-circuit current analysis at the service, extending down to 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 an impedance of 4.5% or greater.

G. Study the electrical distribution system from normal and alternate power sources throughout the electrical distribution system for the Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

H. Include the AC fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply it to low- and medium-voltage, three-phase AC systems. Also account for the fault-current DC decrement to address asymmetrical requirements of interrupting equipment.

I. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

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.

J. Include in the report the identification of any protective device applied outside its capacity.

END OF SECTION 26 05 72

SECTION 26 05 73

COORDINATION STUDIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections wherever applicable to Project Work.

B. Section 01 31 46 – Special Requirements for Project Work shall apply.

C. Section 26 05 00 – General Provisions for Electrical Work shall apply.

1.2 SUMMARY

A. Section includes requirements for the contractor to develop a computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping based on equipment proposed to be provided as described herein.

B. The study shall be produced in two (2) separate submissions.
   1. The first preliminary submission based on types and approximation of feeder length for existing to remain and new to be installed feeders and sub-feeders.
   2. A second finalized submission based on as build conditions.
   3. For additional information see Action Submittals article.

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.

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. Existing to remain items shall remain functional throughout the construction period.

C. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

D. One-Line Diagram: A diagram that 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. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

F. Power System Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

G. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.

H. SCCR: Short-circuit current rating.

I. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

J. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data:

1. For computer software programs to be used for studies.
2. Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

    a. Coordination-study input data, including completed computer program input data sheets.
    b. Study and equipment evaluation reports.

3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer licensed in the state where the project is taking place.

    a. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies causes a delay in equipment manufacturing, obtain approval from the Owner’s Representative for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
    b. Revised one-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power System Analysis Software Developer.
2. For Power Systems Analysis Specialist.
3. 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:
   1. For overcurrent protective devices to include emergencies, operation, and maintenance manuals.

   2. The following are from the Coordination Study Report:

      a. Final one-line diagram.
      b. Final protective device coordination study.
      c. Coordination study data files.
      d. List of all protective device settings.
      e. Time-current coordination curves.
      f. 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 the 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 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

A. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:
   1. SKM System Analysis, Inc.
   2. Power Analytics, Corporation

3. Operation Technology, Inc.
4. ETAP

B. Comply with IEEE 242 and IEEE 399.
1. 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.

C. Computer software programs shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. The 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 COORDINATION STUDY REPORT CONTENTS

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram of modeled power system, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, 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.
6. Any revisions to electrical equipment required by the study.
7. Study Input Data: As described in "Power System Data" Article.

a. Short-Circuit Study Output: As specified in "Short-Circuit Studies" Section 260572.

D. 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, and ground).
2) Adjustable time-current characteristic.
3) Adjustable instantaneous pickup.
4) Include Recommendations on improved trip systems, if applicable.

c. Fuses: Show current rating, voltage, and class.

E. 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 include 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. Generators short-circuit decrement curve and generator damage point.
j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of downstream equipment. Obtain device data detail to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.
6. Maintain selectivity for tripping currents caused by overloads.
7. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
8. Provide adequate time margins between device characteristics such that selective operation is achieved.
9. 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 of the Work. Devices to be coordinated are indicated on Drawings.

1. Proceed with the 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 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.

1. Verify the completeness of data supplied in one-line diagram on Drawings. Call any discrepancies to Owner's Representative attention.
2. For equipment included as Work of this Project, use characteristics submitted under 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. Qualifications of technicians and engineers shall be as defined by NFPA 70E.

B. Gather and tabulate all required input data to support the coordination study. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under direct supervision and control of the Owner's Representative in charge of performing the study and shall be by the Owner's Representative or its representative who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification. Data includes, but are not limited to, the following:

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 bus system (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. Generators 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, size, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, numbers, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
17. Data sheets to supplement the electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting to 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 companies' overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility companies.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes root mean square (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. Switchgear, switchboards, motor-control centers, and panelboards 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 downstream equipment. Obtain device data detail to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.3 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. Based study on device characteristics supplied by device manufacturers.

D. The extent of the electrical power system to be studied is indicated in the Drawings.

E. Begin analysis at the service, extending down to 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 125 kVA.

F. Study the electrical distribution system from normal and alternate power sources throughout electrical distribution system for the Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:

1. The 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.

H. 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.

I. 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.

J. Generator Protection: Select protection according to the manufacturer's written instructions and to IEEE 242.

K. Include the AC fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply it to low- and medium-voltage, three-phase AC systems. Also account for fault-current dc decrement, to address asymmetrical requirements of interrupting equipment.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.

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. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare them 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. Include in the report the identification of any protective device applied outside its capacity.
5. Contractor is responsible for coordinating 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.

3.4 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:

1. Determine load flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
2. Determine load flow and voltage drop based on 80 percent of the design capacity of load buses.
3. Prepare load-flow and voltage-drop analysis and report to show power system components that are overloaded or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.5 MOTOR-STARTING STUDY

A. Perform a motor-starting study to analyze the transient effect of system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of motor starting on the power system stability.

B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141, and voltage sags so as not to affect the operation of other utilization equipment on the system supplying the motor.

3.6 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 equipment manufacturers 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. Any required major modifications to be reported to the Owner’s Representative in writing separate from the actual study specified in this specification manual.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel with the fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the coordination study objectives, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting time-current coordination curves.
3. For Owner's maintenance staff certified as NETA ETT-Certified Technicians Level III or NICET Electrical Power Testing Level III Technicians, teach how to adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION 26 05 73

SECTION 26 05 74

ARC-FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections wherever applicable to Project Work.

B. Section 01 31 46 – Special Requirements for Project Work shall apply.

C. Section 26 05 00 – General Provisions for Electrical Work shall apply.

1.2 SUMMARY

A. Section includes requirements for the contractor to develop a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment proposed to be provided as described herein.

B. The study shall be produced in two (2) separate submissions.
   1. A first preliminary submission based on types and approximation of feeder length for existing and new to be installed feeders and sub-feeders.
   2. A second finalized submission based on as build conditions.
   3. For additional information see Action Submittals article.

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. Field Adjusting Agency: An independent electrical testing agency with full-time employees and the capability to adjust devices and conduct testing indicated and that is a member company of NETA.

C. One-Line Diagram: A diagram that 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.

D. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.

E. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.

F. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

G. SCCR: Short-circuit current rating.

H. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

I. Single-Line Diagram: See "One-Line Diagram."

1.4 ACTION SUBMITTALS

A. Product Data: For computer software programs to be used for studies.

B. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Owner’s Representative and submit preliminary study report for action prior to receiving final approval of distribution equipment submittals.

1. The report must contain sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

C. Study Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form:

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by Power Systems Analysis Specialist licensed as professional engineer in the state where the project is taking place.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Power Systems Analysis Software Developer.
2. For Power System Analysis Specialist.
3. For Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Provide maintenance procedures in equipment manuals according to requirements in NFPA 70E.
2. Operation and Maintenance Procedures: Provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.

B. Software algorithms shall comply with the requirements of standards and guides specified in this Section.

C. Manual calculations are unacceptable.

D. Power System Analysis Software 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. Computer programs should be designed to perform arc-flash analysis or have a function, component, or add-on module designed to perform arc-flash analysis.
2. Computer programs shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

E. Power Systems Analysis Specialist Qualifications: Professional engineer in charge of performing the arc-flash study, analyzing the arc flash, 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.

F. Arc-Flash Study Certification: Arc-Flash Study Report shall be signed and sealed by Power Systems Analysis Specialist.

G. Field Adjusting Agency Qualifications:

1. Employer of a NETA ETT-Certified Technician Level III or NICET Electrical Power Testing Level III certification responsible for all field adjusting of the Work.
2. A member company of NETA.
3. Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:
1. SKM System Analysis, Inc.
2. Power Analytics, Corporation
3. Operation Technology, Inc.
4. ETAP

B. Comply with IEEE 1584 and NFPA 70E.

1. 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.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary of study findings.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Conductor types, sizes, and lengths.
3. Motor and generator designations and kVA ratings.
4. Panelboard designation and rating.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output Data: As specified in "Short Circuit Studies" Section 260572.

F. Protective Device Coordination Study Report Contents: As specified in "Coordination Studies" Section 260573.

G. Arc-Flash Study Output Reports:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

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.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.

10. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch (76-by-127-mm) self-adhesive equipment label for each work location included in the analysis.

B. Label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Protection boundaries.
    a. Arc-flash boundary.
    b. Restricted approach boundary.
    c. Limited approach boundary.
4. Arc flash PPE category.
5. Required minimum arc rating of PPE in Cal/cm squared.
6. Available incident energy.
7. Working distance.
8. Engineering report number, revision number, and issue date.

C. Labels should be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.

1. Short-Circuit Study Output: As specified in "Short-Circuit Studies" Section 260572.
2. Coordination Study Report Contents: As specified in "Coordination Studies" Section 260573.

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 38 percent of the maximum short-circuit current according to NFPA 70E recommendations.

D. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution systems where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

F. Calculate the limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors shall not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 LABELING

A. Apply arc-flash labels on the front cover of each section of the equipment and on side or rear covers with accessible live parts and hinged doors or removable plates for each equipment included in the study. Base arc-flash label data on the highest values calculated at each location.

B. Each piece of equipment listed below shall have an arc-flash label applied to it:
1. Panelboard and safety switches.
2. Control panel.
3. Contactor.

C. Note on record Drawings the location of equipment where the personnel could be exposed to arc-flash hazard during their work.

1. Indicate arc-flash energy.
2. Indicate the protection level required.

3.4 APPLICATION OF WARNING LABELS

A. Install arc-flash warning labels under the direct supervision and control of Power System Analysis Specialist.

3.5 DEMONSTRATION

A. Engage Power Systems Analysis Specialist to train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels.

END OF SECTION 26 05 74

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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

1.2 SUMMARY

A. Section Includes:
1. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Wall plates.

1.3 DEFINITIONS

A. AFCI: Arc-fault circuit interrupter.

B. BAS: Building automation system.

C. EMI: Electromagnetic interference.

D. GFCI: Ground-fault circuit interrupter.

E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

F. RFI: Radio-frequency interference.

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

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.

1.7 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. Service/Power Poles: One for every 10, but no fewer than one.
   2. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
   3. Poke-Through, Fire-Rated Closure Plugs: One for every 10 floor service outlets installed, but no fewer than two.
   4. SPD Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 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 use.

B. Comply with NFPA 70.

C. RoHS compliant.

D. Comply with NEMA WD 1.

E. Comply with New York City Electrical Code (NYCEC).

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in, NYCEC Article 100 by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

G. Device Color:
   1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 NYCEC or device listing.

H. Wall Plate Color: For plastic covers, match device color.

I. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hubbell Incorporated
      b. Leviton Manufacturing Co.

c. Arrow Hart
d. Pass & Seymour
2. Description: Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.

B. Weather-Resistant Duplex Receptacle, 125 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hubbell Incorporated
b. Leviton Manufacturing Co.
c. Arrow Hart
d. Pass & Seymour
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.

C. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hubbell Incorporated
b. Leviton Manufacturing Co.
c. Arrow Hart
d. Pass & Seymour
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.

2.3 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hubbell Incorporated
b. Leviton Manufacturing Co.
c. Arrow Hart
d. Pass & Seymour
2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Feed-through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
6. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
7. Configuration: NEMA WD 6, Configuration 5-15R.
8. Type: Feed through.
9. Standards: Comply with UL 498 and UL 943 Class A.

2.4 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. 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: Steel with white baked enamel, suitable for field painting
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

D. Antimicrobial Cover Plates:
1. Contact surfaces treated with a coating that kills 99.9 percent of certain common bacteria within two hours when regularly and properly cleaned.
2. Tarnish resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated on drawings.

B. Coordination with Other Trades:
1. Protect installed devices and their boxes. 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 comply with NFPA 70, NYCEC, 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 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.
8. Tighten 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.
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. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. 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 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 white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Tests for 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.

D. Test straight-blade convenience for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

E. Wiring devices will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 26 27 26

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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. Section Includes:
   1. Cartridge fuses are rated 600 V ac and less for use in the following:
      a. Control circuits.
      b. Enclosed controllers.
      c. Enclosed switches.
   2. Spare-fuse cabinets.

1.2 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. Coordination charts and tables and related data.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in "Closeout Procedures**,**" and "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.

1.4 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 three of each size and type.

1.5 FIELD CONDITIONS

A. Where the ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bussmann, (Eaton)
   2. Edison
   3. Littlefuse
   4. Mersen USA

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

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: 250V, zero- to 600-A rating, 200 kAIC.
   2. Type RK-5: 250 V, zero- to 600-A rating, 200 kAIC

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 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 a 20 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.

3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on the exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from the 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. Feeders: Class L, time delay.
2. Motor Branch Circuits: Class RK1 time delay.
3. Other Branch Circuits: J, fast acting.
4. Control Transformer Circuits: Class CC, time delay, control transformer duty.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s) in the location shown on the Drawings or as indicated in the field by Engineer.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, and Division 01 Specification Sections 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

1.2 SUMMARY

A. Section Includes:
1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Molded-case switches.
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, 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. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. 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. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1.7 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 three of each size and type.
   2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

A. Testing Qualifications: Accredited by NETA.
   1. Testing Contractor’s Field Supervisor: to manufacturer specifications

1.9 FIELD 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).

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within a specified warranty period.
   1. Warranty Period: One year (from date of Substantial Completion).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   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."

2.2 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with NFPA 70.

a. Comply with New York City electrical Code (NYCEC).

b. Electrical Components, Devices, and Accessories: Listed and labeled as defined in, NYCEC Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2.3 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB Inc.
2. Eaton
3. General electric Company
4. Siemens Industry, Inc
5. Square D, by Schneider electric

B. Type HD, Heavy Duty:
1. Single throw.
2. Three pole.
3. 240-V ac.
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified and indicated fuses.
6. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.

C. Accessories:
1. Hookstick Handle: Allows use of a hookstick to operate the handle.
2. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 NONFUSIBLE SWITCHES
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. ABB Inc.
3. Eaton
4. General electric Company
5. Siemens Industry, Inc
6. Square D, by Schneider electric

A. Type HD, Heavy Duty, Three Pole, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three

B. Accessories:
   1. Hookstick Handle: Allows use of a hookstick to operate the handle.
   2. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.5 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton
   2. Square D
   3. General Electric Company
   4. Siemens

B. Circuit breakers shown to be installed within existing motor control centers as shown in the drawings must be compatible with the existing motor control centers in which they are intended to be installed. Contractor must become familiar with and coordinate with the existing motor control center manufacturer to determine which MCCBs to purchase for this scope of work.

C. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

D. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

E. MCCBs shall be equipped with a device for locking in the isolated position.

F. Lugs shall be suitable for 140 deg F (60 deg C) rated wire on 125-A circuit breakers and below rated wire, sized according to the 167 deg F (75 deg C) temperature rating in NYCEC.

G. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits.

I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
   1. Instantaneous trip.
   2. Long- and short-time pickup levels.
   3. Long- and short-time time adjustments.

4. Ground-fault pickup level, time delay, and I-squared t response.

K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

M. 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.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-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.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be

2.6 MOLDED-CASE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton
2. Square D
3. General Electric Company
4. Siemens

B. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.

D. Features and Accessories:
1. Standard frame sizes and number of poles.
2. Lugs:
   a. Mechanical type, suitable for number, size, trip ratings, and conductor material.
   b. Lugs shall be suitable for deg F (75 deg C) rated wire] [194 deg F (90 deg C) rated wire, sized according to the 167 deg F (75 deg C) temperature rating in NFPA 70.
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.

5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
7. Alarm Switch: One NO contact that operates only when switch has tripped.
8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.

2.7 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1**)**.

C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cove**r** The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.

F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

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.
1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

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 Owner no fewer than fourteen (14) 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 Owner's written permission.
   4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4
   4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids:

3.4 INSTALLATION

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.

B. Comply with mounting and anchoring requirements specified.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.5 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.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and

B. Perform tests and inspections

C. Tests and Inspections for Switches:
   1. Visual and Mechanical Inspection:
      a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems are as described in the Specifications and shown on the Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:
a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuse holder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

D. Tests and Inspections for Molded Case Circuit Breakers:
1. Visual and Mechanical Inspection:
a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
b. Inspect physical and mechanical condition.

c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that the unit is clean.
e. Operate the circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanisms, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with the coordination study.

2. Electrical Tests:
a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.

3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.

f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. 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. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
   c. 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.
5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

E. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.
1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.7 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as

B. Set field-adjustable circuit-breaker trip ranges to values indicated on the Drawings**.**

END OF SECTION 26 28 16

EXHIBIT D: DRAWINGS

FASHION INSTITUTE OF TECHNOLOGY

STATE UNIVERSITY OF NEW YORK

FELDMAN CENTER

NEW WATERSIDE ECONOMIZER

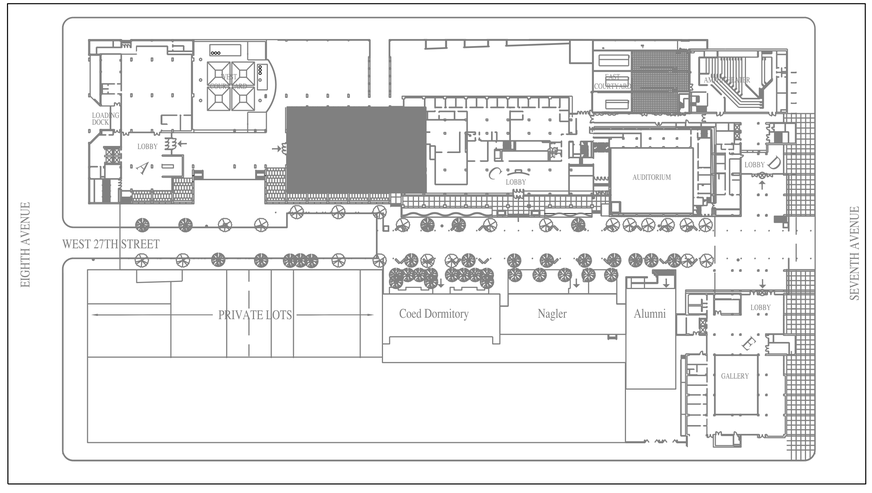
227 WEST 27TH STREET NEW YORK NY 10001
BLOCK: 777 LOT NO.: 18 BIN: 1014251

CONTRACT # C1672

MG Engineering D.P.C. / we engineer success
116 West 32nd Street, 12th Floor, New York, N.Y. 10001
P 212.643.9055 www.mgedpc.net

PROJECT DATA LOCATION:
227 WEST 27TH STREET
NEW YORK, NY 10001

PROPERTY IS NOT LOCATED IN SPECIAL FLOOD HAZARD AREA.



SITE PLAN
NOT TO SCALE

LIST OF DRAWINGS	
DRAWING NAME	DRAWING TITLE
T-001.00	TITLE SHEET
ENERGY	
EN-001.00	MECHANICAL ENERGY COMPLIANCE
MECHANICAL	
M-001.00	MECHANICAL SYMBOLS, ABBREVIATIONS, NOTES AND DRAWING LIST
M-011.00	8TH FLOOR MECHANICAL DEMOLITION PLAN
M-012.00	10TH FLOOR MECHANICAL DEMOLITION PLAN
M-101.00	8TH FLOOR MECHANICAL PLAN
M-102.00	10TH FLOOR MECHANICAL PLAN
M-401.00	EIGHTH THRU 10TH FLOOR CLOSET RISER MECHANICAL PART PLANS
M-402.00	THIRD THRU EIGHTH FLOORS WEST PERIMETER ROOM MECHANICAL PART PLANS
M-403.00	THIRD THRU EIGHTH FLOORS EAST PERIMETER ROOM MECHANICAL PART PLANS
M-501.00	MECHANICAL DETAILS 1
M-502.00	MECHANICAL DETAILS 2
M-601.00	MECHANICAL PIPING DIAGRAM
M-602.00	MECHANICAL FAN COIL PIPING RISER DIAGRAM
M-701.00	MECHANICAL SCHEDULES 1
M-702.00	MECHANICAL SCHEDULES 2
M-801.00	MECHANICAL CONTROL DIAGRAMS
M-901.00	MODIFICATION OF EXISTING GLYCOL MAKEUP PACKAGE FOR ADVISEMENT CENTER
ELECTRICAL	
E-001.00	ELECTRICAL SYMBOL LIST, ABBREVIATIONS, AND DRAWING LIST
E-010.00	10TH FLOOR ELECTRICAL DEMOLITION PLAN
E-100.00	CELLAR ELECTRICAL POWER PLAN
E-110.00	10TH FLOOR ELECTRICAL POWER PLAN
E-401.00	CELLAR THRU 10TH FLOOR CLOSET RISER ELECTRICAL PART PLANS
E-402.00	THIRD THRU EIGHTH FLOORS WEST PERIMETER ROOM ELECTRICAL PART PLANS
E-403.00	THIRD THRU EIGHTH FLOORS EAST PERIMETER ROOM ELECTRICAL PART PLANS
E-501.00	ELECTRICAL DETAILS
E-601.00	ELECTRICAL RISER DIAGRAM
E-701.00	ELECTRICAL PANEL SCHEDULES I
E-702.00	ELECTRICAL PANEL SCHEDULES II
STRUCTURAL	
T-100.00	STRUCTURAL COVER SHEET
A-001.00	AREA OF WORK
A-002.00	EXISTING STEEL FRAME
A-003.00	PROPOSED STEEL FRAME
A-004.00	CONNECTION DETAILS

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

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 2020 NEW YORK CITY ENERGY CONSERVATION CODE.

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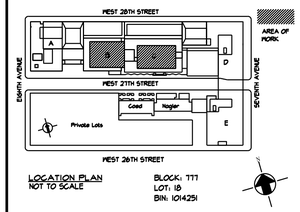
	06/16/2025	ISSUED FOR BID



LOCATION PLAN
NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

Fashion Institute of Technology
227 West 27th Street
New York, NY 10001

MEP Consultants

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Environmental Consultants
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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
COVER SHEET

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	T-001.00
SCALE: NTS	1 OF 1

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				
IIB3	HVAC-R, COMMERCIAL KITCHEN EQUIPMENT, AND SERVICE WATER HEATING EQUIPMENT: EQUIPMENT SIZING, EFFICIENCIES, PIPE SIZING AND OTHER PERFORMANCE FACTORS OF ALL MAJOR EQUIPMENT UNITS, AS DETERMINED BY THE APPLICANT OF RECORD, AND NO LESS THAN 15% OF MINOR EQUIPMENT UNITS, MUST BE VERIFIED BY VISUAL INSPECTION AND, WHERE NECESSARY, REVIEW OF MANUFACTURER'S DATA. POOL HEATERS AND COVERS MUST BE VERIFIED BY VISUAL INSPECTION.	PRIOR TO FINAL PLUMBING AND CONSTRUCTION INSPECTION.	APPROVED CONSTRUCTION DOCUMENTS, ASHRAE 183, ASHRAE HVAC SYSTEMS AND EQUIPMENT HANDBOOK	C403.1, C403.2, C403.3, C403.7.5, C404.2, C404.5, C404.9, C404.10, C406;
IIB4	HVAC-R AND SERVICE WATER HEATING SYSTEM CONTROLS: NO LESS THAN 20% OF EACH TYPE OF REQUIRED CONTROLS MUST BE VERIFIED BY VISUAL INSPECTION AND TESTED FOR FUNCTIONALITY AND PROPER OPERATION. SUCH CONTROLS MUST INCLUDE, BUT ARE NOT LIMITED TO: - THERMOSTATIC - AIR/WATER ECONOMIZERS & CONTROLS - HYDRONIC SYSTEMS CONTROLS WITH SEASONALLY DEPENDENT FUNCTIONALITY: CONTROLS WHOSE COMPLETE OPERATION CANNOT BE DEMONSTRATED DUE TO PREVAILING WEATHER CONDITIONS TYPICAL OF THE SEASON DURING WHICH PROGRESS INSPECTIONS WILL BE PERFORMED SHALL BE PERMITTED TO BE SIGNED OFF FOR THE PURPOSE OF A TEMPORARY CERTIFICATE OF OCCUPANCY WITH ONLY A VISUAL INSPECTION, PROVIDED, HOWEVER, THAT THE PROGRESS INSPECTOR MUST PERFORM A SUPPLEMENTAL INSPECTION WHERE THE CONTROLS ARE VISUALLY INSPECTED AND TESTED FOR FUNCTIONALITY AND PROPER OPERATION DURING THE NEXT IMMEDIATE SEASON THEREAFTER. THE OWNER MUST PROVIDE FULL ACCESS TO THE PROGRESS INSPECTOR WITHIN TWO WEEKS OF THE PROGRESS INSPECTOR'S REQUEST FOR SUCH ACCESS TO PERFORM THE PROGRESS INSPECTION. FOR SUCH SUPPLEMENTAL INSPECTIONS, THE DEPARTMENT MUST BE NOTIFIED BY THE APPROVED PROGRESS INSPECTION AGENCY OF ANY UNRESOLVED DEFICIENCIES IN THE INSTALLED WORK WITHIN 180 DAYS OF SUCH SUPPLEMENTAL INSPECTION.	AFTER INSTALLATION AND PRIOR TO FINAL ELECTRICAL AND CONSTRUCTION INSPECTION, EXCEPT THAT FOR CONTROLS WITH SEASONALLY DEPENDENT FUNCTIONALITY, SUCH TESTING SHALL BE PERFORMED BEFORE SIGN_OFF FOR ISSUANCE OF A FINAL CERTIFICATE OF OCCUPANCY.	APPROVED CONSTRUCTION DOCUMENTS INCLUDING CONTROL SYSTEM NARRATIVES; ASHRAE GUIDELINE 1: THE HVAC COMMISSIONING PROCESS WHERE APPLICABLE	C403.2.4, C403.2.6.1, C403.2.13, C403.3, C403.4, C404.2, C404.6.1, C404.9,
IIB5	HVAC-R AND SERVICE WATER PIPING DESIGN AND INSULATION: INSTALLED PIPING INSULATION MUST BE VISUALLY INSPECTED TO VERIFY PROPER INSULATION PLACEMENT AND VALUES. SERVICE HOT WATER DISTRIBUTION SYSTEMS MUST BE INSPECTED TO VERIFY THE SUPPLY OF HEATED WATER.	AFTER INSTALLATION AND PRIOR TO CLOSING SHAFTS, CELINGS AND WALLS.	APPROVED CONSTRUCTION DOCUMENTS;	C403.11, C404.4, C404.5; MC 603.9;
IIC ELECTRICAL POWER AND LIGHTING SYSTEMS				
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;

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

2020 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*
C403.3.1	**Equipment sizing (Mandatory)**	*HVAC systems sizing based on load calculations*	*Heating and cooling equipment shall not exceed calculated loads*	*Specified equipment sized within load calculation limits*	*Signed and sealed statement from Engineer certifying compliance with Energy Code*
TABLE C403.3.2(9)	**Heat Transfer Equipment**	*plate and frame heat exchanger*	*minimum efficiency not required, tested to AHRI 400*	*minimum efficiency not required, tested to AHRI 400*	*See mechanical schedules M-701*
C403.4.3.3.1	**Temperature dead band**	*Temperature dead band*	*Minimum 20 F dead band between initiation of heat injection or heat rejection to water loop*	*20 F deadband specified Dead band controls as per requirements*	*See mechanical schedules M-701*
C403.5.4	**Water-side economizers**	*Water-side economizer, DC-1B & DC-2B*	*Water economizers shall be configured to cool supply air and provide 100% of expected cooling load at outdoor air temp <50Fdb, <45Fwb. Water economizer system shall have water-side pressure drop of < 15 feet OR a secondary loop*	*Water economizer systems controls provided as per requirements.*	*See mechanical schedules M-701*
C403.8.2	**Motor nameplate horsepower (Mandatory)**	*Exhaust Fans, TX-1 through TX-5, KX-1 through KX-5*	*Motor selection does not except 1.5xbhp for fans less than 6bhp*	*Fan hp < 8 hp hp = 1.5 * 5.5bhp*	*See mechanical schedules M-701*
C403.8.4	**Fractional hp fan motors (Mandatory)**	*Fractional hp fan motors*	*Motor fans 1/12 hp to 1 hp shall be electronically commutated motors or have a minimum efficiency of 70% and must have the means to adjust motor speed for either balancing or remote control. The use of belt-driven fans to sheave adjustments for airflow balancing instead of varying motor speed are permitted.*	*Motor fan 1 hp and efficiency 70%*	*See mechanical schedules M-701*
C403.11.3.1	**Protection of piping insulation (Mandatory)**	*Piping located outdoors*	*All piping insulation is protected from damage, including that due to sunlight, moisture, equipment maintenance and wind. Adhesive tape is not permitted.*	*All outdoor piping insulation is protected from damage.*	*See mechanical drawings*
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*	*Total cooling capacity > 480,000 BTU/h Commissioning is required for this project per requirements*	*See mechanical drawings*

NYC ECC 2020 TABLE C403.11.3 - MINIMUM PIPE INSULATION THICKNESS (INCHES)

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (INCHES)				
	CONDUCTIVITY, k BTU*IN./(H*FT^2*°F)	MEAN RATING TEMPERATURE, °F	<1	1 TO <1½	1½ TO <4	4 TO <8	≥8
>350	0.32-0.34	250	4.5	5.0		5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.21-0.28	100	1.0	1.0	1.5	1.5	1.5
40-60	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
<40	0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

*PIPING THAT CONVEYS FLUIDS THAT HAVE A DESIGN OPERATING TEMPERATURE BETWEEN 60°F AND 105°F DO NOT NEED INSULATION.

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 2020 NEW YORK CITY ENERGY CONSERVATION CODE.

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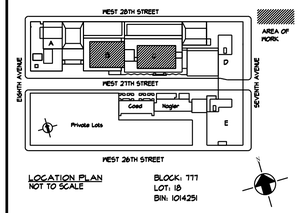
rev. no.	date	revisions
	06/16/2025	ISSUED FOR BID



LOCATION PLAN NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
MECHANICAL ENERGY COMPLIANCE

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	896963
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	EN-001.00
SCALE: NTS	1 OF 1

SYMBOL LIST AND ABBREVIATIONS

ABBREV.	SYMBOL	DESCRIPTION
(E)		EXISTING WORK TO REMAIN
		NEW WORK
		EXISTING WORK TO BE REMOVED
		DIRECTION OF FLOW
		RETURN OR EXHAUST DUCT DOWN
		RETURN OR EXHAUST DUCT UP
		SUPPLY DUCT DOWN
		SUPPLY DUCT UP
MD	MD MD	MOTORIZED DAMPER
FSD/AD, FD/AD, SD/AD		FIRE & SMOKE DAMPERS W/ACCESS DOOR IN DUCT AT WALL
FC	FC	FLEXIBLE CONNECTION
	SD	DUCT MOUNTED SMOKE DETECTOR W/AD
	T	THERMOSTAT WITH DISPLAY
	H	HUMIDISTAT WITH DISPLAY
		CONNECT NEW TO EXISTING WORK
		POINT OF DISCONNECTION, CAP IF NOT TO BE RECONNECTED
TS	TS	TEMPERATURE SENSOR
		THERMOMETER
		WATER PRESSURE GAUGE
		STEAM PRESSURE GAUGE WITH SYPHON
AAV		AUTOMATIC AIR VENT
CV		TWO WAY CONTROL VALVE
		THREE WAY CONTROL VALVE
		BUTTERFLY VALVE
		BUTTERFLY CONTROL VALVE
PSV		SAFETY RELIEF VALVE
		GATE VALVE / SHUT-OFF VALVE
		GLOBE VALVE
		BALL VALVE
		CHECK VALVE
		PLUG VALVE
		COMBINATION FLOW MEASURING AND BALANCING VALVE
		NEEDLE VALVE
		NEEDLE VALVE WITH BLOCK AND BLEED
		STRAINER WITH CAPPED BLOW-DOWN VALVE
TDV		TRIPLE DUTY VALVE
		ECCENTRIC REDUCER
		UNION
	CHWR	CHILLED WATER RETURN
	CHWS	CHILLED WATER SUPPLY
	LPC	LOW PRESSURE CONDENSATE RETURN
	LPS	LOW PRESSURE STEAM
	CW	COLD (CITY) WATER
		PIPE DOWN
		PIPE UP
		END CAP
		PUMP

ABBREVIATIONS

ABV	ABOVE
AC	AIR CONDITIONING
ACC	AIR COOLED CONDENSER
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AFM	AIR FLOW MEASURING STATION
AHU	AIR HANDLING UNIT
AL	ACOUSTIC LINING
APD	AIR PRESSURE DROP
ATC	AUTOMATIC TEMPERATURE CONTROL
BHP	BRAKE HORSEPOWER
BG	BOTTOM GRILLE
BMS	BUILDING MANAGEMENT SYSTEM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BR	BOTTOM REGISTER
BTU	BRITISH THERMAL UNITS
CAR	CONSTANT AIRFLOW REGULATOR
CD	CONDENSATE DRAIN
CFM	CUBIC FEET OF AIR PER MINUTE
CHWS/R	CHILLED WATER SUPPLY AND RETURN
CO	CLEANOUT
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)
DDC	DIRECT DIGITAL CONTROL
DN	DOWN
DP	DIFFERENTIAL PRESSURE
DR	DRAIN
DWG	DRAWING
E	EXISTING
EAT	ENTERING AIR TEMPERATURE
EBH	ELECTRIC BASEBOARD HEATER
ELEV	ELEVATION
ESP	EXTERNAL STATIC PRESSURE
EUH	ELECTRIC UNIT HEATER
EWT	ENTERING WATER TEMPERATURE
FC	FLEXIBLE CONNECTION
FD	FIRE DAMPER
FSD	COMBINATION FIRE/SMOKE DAMPER
FLA	FULL LOAD AMPERES
FLR	FLOOR
FOF	FUEL OIL FILL
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOV	FUEL OIL VENT
FPM	FEET PER MINUTE
FT	FEET
FTR	HOT WATER FINNED TUBE RADIATION
GA	GAUGE
GAL	GALLONS
GPM	GALLONS PER MINUTE
GWS/R	GLYCOL WATER SUPPLY AND RETURN
HP	HORSEPOWER
HPWLS/R	HEAT PUMP LOOP SUPPLY AND RETURN
HWS/R	HOT WATER SUPPLY AND RETURN
HZ	HERTZ
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
MER	MECHANICAL EQUIPMENT ROOM
MFS	MAXIMUM FUSE SIZE
MHP	MOTOR HORSEPOWER
MIN	MINIMUM
MOCP	MAXIMUM OVERCURRENT PROTECTION
NC	NORMALLY CLOSED
N/C	NOT IN CONTACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OED	OPEN ENDED DUCT
PD	PRESSURE DROP
PH	PHASE
PRV	PRESSURE REDUCING VALVE
RG	RETURN GRILLE
RL	REFRIGERANT LIQUID PIPING
RLA	RUNNING LOAD AMPS
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISER
RS	REFRIGERANT SUCTION PIPING
SD	SMOKE DAMPER
SEN	SENSIBLE
SR	SUPPLY REGISTER
SPXF	SMOKE PURGE EXHAUST FAN
TG	TOP GRILLE
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
VFD	VARIABLE FREQUENCY DRIVE
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
WT	WEIGHT

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) MECHANICAL SYSTEMS - BC 1705.21
   b) MECHANICAL AND ELECTRICAL COMPONENTS - 1705.12.3
   c) ENERGY CODE COMPLIANCE INSPECTIONS - BC 110.3.5
   d) FINAL INSPECTIONS - UNDER DIRECTIVE 14
3. THE FOLLOWING ENERGY CODE INSPECTIONS ARE REQUIRED BY THE NYC ENERGY CONSERVATION CODE FOR HVAC SYSTEMS:
   a) HVAC-R AND SERVICE WATER HEATING EQUIPMENT - (IB3), (IIB3)
   b) HVAC-R AND SERVICE WATER HEATING SYSTEM CONTROLS - (IB4), (IIB4)
   c) HVAC-R AND SERVICE WATER PIPING DESIGN AND INSULATION - (IB5), (IIB5)
   d) ELECTRICAL MOTORS AND ELEVATORS - (IIC6)
   e) MAINTENANCE INFORMATION - (ID1), (IID1)
4. 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) HYDRONIC PIPING SYSTEMS - MC 1208
5. THE FOLLOWING WORK ITEMS, COMPONENTS, MATERIALS, CAPACITIES, ETC., SHALL COMPLY WITH THE FOLLOWING CODE REFERENCE.
   a) TEMPERATURE CONTROL - MC 309
   b) NOISE CONTROL AND VIBRATION ISOLATION REQUIREMENTS - MC 313
   c) PIPING AND INSULATION - MC 1201
6. 68 DEGREES F IS THE MINIMUM TEMPERATURE TO BE MAINTAINED IN OCCUPIED SPACES DURING HEATING SEASON

DRAWING LIST

M-001.00	MECHANICAL SYMBOLS, ABBREVIATIONS, NOTES AND DRAWING LIST
M-011.00	8TH FLOOR MECHANICAL DEMOLITION PLAN
M-012.00	10TH FLOOR MECHANICAL DEMOLITION PLAN
M-101.00	8TH FLOOR MECHANICAL PLAN
M-102.00	10TH FLOOR MECHANICAL PLAN
M-401.00	EIGHTH THRU 10TH FLOOR CLOSET RISER MECHANICAL PART PLANS
M-402.00	3RD FLOOR THRU 8TH FLOOR WEST MECHANICAL PART PLANS
M-403.00	3RD FLOOR THRU 8TH FLOOR EAST MECHANICAL PART PLANS
M-501.00	MECHANICAL DETAILS 1
M-502.00	MECHANICAL DETAILS 2
M-601.00	MECHANICAL PIPING DIAGRAM
M-602.00	MECHANICAL FAN COIL PIPING RISER DIAGRAM
M-701.00	MECHANICAL SCHEDULES 1
M-702.00	MECHANICAL SCHEDULES 2
M-801.00	MECHANICAL CONTROL DIAGRAMS
M-901.00	MODIFICATION OF EXISTING GLYCOL MAKEUP PACKAGE FOR ADVISEMENT CENTER

NOTE

SYMBOLS AND ABBREVIATIONS LISTED IN THE TABLES ABOVE ARE TYPICAL FOR HVAC AIR AND WATER DISTRIBUTION SYSTEMS. NOT ALL OF LISTED SYMBOLS OR ABBREVIATIONS WERE USED IN THIS PROJECT.

GENERAL NOTES

1. 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. CONTRACTOR WILL NOT BE RESPONSIBLE FOR DELAYS CAUSED BY THE MITIGATION ACTIVITIES OR ANY ASSOCIATED COSTS.
2. ALL PIPING SHALL BE SUSPENDED FROM BUILDING STRUCTURE ONLY, EXCEPT AS SPECIFICALLY ALLOWED IN THE SPECIFICATIONS. HVAC CONTRACTOR SHALL PROVIDE SUPPLEMENTARY STEEL AS NECESSARY TO SUPPORT PIPES FROM BUILDING STRUCTURE. THE ENGINEER SHALL BE THE SOLE DETERMINANT AS TO PERMISSIBILITY OF HANGING NEW WORK FROM BUILDING STRUCTURE AND SLABS.
3. PIPING PROVIDED UNDER THIS CONTRACT SHALL BE COORDINATED UNDER THIS CONTRACT WITH WORK BEING PROVIDED BY OTHER TRADES.
4. 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 CEILING HEIGHTS, TO MEET STRUCTURAL AND FIELD CONDITIONS. CONTRACTOR SHALL PROVIDE REDRAWING OF SHOP DRAWINGS AS NECESSARY TO ACCOMMODATE THE ARCHITECT'S REQUIREMENTS, AT NO ADDITIONAL COST TO THE OWNER. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR REQUIRED CEILING HEIGHTS.
5. 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.
6. SYMBOLS AND ABBREVIATIONS SHOWN ON THE DRAWINGS ARE FOR MECHANICAL DRAWINGS ONLY. SEE OTHER TRADES DRAWINGS FOR THEIR RESPECTIVE SYMBOLS AND ABBREVIATIONS.
7. PRIOR TO PERFORMING ANY CORE DRILLING OR CUTTING OF EXISTING FLOOR OR ROOF SLAB, CONTRACTOR SHALL PERFORM A SCAN OF THE SLAB USING GROUND PENETRATING RADAR (GPR) TO CONFIRM THAT THERE ARE NO EXISTING CONDUITS OR PIPES IN THE AREA OF CORE DRILL OR CUTTING OF THE SLAB.

DEMOLITION NOTES

1. DEMOLITION OF HVAC ITEMS SHALL BE PERFORMED UNDER THE HVAC CONTRACT.
2. LOCATION OF THE EXISTING DUCTWORK & PIPING AS SHOWN ON DRAWINGS IS APPROXIMATE.
3. PROVIDE TEMPORARY SUPPORTS WHERE REQUIRED.
4. DURING DEMOLITION, PROPERLY CAP AND PROTECT ALL DUCTWORK, EQUIPMENT, AND PIPING THAT WILL REMAIN IN OPERATION.
5. WHERE EXISTING INSULATION TO REMAIN IS DAMAGED BY THE REQUIREMENTS OF THE WORK, REPLACE ANY DAMAGED INSULATION TO MATCH EXISTING.
6. DEMOLISH ALL EQUIPMENT AS INDICATED, FIXTURES AND/OR MISCELLANEOUS ARTICLES IN THEIR ENTIRETY INCLUDING AUXILIARY EQUIPMENT, PIPING, WIRING, CONDUIT AND DUCTWORK. DEMOLITION WORK SHALL BE PERFORMED BY WORKMEN EXPERIENCED IN THIS TYPE OF WORK AND SHALL BE CARRIED THROUGH TO COMPLETION WITH DUE REGARDS TO THE SAFETY OF ALL BUILDING OCCUPANTS AND THE EMPLOYEES OF THE CONTRACTOR WITH AS LITTLE DISTURBANCE AS POSSIBLE.
7. MATERIALS RESULTING FROM THE DEMOLITION OPERATIONS SHALL NOT BE ALLOWED TO ACCUMULATE ON THE FLOORS AND ROOF SURFACES, EXTERIOR GRADE SURFACES OR OTHER PARTS OF THE PREMISES, AND SHALL BE PROMPTLY REMOVED AND DISPOSED OF AWAY FROM THE PREMISES.
8. INCLUDE ALL DEMOLITION OF SYSTEMS AND COMPONENTS WHERE SYSTEMS SHALL BE REPLACED BY NEW WORK. REFER TO THE DRAWINGS AND SPECIFICATIONS FOR THE SCOPE OF NEW AND RECONNECTED WORK. THE INTENT OF THIS REQUIREMENT IS TO HAVE THE CONTRACTOR DISCONNECT, DEMOLISH AND REMOVE ALL EXPOSED AND CONCEALED WORK WHERE BEING REPLACED OR CONNECTED TO THE NEW LAYOUTS.
9. COORDINATE ELECTRICAL POWER DISCONNECTION PRIOR TO DEMOLITION WITH ELECTRICAL CONTRACTOR.
10. PROTECT ALL HVAC WORK AND WORK OF OTHER TRADES WHICH IS TO REMAIN, FROM DAMAGE DURING DEMOLITION.
11. ALL PIPING AND DUCTWORK TO REMAIN SHALL HAVE ENDS TERMINATED IN A NEAT MANNER READY FOR CONNECTION OF NEW WORK. ALL EXPOSED ENDS OF PIPING AND DUCTWORK SHALL BE CAPPED. SCREWED PIPING SHALL END ON A SCREWED JOINT. FLANGED PIPE SHALL END WITH A FLANGED JOINT. WELDED PIPING SHALL BE MECHANICALLY CUT, CLEANED OF BURRS AND A CAP WELDED TO THE PIPE. DUCTWORK SHALL BE CAPPED WITH SHEET METAL CONNECTED TO THE DUCT TO REMAIN.
12. REMOVAL OF EQUIPMENT, PIPING AND DUCTWORK SHALL INCLUDE ALL HANGERS & SUPPORT ASSOCIATED WITH THE EQUIPMENT, PIPING AND DUCTWORK TO BE REMOVED.

SCOPE OF WORK

1. PROVIDE NEW DRYCOOLERS DC-2B & DC-3B ON 10TH FLOOR SETBACK ROOF
2. PROVIDE NEW HEAT EXCHANGERS AND PUMPS ON 10TH FLOOR

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

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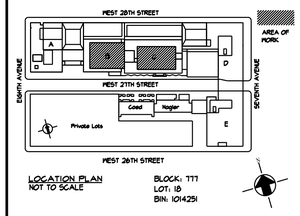

LOCATION PLAN
NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

Fashion Institute of Technology
227 West 27th Street
New York, NY 10001

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236 West 27th Street 1401
New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

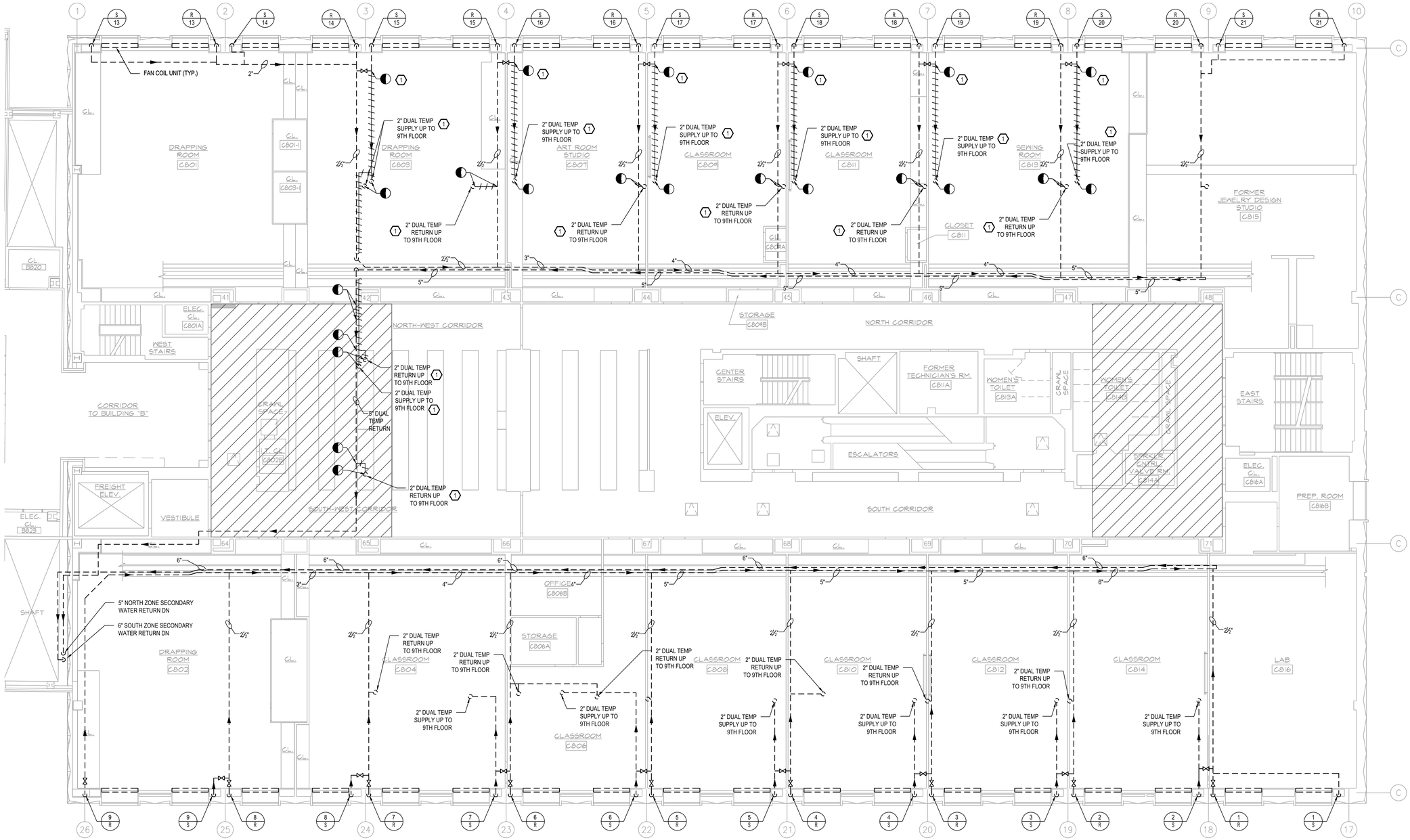
C1672

DRAWING TITLE:
MECHANICAL SYMBOLS, ABBREVIATIONS, NOTES AND DRAWING LIST

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-001.00
SCALE: NTS	1 OF 16



LEGEND

REMOVE EXISTING GYPSUM BOARD / 2x2 ACT CEILING

KEY NOTES:

(1) DEMOLISH EXISTING 2" DUAL TEMPERATURE PIPING. CUT, ADD ISOLATION VALVE AND CAP PIPING UP TO 9TH FLOOR TO BE RECONNECTED TO NEW 2" PIPING

SCHEDULE NOTES:

WORK SHOWN ON THIS PLAN IS TO BE SCHEDULED BETWEEN THE FOLLOWING TIMELINE:

DECEMBER 23RD 2025 - JANUARY 20TH 2026

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

0 4' 8' 16'

SCALE: 1/8" = 1'-0"

EIGHTH FLOOR MECHANICAL DEMOLITION PLAN

SCALE:1/8"=1'-0"

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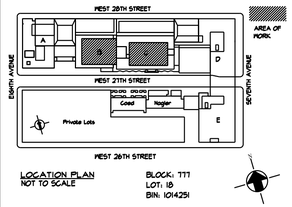
	06/16/2025	ISSUED FOR BID



LOCATION PLAN NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

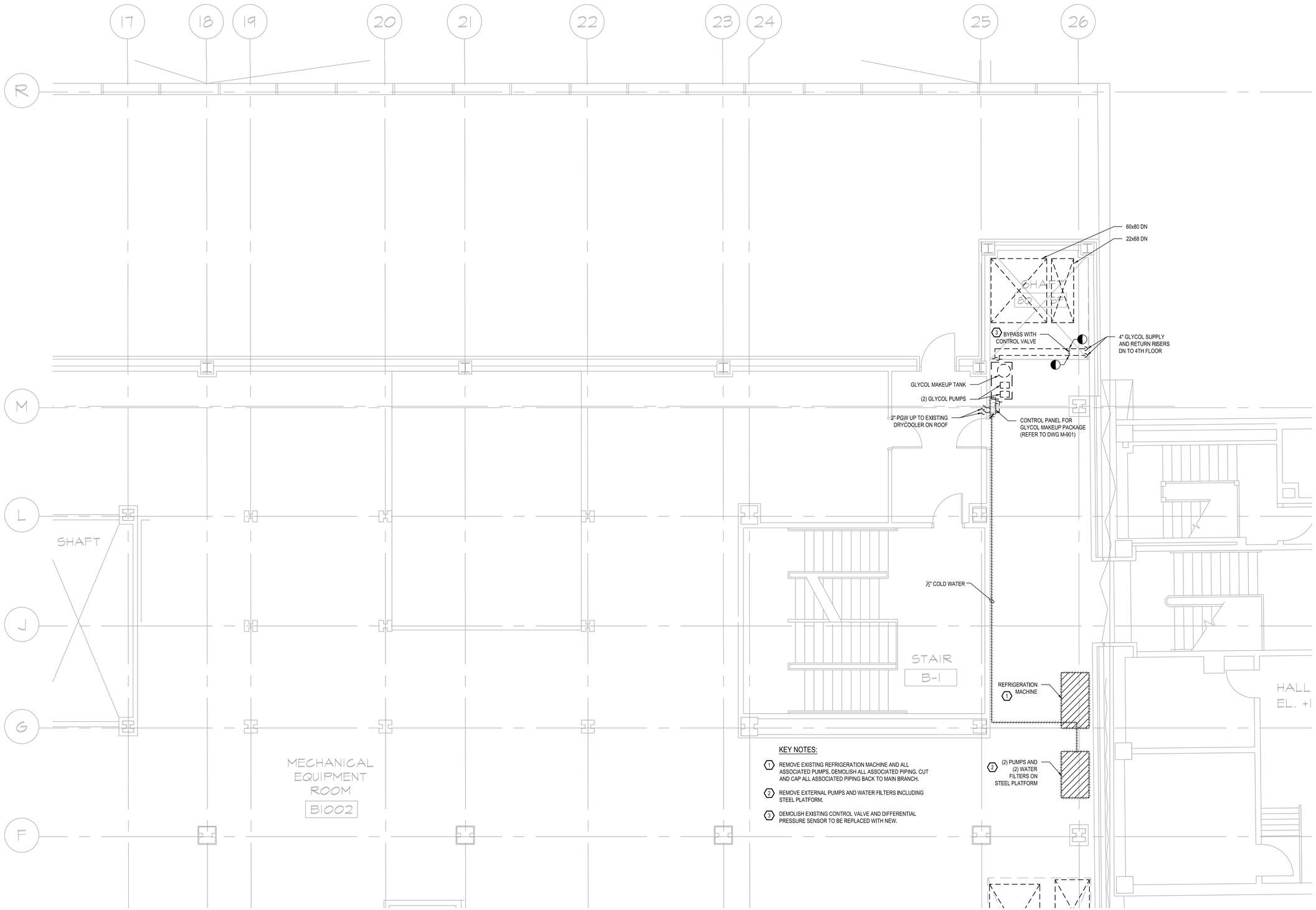
C1672

DRAWING TITLE:
EIGHTH FLOOR MECHANICAL DEMOLITION PLAN

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-011.00
SCALE: NTS	2 OF 16



KEY NOTES:

1. REMOVE EXISTING REFRIGERATION MACHINE AND ALL ASSOCIATED PUMPS. DEMOLISH ALL ASSOCIATED PIPING. CUT AND CAP ALL ASSOCIATED PIPING BACK TO MAIN BRANCH.
2. REMOVE EXTERNAL PUMPS AND WATER FILTERS INCLUDING STEEL PLATFORM.
3. DEMOLISH EXISTING CONTROL VALVE AND DIFFERENTIAL PRESSURE SENSOR TO BE REPLACED WITH NEW.

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0 4' 8' 16'
SCALE: 1/8" = 1'-0"

TENTH FLOOR MECHANICAL DEMOLITION PLAN

SCALE:1/8"=1'-0"

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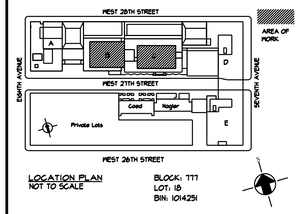

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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

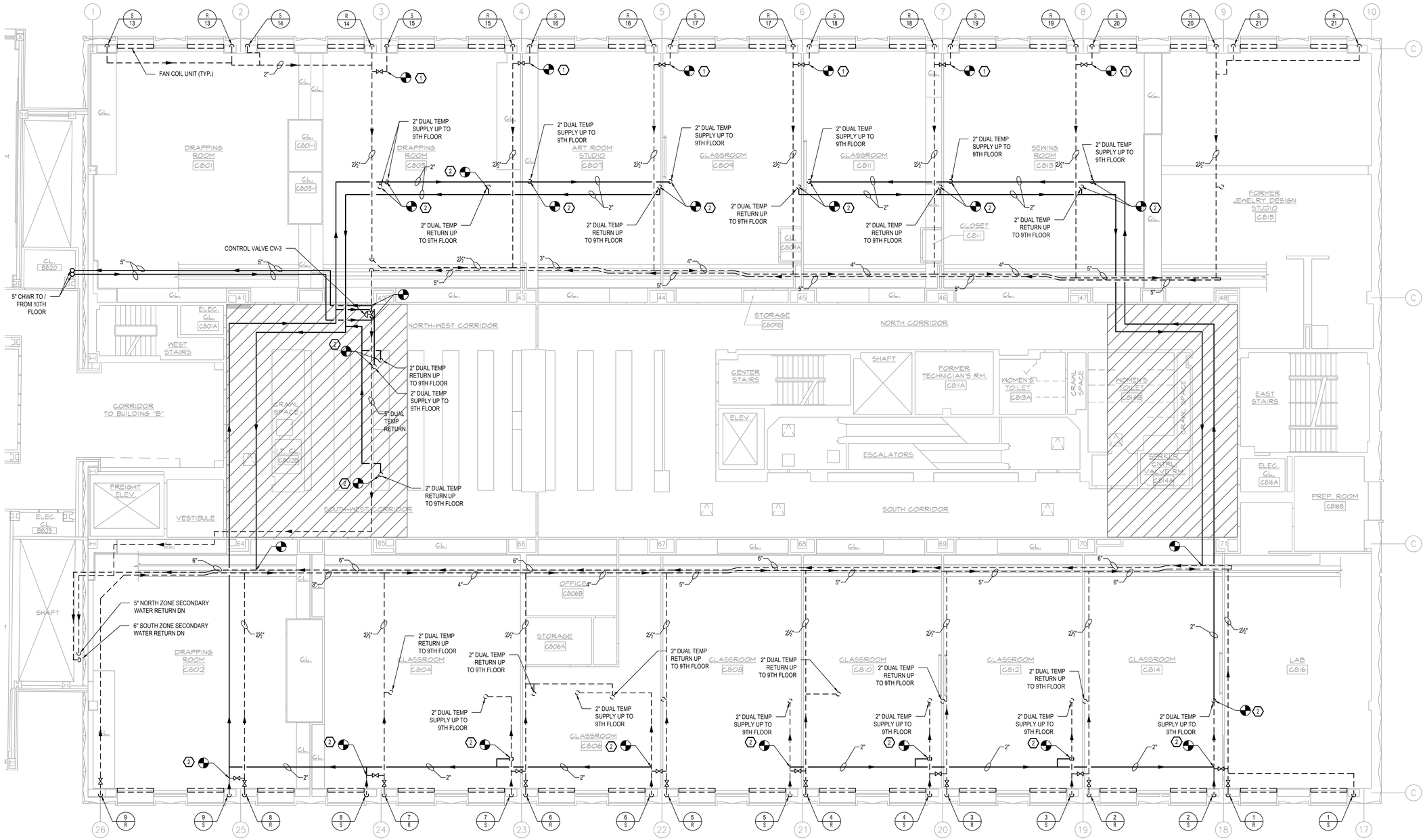
C1672

DRAWING TITLE:
TENTH FLOOR MECHANICAL DEMOLITION PLAN

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-012.00
SCALE: NTS	3 OF 16



LEGEND

NEW 2X2 ACT CEILING

KEY NOTES:

1. INSTALL NEW AIR VENT
2. CONNECT NEW 2" PIPING TO BOTTOM OF RISER TO 9TH FLOOR.

SCHEDULE NOTES:

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DECEMBER 23RD 2025 - JANUARY 20TH 2026

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0 4' 8' 16'

SCALE: 1/8" = 1'-0"

EIGHTH FLOOR MECHANICAL PLAN

SCALE:1/8"=1'-0"

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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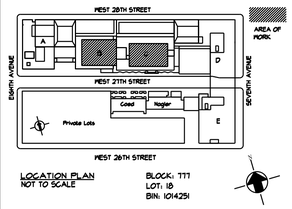

LOCATION PLAN NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

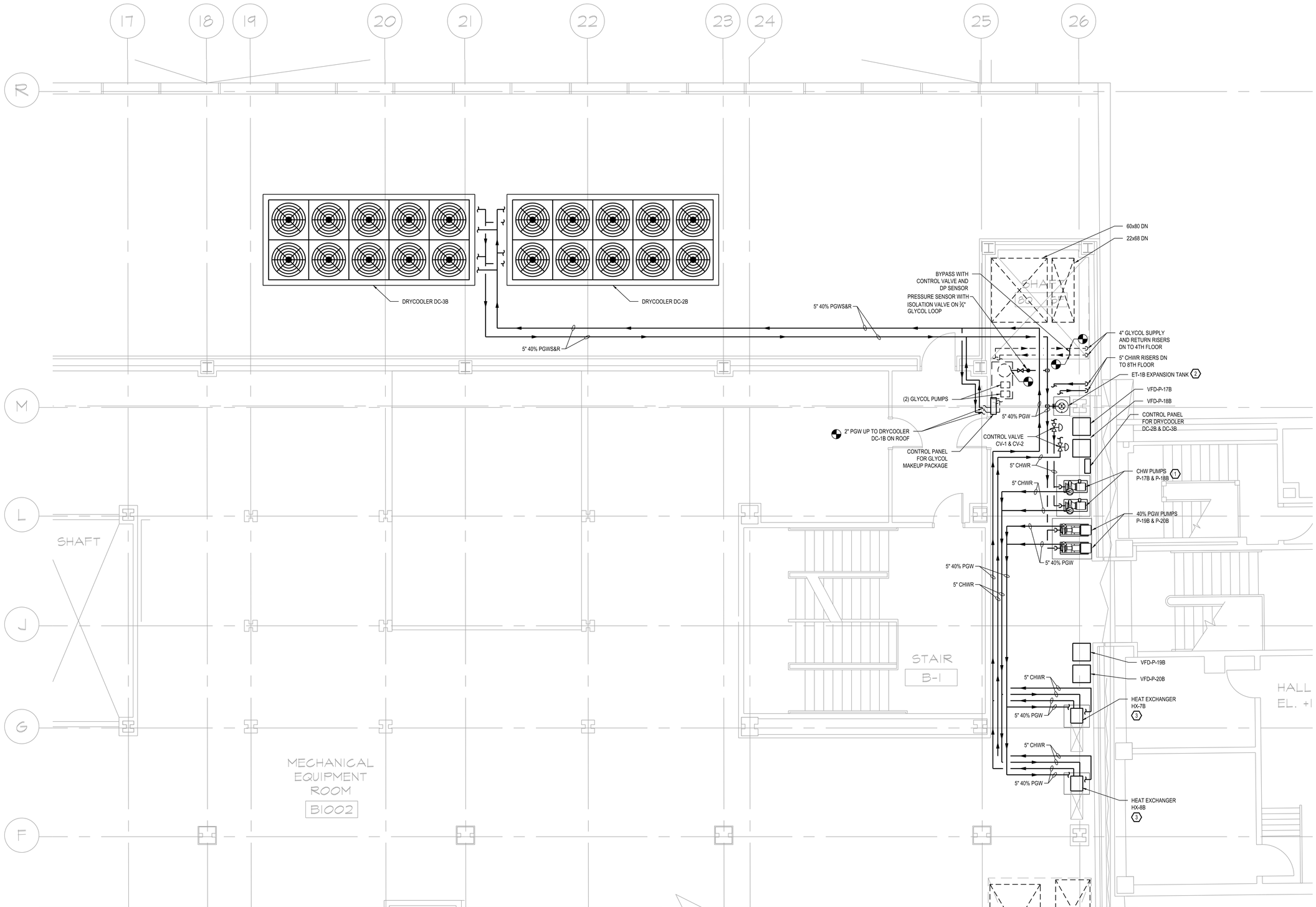
C1672

DRAWING TITLE:
EIGHTH FLOOR
MECHANICAL PLAN

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-101.00
SCALE: NTS	4 OF 16



KEY NOTES:

1. PROVIDE NEW PUMPS ON INERTIA PAD AND CONCRETE PAD WITH RESERVOIR AND LEAK DETECTOR.
2. PROVIDE EXPANSION TANK ON CONCRETE PAD.
3. PROVIDE HEAT EXCHANGER ON CONCRETE PAD.

NOTE:

REFER TO PIPING DIAGRAM ON M-601 AND CONTROL DIAGRAM ON M-801 FOR VALVES AND INSTRUMENTATION.

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0 4' 8' 16'

SCALE: 1/8" = 1'-0"

TENTH FLOOR MECHANICAL PLAN

SCALE:1/8"=1'-0"

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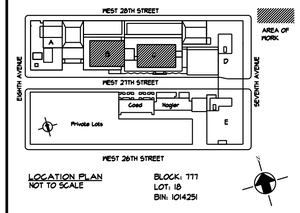

LOCATION PLAN
NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

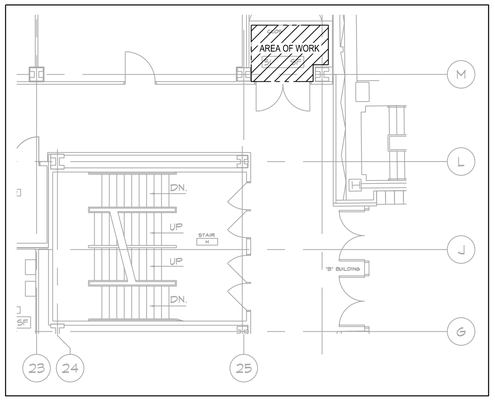
C1672

DRAWING TITLE:
TENTH FLOOR
MECHANICAL PLAN

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-102.00
SCALE: NTS	5 OF 16



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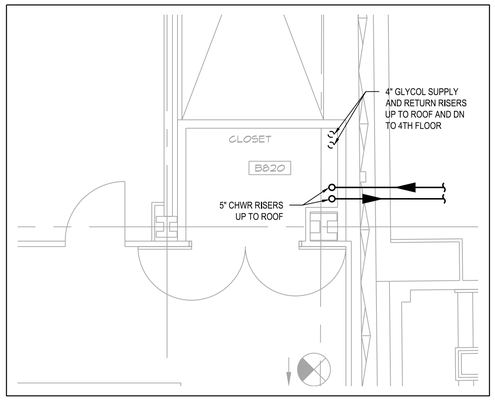
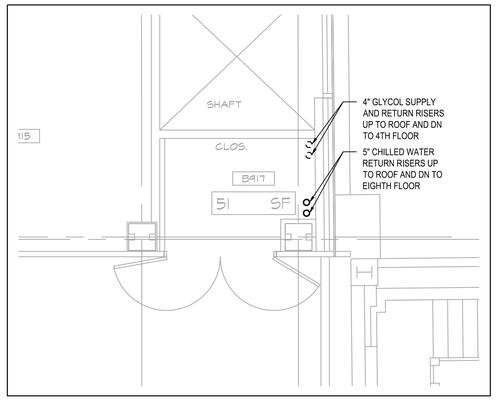
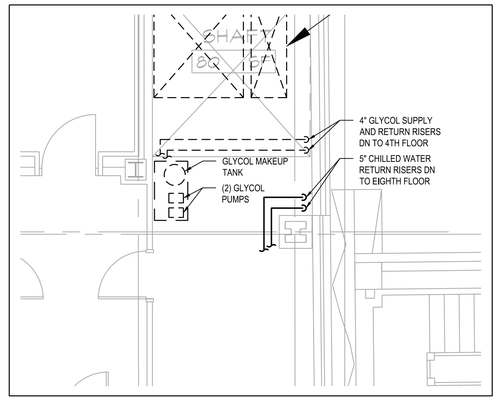
1/8"=1'-0"



1 EIGHTH FLOOR MECHANICAL PART PLAN
1/4"=1'-0"



2 NINTH FLOOR MECHANICAL PART PLAN
1/4"=1'-0"



3 TENTH FLOOR MECHANICAL PART PLAN
1/4"=1'-0"

NOTES:

1. PROVIDE FIRE STOPPING AS PER DETAIL AT ALL FIRE RATED PENETRATIONS.
2. COORDINATE LOCATIONS OF NEW 5" CHWR RISERS WITH EXISTING PIPING AND NEW ELECTRICAL CONDUIT RISERS. SEE ELECTRICAL DRAWINGS.

0 2' 4' 8'
SCALE: 1/4" = 1'-0"

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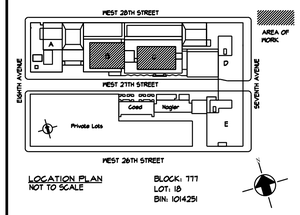

LOCATION PLAN
NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

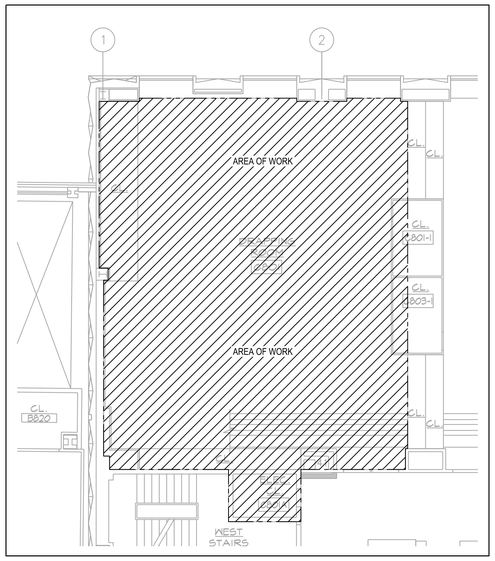
C1672

DRAWING TITLE:
EIGHTH THRU 10TH FLOOR
CLOSET RISER MECHANICAL
PART PLANS

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-401.00
SCALE: NTS	6 OF 16



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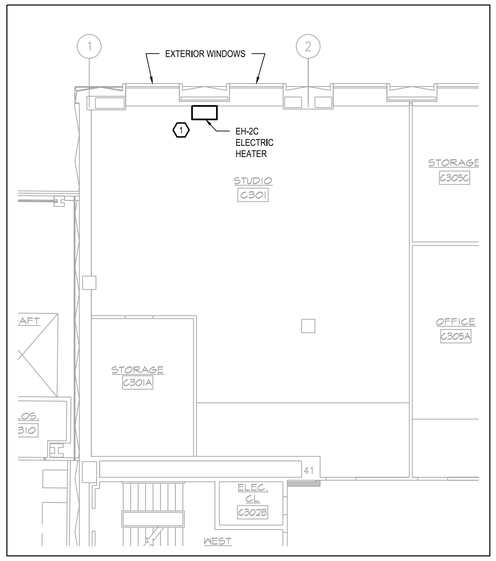
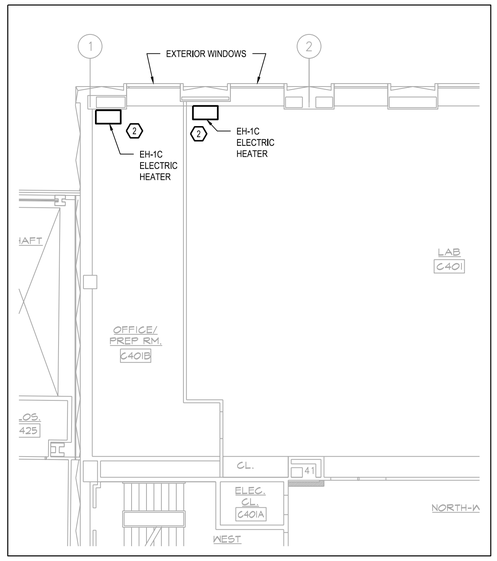
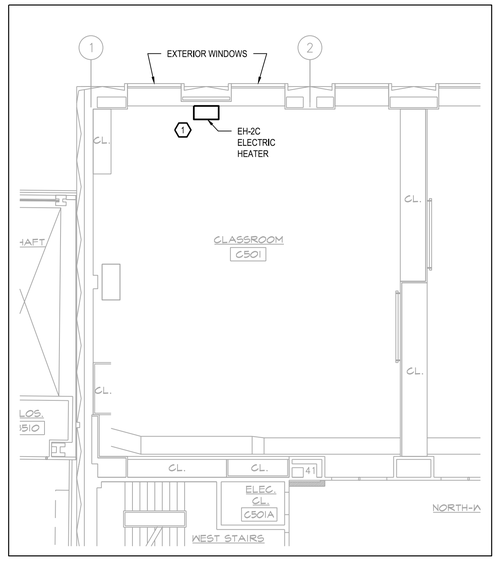
1/8"=1'-0"



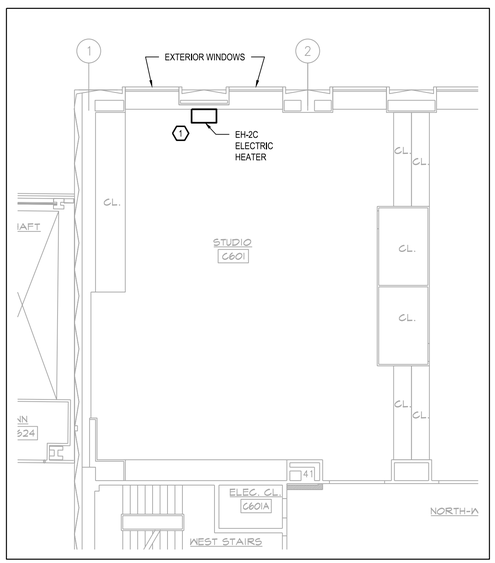
1 THIRD FLOOR MECHANICAL PART PLAN
1/8"=1'-0"



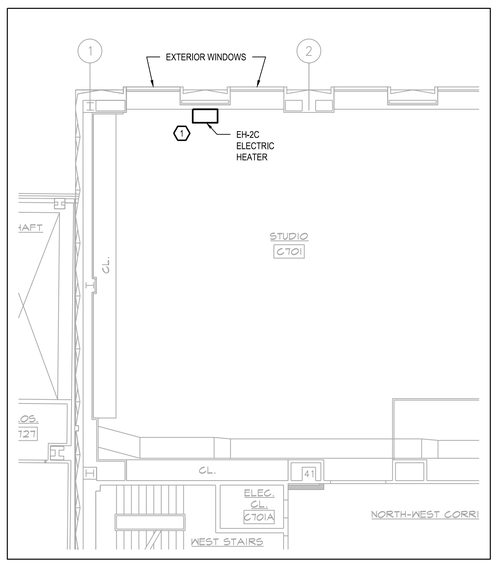
2 FOURTH FLOOR MECHANICAL PART PLAN
1/8"=1'-0"



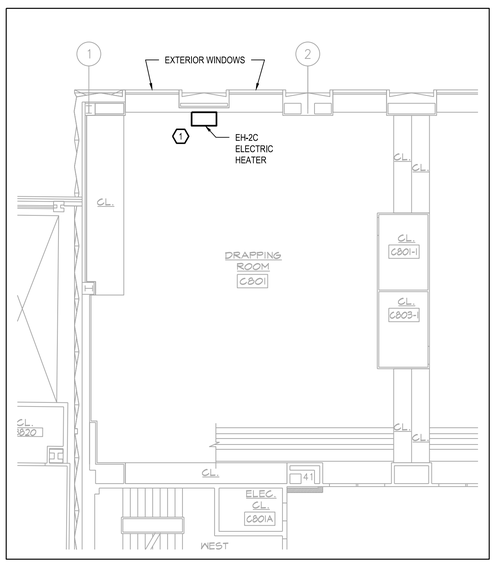
3 FIFTH FLOOR MECHANICAL PART PLAN
1/8"=1'-0"



4 SIXTH FLOOR MECHANICAL PART PLAN
1/8"=1'-0"



5 SEVENTH FLOOR MECHANICAL PART PLAN
1/8"=1'-0"



6 EIGHTH FLOOR MECHANICAL PART PLAN
1/8"=1'-0"

KEY NOTES:

1. PROVIDE NEW 2KW ELECTRIC HEATER MOUNTED FROM CEILING ON COLUMN NEXT TO EXTERIOR WINDOWS. SEE SCHEDULE ON DRAWING M-701.
2. PROVIDE NEW 1.5KW ELECTRIC HEATER MOUNTED FROM CEILING NEXT TO EXTERIOR WINDOWS. SEE SCHEDULE ON DRAWING M-701.

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

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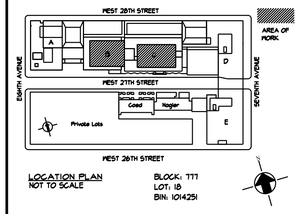

LOCATION PLAN
NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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Structural Consultants
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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

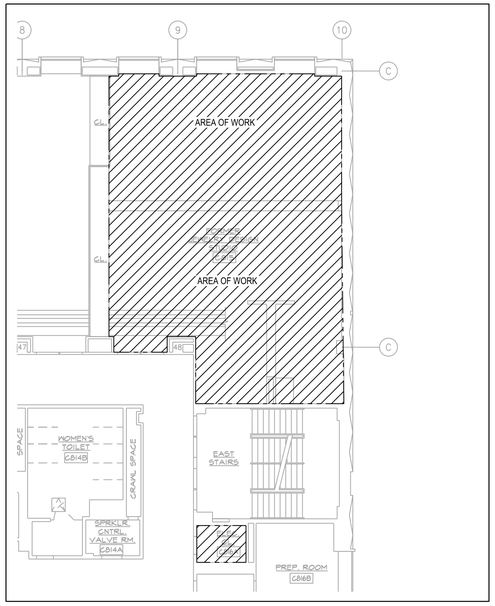
C1672

DRAWING TITLE:
THIRD THRU EIGHTH FLOORS
WEST PERIMETER ROOM
MECHANICAL PART PLANS

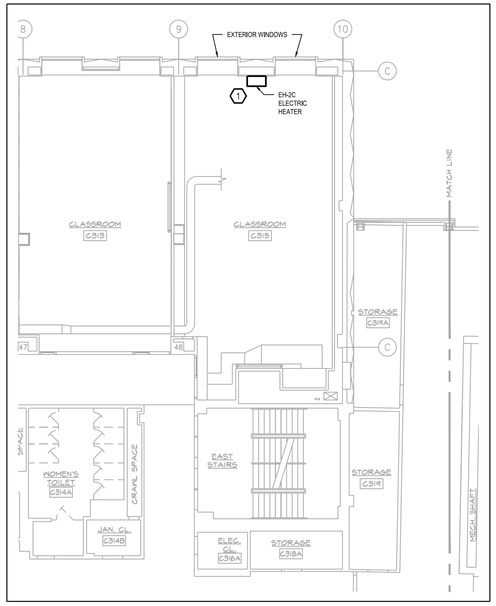
DOB NOW JOB•

SEAL & SIGNATURE:

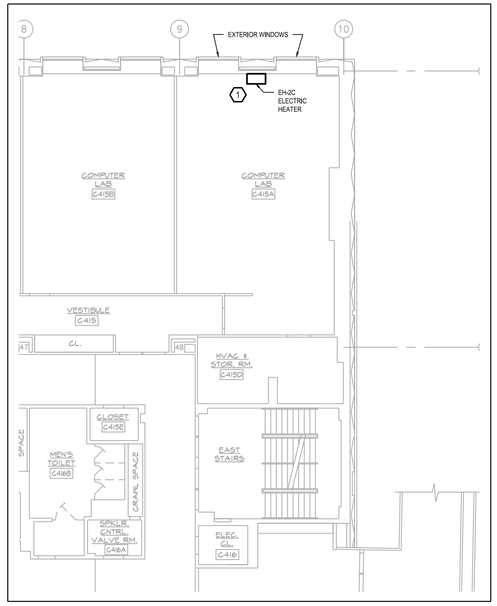
DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-402.00
SCALE: NTS	7 OF 16



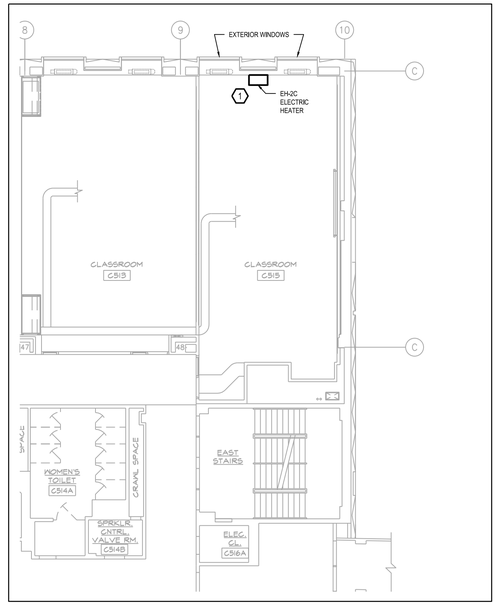
0 AREA OF WORK (TYP. THIRD-EIGHTH FLOOR)
3/32"=1'-0"



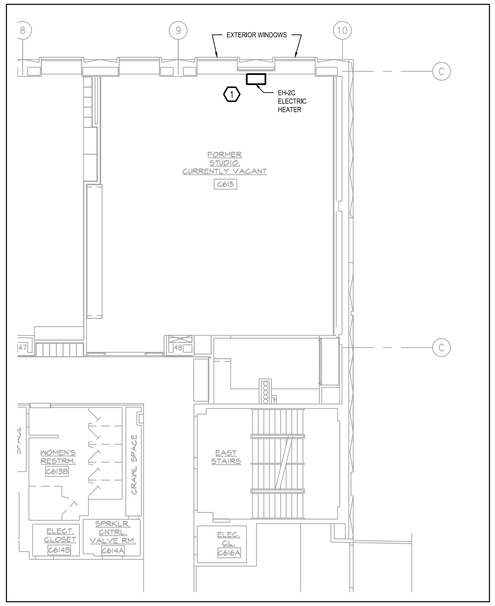
1 THIRD FLOOR MECHANICAL PART PLAN
3/32"=1'-0"



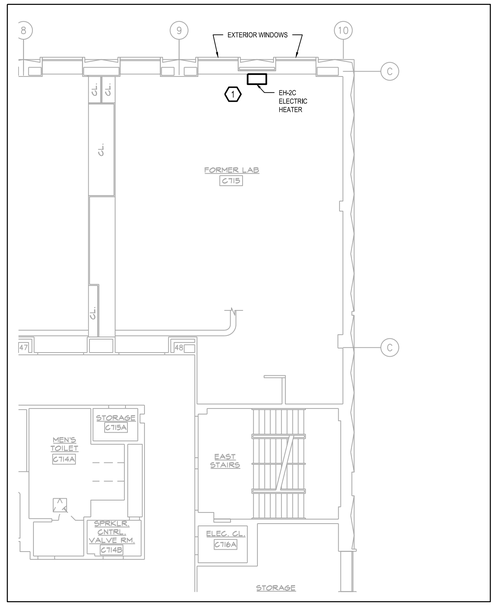
2 FOURTH FLOOR MECHANICAL PART PLAN
3/32"=1'-0"



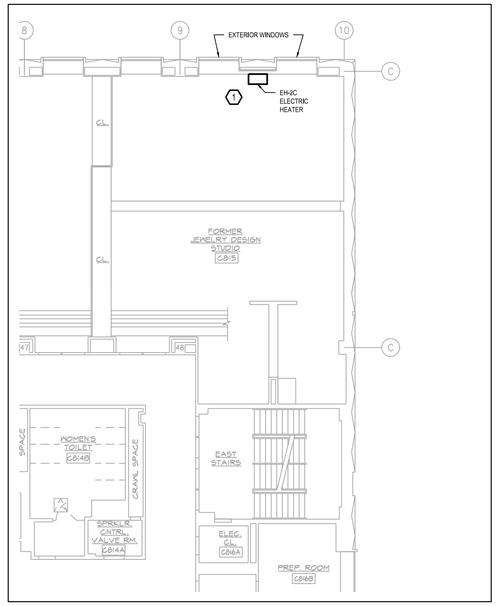
3 FIFTH FLOOR MECHANICAL PART PLAN
3/32"=1'-0"



4 SIXTH FLOOR MECHANICAL PART PLAN
3/32"=1'-0"



5 SEVENTH FLOOR MECHANICAL PART PLAN
3/32"=1'-0"



6 EIGHTH FLOOR MECHANICAL PART PLAN
3/32"=1'-0"

KEY NOTES:

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0 4' 8' 16'
SCALE: 1/8" = 1'-0"

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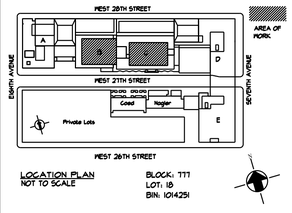

LOCATION PLAN
NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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PROJECT:
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NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
THIRD THRU EIGHTH FLOORS
EAST PERIMETER ROOM
MECHANICAL PART PLANS

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
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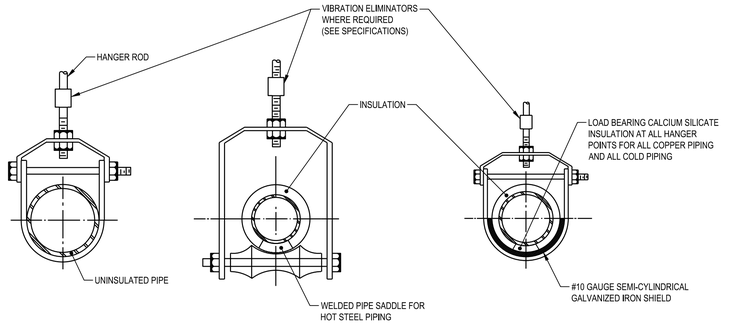
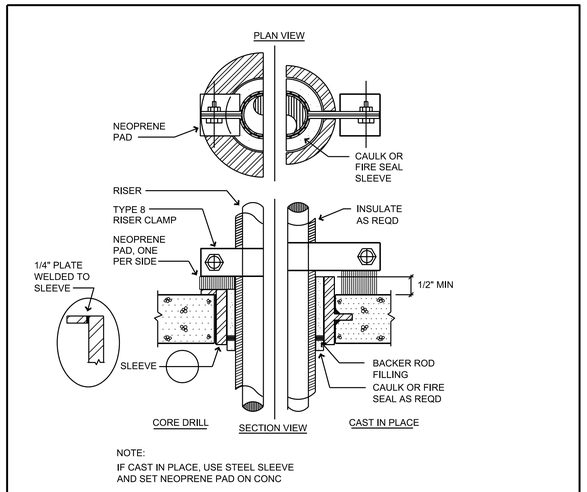
CHK BY:	DNE
DWG No:	M-403.00
SCALE:	3/32"=1'-0"
	8 OF 16

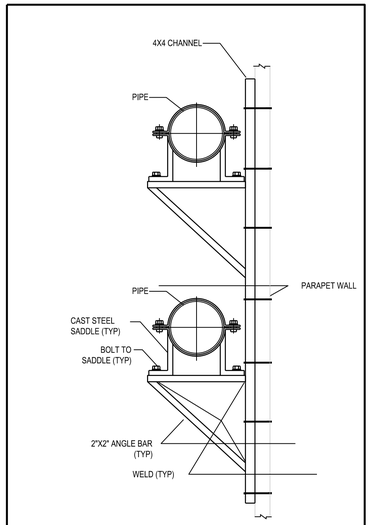


INDIVIDUAL PIPE HANGER ROD & SPACING SCHEDULE												
NOMINAL PIPE OR TUBE SIZE - INCHES	3/4	1	1 1/2	2	2 1/2	3	4	5	6	8	10	12
HANGER ROD SIZES -INCHES	3/8	3/8	3/8	3/8	1/2	1/2	5/8	5/8	7/8	7/8	7/8	7/8
MAXIMUM SPACING BETWEEN PIPE SUPPORT - FEET	6	7	9	10	11	12	14	16	17	19	22	23
MAX. SPACING BETWEEN COPPER. TUBE SUPPORTS - FEET	6	6	8	9	10	10	12	14	14	16	18	20

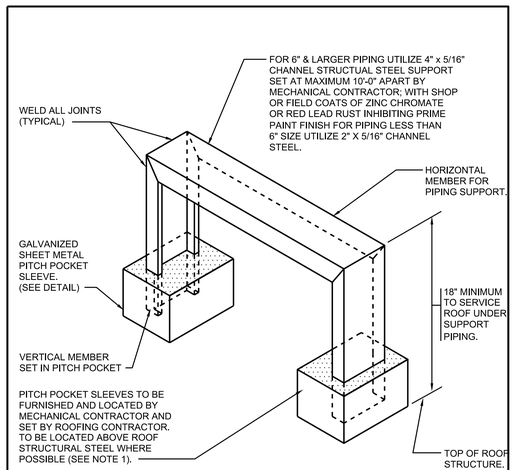
1 **CLEVIS AND ROLLER HANGER DETAILS**
Not to Scale



1 **Single Pipe Type 8 Riser Clamp with Vibration Isolation**
Not to Scale

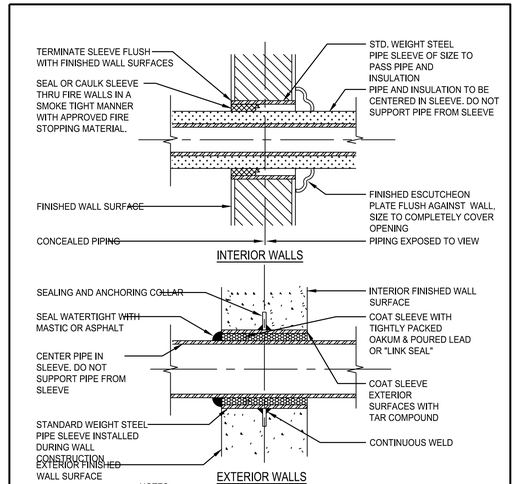


6 **EXTERIOR PIPE SUPPORT DETAIL**
Not to Scale



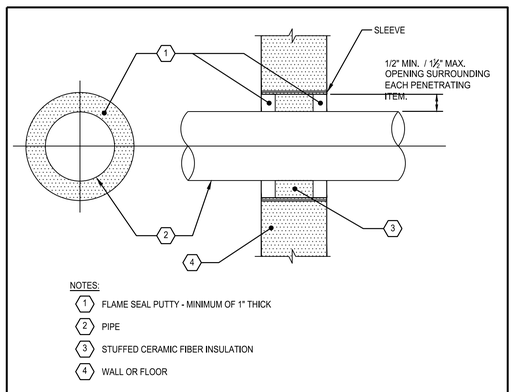
NOTE:
1. MECHANICAL CONTRACTOR TO SUBMIT PIPING LAYOUT WITH SUPPORT LOCATIONS & KIP LOADING TO ENGINEER'S OFFICE FOR ENGINEER'S REVIEW AND APPROVAL PRIOR TO ERECTION.

2 **Structural Support for Water Piping Mains Located Above Roof**
Not to Scale



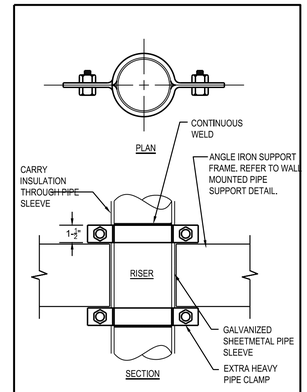
NOTES:
1. PIPE SLEEVE FOR EXTERIOR WALL ABOVE OR BELOW GRADE.
2. FOR GAS SERVICE, EXTEND SLEEVE 1" PAST INSIDE FACE OF & 4" PAST OUTSIDE FACE OF WALL.

4 **Pipe Sleeves Thru Walls**
Not to Scale

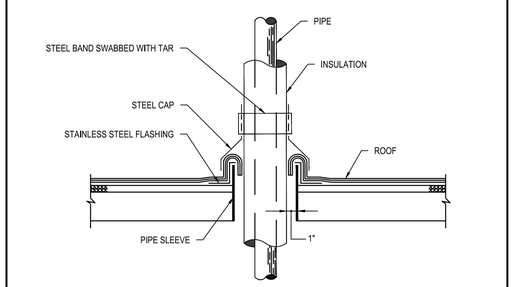


NOTES:
1. FLAME SEAL PUTTY - MINIMUM OF 1" THICK
2. PIPE
3. STUFFED CERAMIC FIBER INSULATION
4. WALL OR FLOOR

5 **Fire Stopping for Fire/Smoke Rated Wall/Floor Openings**
Not to Scale



7 **Riser Anchor Detail**
Not to Scale



8 **DETAIL OF INSULATED PIPING THRU ROOF**
Not to Scale

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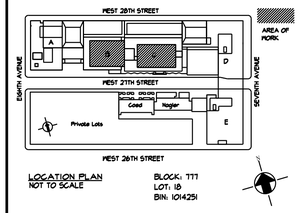

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

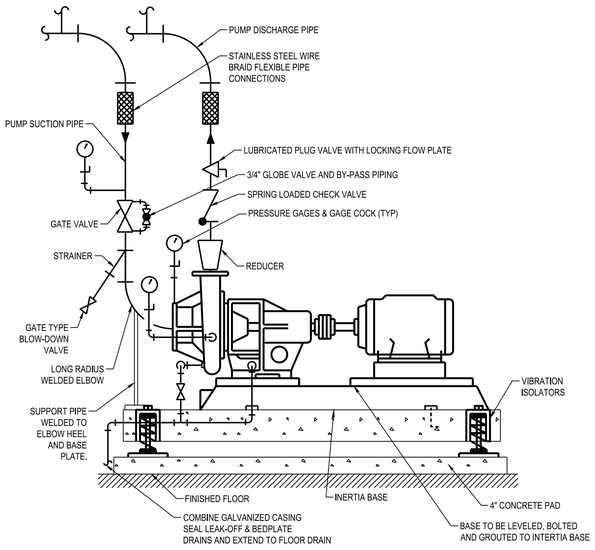
C1672

DRAWING TITLE:
MECHANICAL DETAILS 1

DOB NOW JOB•

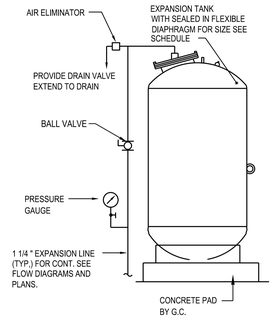
SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-501.00
SCALE: NTS	9 OF 16

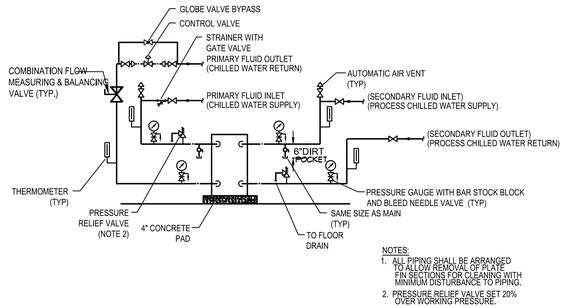


NOTES:
1. INERTIA BASE HEIGHTS SHALL BE AS FOLLOWS: UP TO 15HP=6", 20-50HP=8", 60-100HP=10", OVER 100HP=12".

1 PIPING CONNECTION DETAIL - END SUCTION PUMP
Not to Scale



2 FLOOR MOUNTED EXPANSION TANK
Not to Scale



NOTES:
1. ALL PIPING SHALL BE ARRANGED TO ALLOW REMOVAL OF PLATE FIN SECTIONS FOR CLEANING WITH MINIMUM DISTURBANCE TO PIPING.
2. PRESSURE RELIEF VALVE SET 20% OVER WORKING PRESSURE.

3 WATER-TO-WATER PLATE TYPE HEAT EXCHANGER PIPING
Not to Scale

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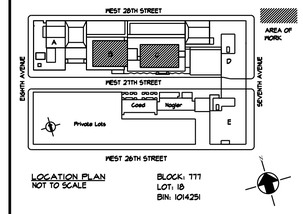

LOCATION PLAN
NOT TO SCALE

BLOCK: 777
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NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

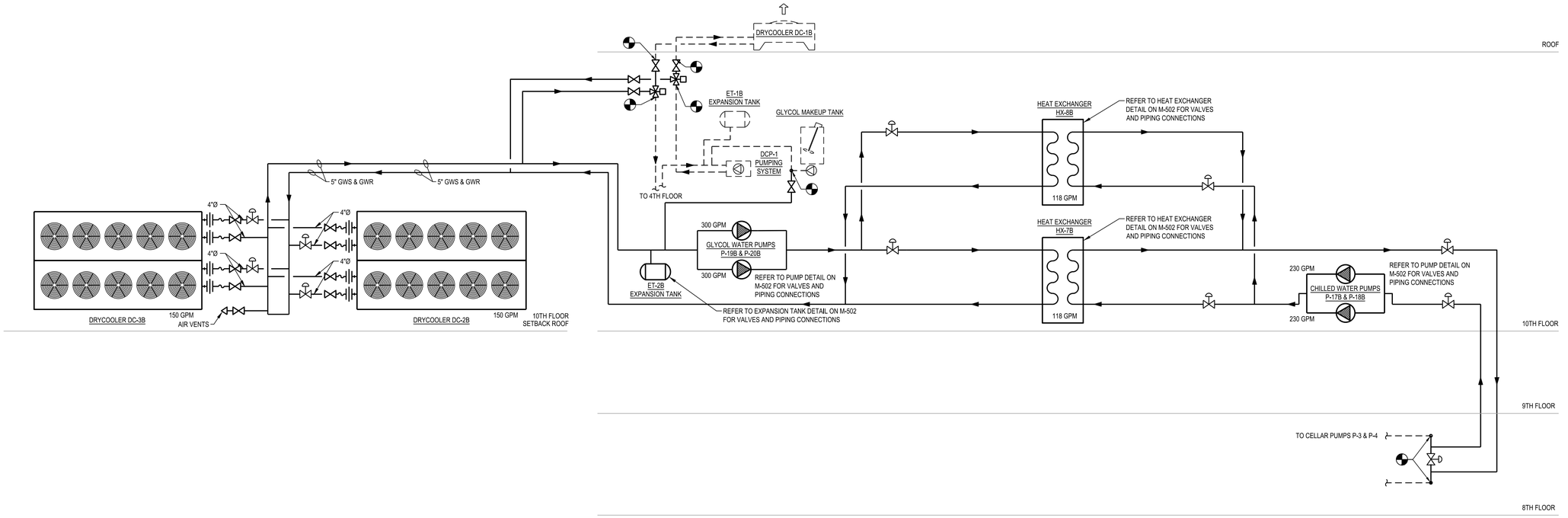
C1672

DRAWING TITLE:
MECHANICAL DETAILS 2

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-502.00
SCALE: NTS	10 OF 16



WATERSIDE PIPING DIAGRAM

LEGEND

NC	NORMALLY CLOSED
NO	NORMALLY OPEN
TS	TEMPERATURE SENSOR
ES	END SWITCH
MSD	SMOKE DAMPER
SD	SMOKE DETECTOR
H	HUMIDITY TRANSMITTER
CHWS/R	CHILLED WATER SUPPLY/RETURN
CV	CONTROL VALVE
AI	ANALOG INPUT
AO	ANALOG OUTPUT
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
AFM	AIR FLOW MEASURING STATION
AFS	AIR FLOW MEASURING SWITCH
PD	PRESSURE DIFFERENTIAL SENSOR
SPS	STATIC PRESSURE SENSOR
VFD	VARIABLE FREQUENCY DRIVE
SS	START / STOP
VP	VELOCITY PRESSURE
LPS	LOW PRESSURE SENSOR
DC	DRYCOOLER
VFD	VARIABLE FREQUENCY DRIVE
CV	CONTROL VALVE
CS	CURRENT SENSOR
DP	PRESSURE DIFFERENTIAL SENSOR
PT	PRESSURE TRANSMITTER
	CONTROL VALVE
	VALVE
TT	TEMPERATURE SENSOR / WELL
PT	PRESSURE SENSOR

LEGEND

	GATE VALVE
	CHECK VALVE
	UNION
	BALL OR FLOW CONTROL VALVE
	FLEXIBLE CONNECTION
P.D.	PRESSURE DROP
	3-WAY CONTROL VALVE

NOTES:
1. PIPING SHALL BE INSULATED AS PER SPECS.
2. PROVIDE PRESSURE AND TEMPERATURE GAUGES TO MONITOR COMPONENT PRESSURE DROPS AND PERFORMANCE.
3. PROVIDE FLOW MEASURING DEVICES, UNIONS, FLEXIBLE CONNECTIONS, BALANCING VALVES, AIR VENTS AND DRAINS AS REQUIRED.

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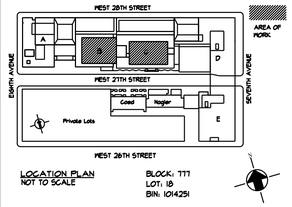

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DRAWING TITLE:
MECHANICAL PIPING DIAGRAM

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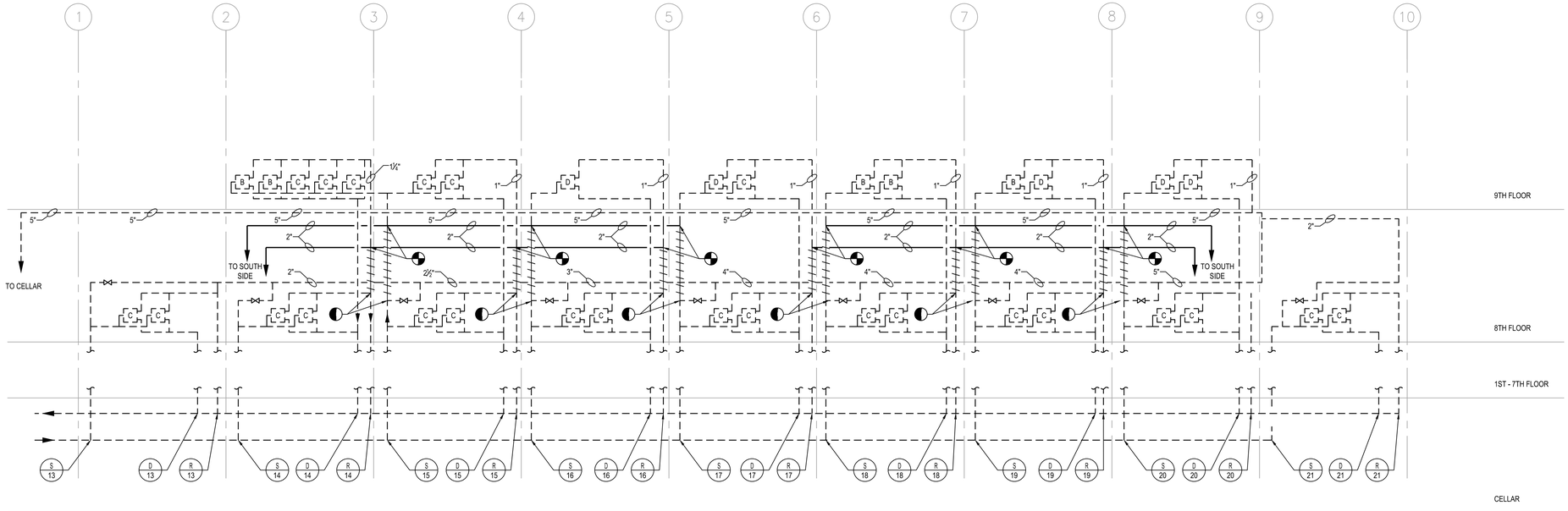
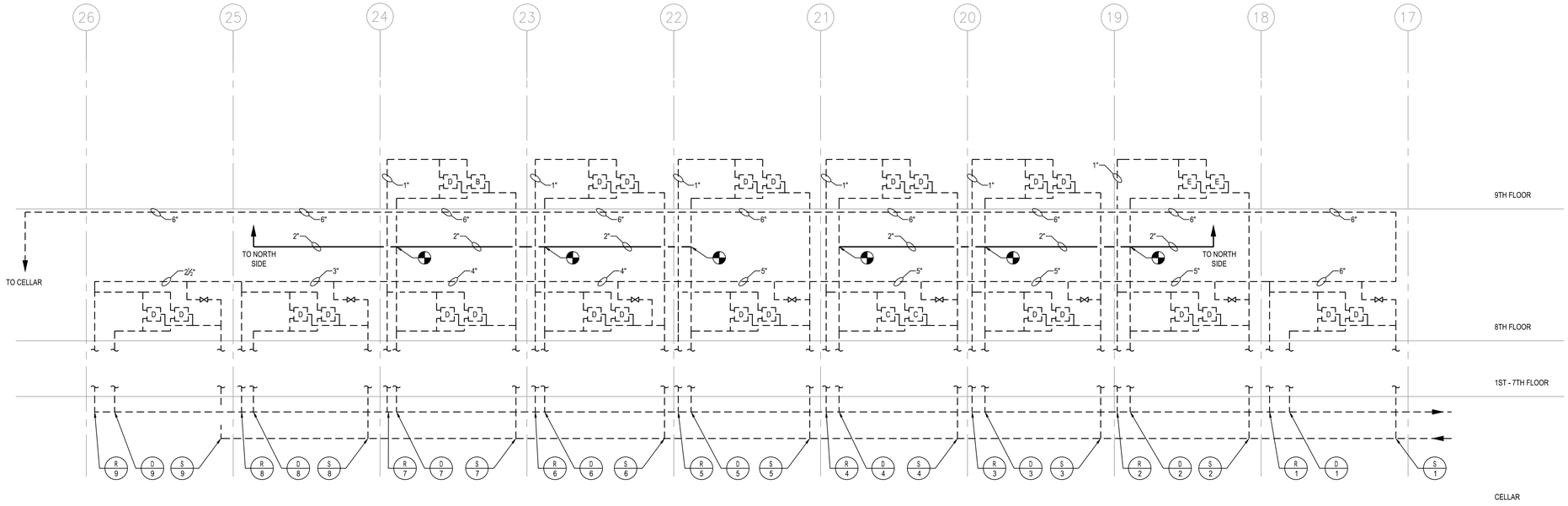
SCALE: NTS	11 OF 16



NORTH SIDE FAN COIL UNIT PIPING RISER DIAGRAM

NTS



SOUTH SIDE FAN COIL UNIT PIPING RISER DIAGRAM

NTS

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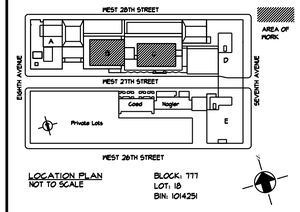

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Structural Consultants
Darius Toraby Architects P.C.
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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
MECHANICAL FAN COIL
PIPING RISER DIAGRAM

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-602.00
SCALE: NTS	12 OF 16

OUTDOOR UNIT - DRY COOLER SCHEDULE — LIEBERT AS STANDARD

GENERAL DATA		SELECTION DATA												ELECTRICAL DATA					
UNIT NO.	LOCATION	MODEL	MAX FLOW RATE (GPM)	WPD (FT-WT)	TOTAL HEAT REJECTION (MBH)	FANS QTY	EWT (F)	LWT (F)	EAT (F)	LAT (F)	TOTAL WEIGHT (LBS)	OPERATING CHARGE (GALLONS)	SUPPORT (LOCATION/ TYPE)	DIMENSION WxDxH (IN)	kW	FLA	MCA	MFS	V/PH/HZ	REMARKS
DC-2B & DC-3B	ROOF SEE DWGS	DNT 150Y68	150	41.9	1543.7	10	57	47.3	45	51	3797	65.67	FLOOR MTD ON ROOF	216x86x94	18	72	66.7	70	208/3/60	40% PROPYLENE GYLCOL

NOTES:

1 PROVIDE DIRECT DRIVE SUPPLY FAN
2 ALL SYSTEMS SHALL BE 40% ETHYLENE GLYCOL SOLUTION
3 PROVIDE GLYCOL DUAL PUMP PACKAGE MODEL GPS-050-D-A/B PER DRY COOLER UNIT
4 PROVIDE V4 - 3-WAY 150 PSI REGULATING CONTROL VALVES PER EACH AC UNIT
5 PROVIDE LOW ENTERING CONDENSER WATER KIT
6 PROVIDE LOW PROFILE CONDENSATE PUMP PER AC UNIT WITH SINGLE SPOT TYPE REMOTE WATER DETECTOR
7 PROVIDE COMPRESSOR SOUND JACKET PER AC UNIT.
8 PROVIDE MICROPROCESSOR CONTROLLER - SMALL BEZEL - PER AC UNIT
9 PROVIDE PCONET FOR E-SERIES / E-SQUARED BACNET CARD PER AC UNIT
10 PROVIDE PCONET FOR E-SERIES / E-SQUARED BACNET CARD
11 PROVIDE DISCONNECT SWITCH PER AC UNIT, DRY COOLER, & PUMP PACKAGE
12 PROVIDE 1" 20% EFFECTIVE FILTERS - AIR FILTRATION

GLYCOL PUMP SCHEDULE — "BELL AND GOSSETT" AS STANDARD

TAG No.	SERVICE	LOCATION	WATER FLOW	TDH FT.	MOTOR DATA				TYPE	EFFICIENCY %	IMPELLER SIZE	NPSHR FT	MODEL NUMBER	OPERATING WEIGHT	REMARKS
					BHP	HP	RPM	V/PH/HZ							
P-19B	DC-2B&3B	10TH FLOOR MER	300	85	10.3	15	3600	208/3/60	BASE MOUNTED END SUCTION PUMP	64.5	6.625	21.4	BG-E1510-2AD-SS-215T-S	341	PERFORMANCES BASED ON PG 40%
P-20B	DC-2B&3B	10TH FLOOR MER	300	85	10.3	15	3600	208/3/60	BASE MOUNTED END SUCTION PUMP	64.5	6.625	21.4	BG-E1510-2AD-SS-215T-S	341	PERFORMANCES BASED ON PG 40%

NOTES:

1. PROVIDE VFD FOR EACH PUMP.
2. PROVIDE PUMP SEQUENCER.
3. PROVIDE INERTIA BASE, 4"H CONCRETE PAD.
4. PROVIDE PIPING HOOK-UP AS PER DETAILS.

CHILLED WATER PUMP SCHEDULE — "BELL AND GOSSETT" AS STANDARD

TAG No.	SERVICE	LOCATION	WATER FLOW GPM	TDH FT.	MOTOR DATA					TYPE	EFFICIENCY %	IMPELLER SIZE DIAMETER	NPSHR FT	MODEL NUMBER	OPERATING WEIGHT LBS	REMARKS
					BHP	HP	RPM	V/PH/HZ	HOUSE FRAME							
P-17B	HX-7B	10TH FLOOR MER	230	60	5.21	7.5	3600	208/3/60	254T	CLOSE COUPLED END SUCTION PUMP	66.5	5.375	9.75	BG-E1531-200AD-184-SS	236	
P-18B	HX-8B	10TH FLOOR MER	230	60	5.21	7.5	3600	208/3/60	254T	CLOSE COUPLED END SUCTION PUMP	66.5	5.375	9.75	BG-E1531-200AD-184-SS	236	STAND-BY

NOTES:

1. PROVIDE VFD FOR EACH PUMP.
2. PROVIDE PUMP SEQUENCER.
3. PROVIDE INERTIA BASE, 4"H CONCRETE PAD.
4. PROVIDE PIPING HOOK-UP AS PER DETAILS.

CLOSED EXPANSION TANK SCHEDULE — BELL & GOSSETT AS STANDARD

UNIT NO.	LOCATION	SERVICE	SYSTEM	MODEL	SIZE		ACTUAL TANK VOLUME [GALLONS]	REQUIRED ACCEPTANCE [GALLONS]	REQUIRED TANK VOLUME [GALLONS]	MIN OPERATING TEMPERATURE [DEG F]	MAXIMUM OPERATING TEMPERATURE [DEG F]	MAXIMUM WORKING TEMPERATURE [DEG F]	MIN OPERATING PRESSURE [PSIG]	MAX OPERATING PRESSURE [PSIG]	MAX WORKING PRESSURE [PSIG]	TYPE OF MEMBRANE	SHIPPING WEIGHT [LBS]	REMARKS
					HEIGHT [INCHES]	DIAMETER [INCHES]												
ET-2B	10TH FLOOR MER	P-19B&20B	40% PG WATER	B50	24	14	240	4.44	11.03	40	90	240	12	30	125	BLADDER HEAVY DUTY BUTYL RUBBER	50	PRE CHARGED AT 12 PSIG

NOTES:

1 PROVIDE SIGHT- GLASS
2 PROVIDE DESIGN AND CONSTRUCTION PER ASME, SECTION VIII, DIVISION 1
3 PROVIDE HEAVY DUTY BUTYL REPLACEABLE BLADDER.
4 PROVIDE TANK WITH RING BASE, LIFTING RINGS, AND NPT SYSTEM CONNECTION.
5 PROVIDE AN AIR CHARGING VALVE (STANDARD TYRE VALVE) TO ALLOW FOR ADJUSTING THE PRESSURE.
6 PROVIDE INTEGRATED BLADDER INTEGRITY MONITOR.

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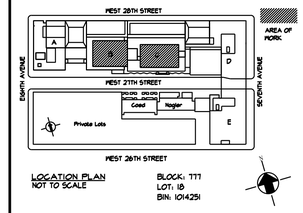

LOCATION PLAN NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
MECHANICAL SCHEDULES 1

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-701.00
SCALE: NTS	13 OF 16

PLATE AND FRAME HEAT EXCHANGER SCHEDULE

BASIS OF DESIGN: "ALFA LAVAL"

TAG	LOCATION	UNIT SERVED	SYSTEM AND/OR SERVICE	PRIMARY WATER (COLD SIDE)						SECONDARY WATER (HOT SIDE)						HEAT TRANSFER MBH	SURFACE AREA SQ.FT.	FLUID VOLUME CU.FT.	OPER. WEIGHT LBS	DIMENSIONS			MODEL No	REMARKS
				FLOW GPM	EWT °F	LWT °F	PD PSI	FLUID	WORKING PRESSURE PSIG	FLOW GPM	EWT °F	LWT °F	PD PSI	FLUID	WORKING PRESSURE PSIG					LENGTH IN.	WIDTH IN.	HEIGHT IN.		
HX-7B	10TH FLOOR MER	DC-2B&3B	GLYCOL CHILLED WATER	118	50	62	6.2	40% PG WATER	150	107.7	64	53	3.8	CHW	150	620.5	458.4	1.25	1049	46.5	13	51.6	AQ2L-FG	
HX-8B	10TH FLOOR MER	DC-2B&3B	GLYCOL CHILLED WATER	118	50	62	6.2	40% PG WATER	150	107.7	64	53	3.8	CHW	150	620.5	458.4	1.25	1049	46.5	13	51.6	AQ2L-FG	

VARIABLE FEQUENCY DRIVE SCHEDULE

BASIS OF DESIGN: YASKAWA

GENERAL				ELECTRICAL DATA				ENCLOSURE			REMARKS
TAG	SERVICE	LOCATION	MFG MODEL NO.	NOMINAL HP	NUMBER OF MOTORS	RATED OUTPUT CURRENT [AMPS]	VOLT/PH/HZ	DIMENSIONS [INCHES]	ENCLOSURE TYPE	WEIGHT [LBS]	
VFD-P-17B	P-17B	10TH FLOOR MER	H6B2D024	7.5	1	24.2	208/3/60	34.1 H X 19.3 W X 18.9 D	NEMA 12	137	FUSED WITH DISCONNECT SWITCH
VFD-P-18B	P-18B	10TH FLOOR MER	H6B2D024	7.5	1	24.2	208/3/60	34.1 H X 19.3 W X 18.9 D	NEMA 12	137	FUSED WITH DISCONNECT SWITCH
VFD-P-19B	P-19B	10TH FLOOR MER	H6B2D046	15	1	46.2	208/3/60	37.3 H X 24.5 W X 19 D	NEMA 12	189	FUSED WITH DISCONNECT SWITCH
VFD-P-20B	P-20B	10TH FLOOR MER	H6B2D046	15	1	46.2	208/3/60	37.3 H X 24.5 W X 19 D	NEMA 12	189	FUSED WITH DISCONNECT SWITCH

PROVIDE FOLLOWING OPTIONS:
1. CIRCUIT BREAKER 100 Kaic
2. 2-CONTACTOR BYPASS

ELECTRICAL HEATERS

BASIS OF DESIGN: STELPRO

GENERAL				HEATING CAPACITY		VOLT/PH/HZ	DIMENSIONS [INCHES]	WEIGHT [LBS]	REMARKS
TAG	SERVICE	LOCATION	MFG MODEL NO.	KW	BTU/HR				
EH-1C	CLASSROOM	WEST PERIMETER ROOM 4TH FLOOR	AWFA1501WC24W	1.5	5,119	120/1/60	23X16	20	NOTES
EH-2C	CLASSROOM	EAST / WEST PERIMETER ROOMS C BUILDING 3 TO 8 FL	AWFA2008WC24W	2	6,825	208/1/60	23X16	23	NOTES

PROVIDE FOLLOWING OPTIONS:
1 FACTORY INSTALLED DISCONNECT SWITCH
2 BUILT IN LINE VOLTAGE FOR BMS CONTROL
3 BUILT IN WALL BRACKET
4 ELECTRIC THERMOSTAT

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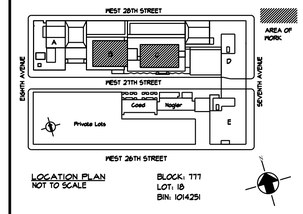

LOCATION PLAN NOT TO SCALE

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BIN: 1014251

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

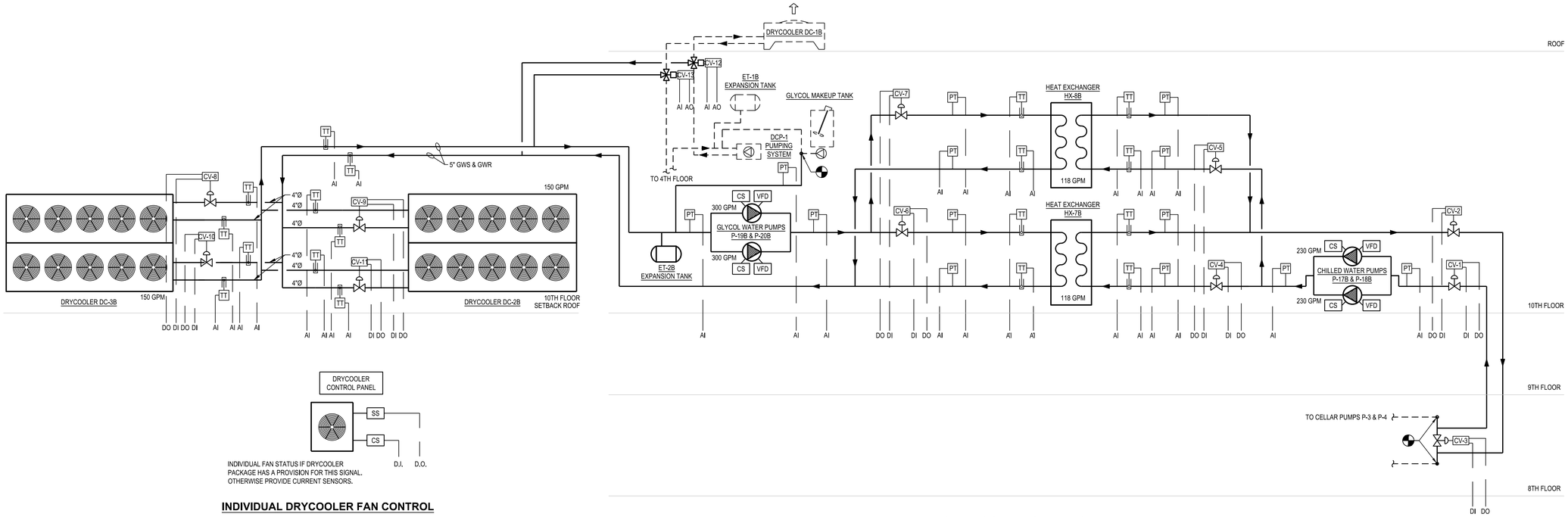
C1672

DRAWING TITLE:
MECHANICAL SCHEDULES 2

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-702.00
SCALE: NTS	14 OF 16



WATERSIDE CONTROL DIAGRAM

INDIVIDUAL DRYCOOLER FAN CONTROL

LEGEND

NC	NORMALLY CLOSED
NO	NORMALLY OPEN
TS	TEMPERATURE SENSOR
ES	END SWITCH
MSD	SMOKE DAMPER
SD	SMOKE DETECTOR
H	HUMIDITY TRANSMITTER
CHWS/R	CHILLED WATER SUPPLY/RETURN
CV	CONTROL VALVE
AI	ANALOG INPUT
AO	ANALOG OUTPUT
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
AFM	AIR FLOW MEASURING STATION
AFS	AIR FLOW MEASURING SWITCH
PD	PRESSURE DIFFERENTIAL SENSOR
SPS	STATIC PRESSURE SENSOR
VFD	VARIABLE FREQUENCY DRIVE
SS	START / STOP
VP	VELOCITY PRESSURE
LPS	LOW PRESSURE SENSOR
DC	DRYCOOLER
VFD	VARIABLE FREQUENCY DRIVE
CV	CONTROL VALVE
CS	CURRENT SENSOR
DP	PRESSURE DIFFERENTIAL SENSOR
PT	PRESSURE TRANSMITTER
	CONTROL VALVE
	VALVE
TT	TEMPERATURE SENSOR / WELL
PT	PRESSURE SENSOR

LEGEND

	GATE VALVE
	CHECK VALVE
	UNION
	BALL OR FLOW CONTROL VALVE
	FLEXIBLE CONNECTION
P.D.	PRESSURE DROP
	3-WAY CONTROL VALVE

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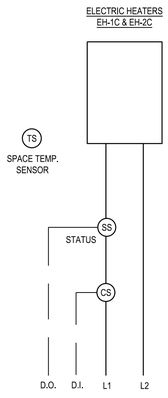
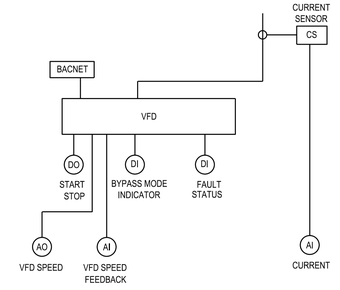


ELECTRIC HEATER TYPICAL
CONTROL DIAGRAM
NTS



ALL SAFETIES LISTED HERE

VFD TYPICAL
CONTROL DIAGRAM
NTS

VFD MINIMUM REQUIREMENT FOR BMS VARIABLES.

1. PROVIDE THE FOLLOWING VARIABLES FROM THE VFD TO THE BACNET NETWORK:
   - 1.1. PHASE VOLTAGE
   - 1.2. PHASE AMPS
   - 1.3. OUTPUT FREQUENCY
   - 1.4. INPUT POWER KVA
   - 1.5. OUTPUT POWER KVA
   - 1.6. BYPASS STATUS
   - 1.7. ALARM STATUS
   - 1.8. ALARM CODE
   - 1.9. INPUT VOLTAGE
   - 1.10. OUTPUT VOLTAGE

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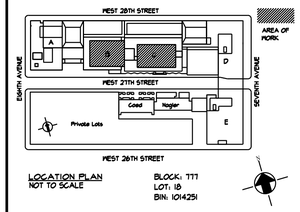

LOCATION PLAN
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PROJECT:
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NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
MECHANICAL CONTROL DIAGRAMS

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-801.00
SCALE: NTS	15 OF 16

EXISTING DRYCOOLER DC-1B SYSTEM SEQUENCE OF OPERATION

SEQUENCE OF OPERATION

ANY OF THE AC FLOOR UNITS SHALL START A LEAD DRYCOOLER SYSTEM WHEN ITS THERMOSTAT CALLS FOR COOLING. THE ISOLATING VALVES SHALL OPEN AND THE LEAD PUMP SHALL START. THE FLOW SWITCH ON THE DISCHARGE HEADER OF THE PUMPS SHALL PROVE PUMP OPERATION. IN CASE THERE IS NO FLOW ESTABLISHED AS CONFIRMED BY THE FLOW SWITCH THE DRYCOOLER PUMP CONTROLLER WILL ATTEMPT TO START SECOND PUMP. (ALL ABOVE FUNCTIONS MAY BE PERFORMED BY THE BAS) THE CURRENT SENSORS SHALL CONFIRM PUMP OPERATION IN BAS. THE UNIT INSTALLED FAN STAGING CONTROLLER WILL TURN ON& OFF DRYCOOLER'S FANS TO MAINTAIN SET LIQUID DISCHARGE TEMPERATURE. A FAILURE OF ANY OF FANS TO START WILL BE ANNOUNCED AT THE BAS VIA FAN FAIL ALARM FROM THE DRYCOOLER CONTROLLER OR A CURRENT SENSOR INSTALLED AT THE FAN AND AUXILIARY START RELAY OUTPUT COMPARATOR IF THIS FUNCTION IS TO BE EXECUTED BY THE BAS. ANY OF THE DRYCOOLER SYSTEMS CAN BE DESIGNATED A LEAD OR LAG SYSTEM. LEAD /LAG DRYCOOLER DESIGNATION SHALL BE DETERMINED BASED ON RUN TIME.

GLYCOL TANK PUMP SHALL START BASED ON THE PRESSURE IN THE SYSTEM. IF THE PUMP RUN TIME EXCEEDES PRE-ASSUMED LIMIT OR THE PRESSURE FALLS BELOW THE PRE-SET LEVEL AN ALARM SHALL BE ISSUED BY BAS INDICATING POSSIBILITY OF A LEAK.

EACH UNIT SHALL HAVE FILTER PRESSURE DIFF SENSOR TO ISSUE THE MAINTENANCE WARNING AT THE BAS. EACH UNIT SHOULD HAVE A GENERAL ALARM AND A SPACE TEMP SENSOR REPORTING TO BAS. EACH UNIT SHALL HAVE START STOP OVERRIDE FROM BAS.

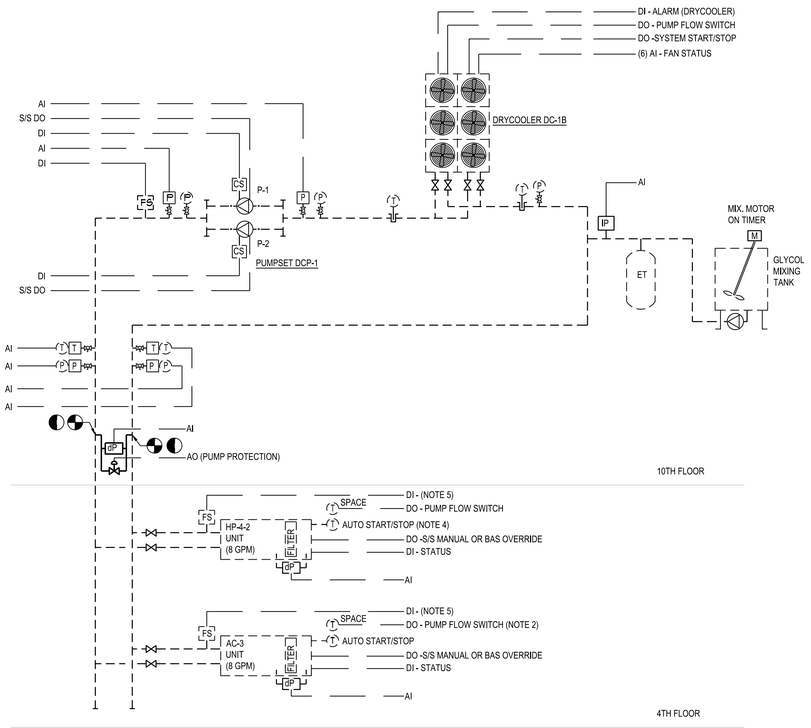
A PRESSURE DIFFERENTIAL SENSOR AT THE FAR END OF THE SYSTEM AND ACROSS THE SUPPLY AND RETURN RISERS SHALL MAINTAIN THE PRESET MINIMUM/MAXIMUM PRESSURE VIA A BYPASS VALVE WHILE THE AC UNITS HEAD PRESSURE CONTROL VALVES CLOSE & OPEN.

SEQUENCE OF OPERATION FOR HVAC EQUIPMENT SERVING ROOM C402/404

SUMMER
EXISTING PERIMETER FAN COILS PROVIDE COOLING FOR PERIMETER ROOMS. DDC CONTROLLERS INSTALLED AT FAN COILS WILL DIRECT CONTROL VALVES TO OPEN OR THROTTLE DUAL TEMPERATURE WATER FLOW TO UNITS TO SATISFY THERMOSTAT SET POINT.
CEILING MOUNTED FAN COILS FC-4-1 & FC-4-2 WILL PROVIDE COOLING FOR INTERIOR OFFICE SPACE. CONTROLS FOR THE FAN COILS SHALL BE SIMILAR TO THE MODIFIED CONTROLS FOR THE EXISTING UNITS. EXISTING CONSTANT VOLUME DUCTWORK WILL PROVIDE REQUIRED VENTILATION.

WINTER
FAN COILS WITH CONTROLS WILL PROVIDE HEATING FOR PERIMETER ROOMS. CEILING MOUNTED HP-4-1 & HP-4-2 WILL PROVIDE COOLING FOR INTERIOR OFFICE SPACES. FC-4-1 & FC-4-2 WILL PROVIDE WARM-UP FUNCTION AS NECESSARY. EXIST. CONSTANT VOLUME DUCT WILL PROVIDE REQUIRED VENTILATION AIR.

TEMPERATURE CONTROL SYSTEM SHALL LOCK-OUT HP-4-1 & HP-4-2 OPERATION IF FC-4-1 & FC-4-2 ARE IN USE (DURING WARM UP)



MODIFICATION OF EXISTING DRYCOOLER DC-1B CONTROL DIAGRAM

NTS

LEGEND

	NEW WORK		PUMP
	EXISTING WORK	T	TEMPERATURE SENSOR / WELL
	SIGNAL / CONTROL LINE	PI	LOCAL PRESSURE INDICATION (GAUGE)
VFD	VARIABLE FREQUENCY DRIVE	CS	CURRENT SENSOR SWITCH
NTS	NOT TO SCALE	P	PRESSURE SENSOR
	BUTTERFLY VALVE	dP	PRESSURE DIFFERENTIAL SENSOR
	GATE SHUT OFF VALVE	T	LOCAL TEMPERATURE INDICATION (THERMOMETER)
	BALL SHUT OFF VALVE	V21	VALVE TAG
	SOLENOID VALVE	FS	FLOW SWITCH
	STRAINER	AI	ANALOG INPUT
M	MOTORIZED VALVE	AO	ANALOG OUTPUT
	CONTROL VALVE	DI	DIGITAL INPUT
		DO	DIGITAL OUTPUT

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

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NEW YORK CITY ENERGY CONSERVATION CODE
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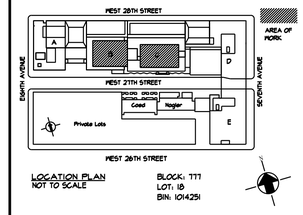

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
MODIFICATION OF EXISTING GLYCOL MAKEUP PACKAGE FOR ADVISEMENT CENTER

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	ASB
CHK BY:	DNE
DWG No:	M-901.00
SCALE: NTS	16 OF 16

ELECTRICAL ABBREVIATIONS

A	-AMPS	KW	- KILOWATT
AC	- AIR CONDITIONING	KWH	- KILOWATT HOURS
ARCH	- ARCHITECTURAL	M	- MAIN
APPROX	- APPROXIMATELY	MACH	- MACHINE
ATS	- AUTOMATIC TRANSFER SWITCH	MCC	- MOTOR CONTROL CENTER
AUTO	- AUTOMATIC	MECH	- MECHANICAL
AWG	- AMERICAN WIRE GAUGE	MH	- MAN-HOLE
BLDG	- BUILDING	MTD	- MOUNTED
BPS	- BOLTED PRESSURE SWITCH	MTR	- MOTOR
CDT	- CONDUIT	N	- NEUTRAL
CKT	- CIRCUIT	NEC	- NATIONAL ELECTRIC CODE
CLG	- CEILING	NEMA	- NATIONAL ELECTRICAL MANUFACTURERS
COL	- COLUMN	NIC	- NOT IN CONTRACT
CONC	- CONCRETE	NTS	- NOT TO SCALE
CONST	- CONSTRUCTION	OCPD	- OVER-CURRENT PROTECTIVE DEVICE
COORD	- COORDINATE	OL	- OVERLOAD
CT	- CURRENT TRANSFORMER	O/H, OH	- OVER-HEAD
CTRL	- CONTROL	P	- POLES
CTRLR	- CONTROLLER	PB	- PULL BOX
CU	- COPPER	PF	- POWER FACTOR
DC	- DIRECT CURRENT	PH	- PHASE
DISC	- DISCONNECT	PNL	- PANEL
DN	- DOWN	PP	- POWER PANEL
DP	- DISTRIBUTION PANEL	PWR	- POWER
DWG	- DRAWING	R	- RELOCATED
E	- EXISTING	RM	- ROOM
ERPL	- EXISTING TO BE REPLACED WITH NEW	SB	- SPLICE BOX
ELEC	- ELECTRICAL	SP	- SPARE
ELEV	- ELEVATOR	SPECS	- SPECIFICATIONS
EQPMT	- EQUIPMENT	STD	- STANDARD
ER	- EXISTING TO REMAIN	SURF	- SURFACE
ERL	- EXISTING TO RELOCATE	SW	- SWITCH
EXIST	- EXISTING	SWBD	- SWITCHBOARD
FA	- FIRE ALARM	SWGR	- SWITCHGEAR
FBO	- FURNISHED BY OTHERS	TELCO	- TELEPHONE COMPANY
FCO	- FUSE CUT-OUT	TV	- TELEVISION
FDR	- FEEDER	TYP	- TYPICAL
FDS	- FUSED DISC. SWITCH (FIRE ALARM)	U/G, UG	- UNDER-GROUND
FT	- FEET	UF	- UNFUSED
G	- GROUND	UG	- UNDERGROUND
GND	- GROUND	U.O.N., UON	- UNLESS OTHERWISE NOTED
HC	- HUNG CEILING	V	- VOLTS
HH	- HAND-HOLE	VA	- VOLT AMPERE
HP	- HORSEPOWER	VIF	-VERIFIED IN FIELD
HT	- HEIGHT	W	- WATTS
HTG	- HEATING	W/	- WITH
HVAC	- HEATING VENTILATING AND AIR CONDITIONING	XFMR	- TRANSFORMER
HZ	- HERTZ	1/C,2/C,3/C	- QTY OF CONDUCTORS
IC	- INTERRUPTING CAPACITY	C/B, BKR	- CIRCUIT BREAKER
IG	- ISOLATED GROUND	CT, C/T	- CURRENT TRANSFORMER
IN	- INCHES	Ø	- PHASE
JB	- JUNCTION BOX		
KVA	- KILOVOLT AMPERES		

ELECTRICAL DRAWING LIST

DWG No.	DRAWING TITLE
E-001.00	ELECTRICAL SYMBOL LIST, ABBREVIATIONS, AND DRAWING LIST
E-010.00	10TH FLOOR ELECTRICAL DEMOLITION PLAN
E-100.00	CELLAR ELECTRICAL POWER PLAN
E-110.00	10TH FLOOR ELECTRICAL POWER PLAN
E-401.00	CELLAR THRU 10TH FLOOR CLOSET RISER ELECTRICAL PART PLANS
E-402.00	THIRD THRU EIGHTH FLOORS WEST PERIMETER ROOM ELECTRICAL PART PLANS
E-403.00	THIRD THRU EIGHTH FLOORS EAST PERIMETER ROOM ELECTRICAL PART PLANS
E-501.00	ELECTRICAL DETAILS
E-601.00	ELECTRICAL RISER DIAGRAM
E-701.00	ELECTRICAL PANEL SCHEDULES I
E-702.00	ELECTRICAL PANEL SCHEDULES II

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
CX#	HOMERUN TO DESIGNATED PANELBOARD - NUMERALS INDICATE CIRCUIT NUMBER.
	GROUND CONNECTION
CX# 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# TM6-USB-CC6 OR EQUIVALENT
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
#	MOTOR, # INDICATES HORSEPOWER
	FUSIBLE SWITCH
BPS	BOLTED PRESSURE SWITCH
	CIRCUIT BREAKER
FSD	FIRE SMOKE DAMPER
MD	MOTORIZED DAMPER
VD	VOLUME DAMPER
J / J / J	CEILING/WALL/FLOOR MOUNTED JUNCTION BOX
$	MANUAL ON/OFF SWITCH

LEGEND

———	NEW WORK
– – – –	EXISTING
//////	DEMO
–·–·–	AREA OF WORK

POWER NOTES

1. FOR EXACT LOCATION OF ALL POWER, TEL/DATA OUTLETS AND MECHANICAL EQUIPMENTS COORDINATE WITH MECHANICAL AND ELECTRICAL 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. 3/4" CONDUIT SHALL BE THE MINIMUM TRADE SIZE OF CONDUIT.
4. 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.
5. ALL COMMUNICATIONS, SECURITY WORKS ARE A SEPARATE CONTRACT, UON. EC TO PROVIDE ALL CONDUIT, RACEWAY, BACK-BOXES.
6. 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.
7. CONTRACTOR SHALL PERFORM SHORT-CIRCUIT AND OVER-CURRENT PROTECTIVE STUDY AS PER PROJECT SPECIFICATIONS. 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.

MECHANICAL/PLUMBING EQUIPMENT 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 CONTRACTORS 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.

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.

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 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.
3. CIRCUIT NUMBERS ARE FOR GUIDANCE ONLY. CONTRACTOR SHALL BE RESPONSIBLE TO BALANCE PHASES. REFER TO PANEL SCHEDULES FOR BRANCH CIRCUIT REQUIREMENTS.
4. 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).
5. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING AND PROVIDING THE ACTUAL NUMBER OF CONDUCTORS REQUIRED FOR ALL BRANCH CIRCUIT WIRING TO SERVE THE INTENDED FUNCTION.
6. FOR EXACT LOCATION AND QUANTITY OF RECEPTACLES, TELEPHONE AND OTHER OUTLETS, REFER TO THE ELECTRICAL DRAWINGS.
7. 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.
8. 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.
9. ELECTRONIC AS-BUILT DRAWINGS, SHOWING CONDUIT RUNS AND CIRCUITING MUST BE GIVEN TO THE ENGINEER AND OWNER AT THE COMPLETION OF THE JOB.
10. THE CONTRACTOR SHALL REMOVE AND/OR RELOCATE ALL EXISTING ELECTRICAL WORK WHICH INTERFERES WITH THE NEW MECHANICAL AND ELECTRICAL LAYOUTS. ALL WORK WHICH IS NO LONGER REQUIRED TO FUNCTION SHALL BE DE-ENERGIZED AND DISCONNECTED AT THE SOURCE OF POWER SUPPLY.
11. PANEL DIRECTORIES SHALL BE MODIFIED AND COMPLETELY FILLED IN AT COMPLETION OF JOB.
12. 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.
13. CONNECT NEW WORK TO EXISTING WORK IN A NEAT AND ACCEPTABLE MANNER.
14. DISPOSE OF REMOVED RACEWAYS, WIRE, PANELS, ETC., AS DIRECTED BY CM & OWNER.
15. 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).
16. ALL RACEWAYS WHICH BECOME EXPOSED BEYOND FINISHED SURFACES BECAUSE OF THE ALTERATION WORK SHALL BE REMOVED AND RE-ROUTED BEHIND THE FINISHED SURFACES.
17. 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.
18. 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.
19. ALL NEW TELEPHONE, ELECTRIC AND DATA OUTLETS TO BE INSTALLED ON AN EXISTING WALL SHOULD BE FLUSH MOUNTED WITH THE FINISHED WALL SURFACE.
20. ALL OPEN FLOOR OUTLETS, NOT USED, SHALL BE CAPPED.
21. ALL HOLES IN SLABS OR WALLS SHALL BE FIRE STOPPED VIA LISTED FIRE-STOPPING ASSEMBLIES. SUBMIT TO ENGINEER FOR APPROVAL.
22. PROVIDE A GROUND BUS IN NEW PANELS.
23. 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.
24. REFER TO PROJECT 'BOOK' SPECIFICATIONS FOR ADDITIONAL, IMPORTANT REQUIREMENTS,

GENERAL DEMOLITION 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 MECHANICAL AND ELECTRICAL DRAWINGS 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 ENGINEER.
2. THE CONTRACTOR SHALL REMOVE OR REUSE ALL EXISTING ELECTRICAL WORK WHICH INTERFERES WITH THE NEW ELECTRICAL LAYOUTS ACCORDING TO THE DRAWING SET. ALL EQUIPMENT WHICH IS NO LONGER REQUIRED TO FUNCTION SHALL BE DE-ENERGIZED AND DISCONNECTED AT THE SOURCE OF POWER SUPPLY.
3. ALL PRESENT ELECTRICAL MATERIAL AND EQUIPMENT WHICH ARE TO BE REMOVED UNDER THIS CONTRACT SHALL BE REMOVED BY THE CONTRACTOR AND SHALL BECOME THE PROPERTY OF OWNERSHIP.
4. ALL RACEWAYS WHICH BECOME EXPOSED BEYOND FINISHED SURFACES BECAUSE OF THE ALTERATION WORK SHALL BE REMOVED AND REROUTED BEHIND THE FINISHED SURFACES.
5. 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.
6. EXISTING ELECTRICAL ITEMS AND/OR CONDUIT AND WIRE IN WALLS, HUNG CEILINGS, ETC., OR AREAS NOT BEING UTILIZED, SHALL BE DISCONNECTED AND REMOVED.
7. 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.
8. THIS DEMOLITION NOTES ARE DIAGRAMMATIC DESCRIPTION OF THE REMOVAL 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, BUILDING MANAGEMENT AND MECHANICAL CONTRACTORS BEFORE ANY WORK.

EXISTING CONDITION & RELOCATION NOTES

1. GENERALLY, IN AREAS SCHEDULED FOR DEMOLITION AND REMODELING REMOVE EXPOSED PORTIONS OF THE BRANCH AND SIGNAL CIRCUIT WIRING AND CONDUITS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE CONTINUITY OF EXISTING CIRCUITS FEEDING DEVICES THAT ARE TO REMAIN. MAINTAIN THE CONTINUITY OF EXISTING CIRCUITS SERVING OTHER SPACES BUT PASSING THROUGH THE AREA OF RENOVATION.
2. IN SUCH CASES, WHERE NEW CONDUITS ARE TO BE INSTALLED IN EXISTING WALLS, IN FURNISHED ROOMS, THEY SHALL BE CONCEALED BY CUTTING AND PATCHING THE WALLS FOR THE CONDUITS UNLESS OTHERWISE NOTED.
3. CONDUITS OR SLEEVES, THAT ARE NO LONGER REQUIRED, WHICH ARE PROTRUDING THROUGH THE FLOOR SLAB, SHALL BE CUT BACK AND CAPPED. ALL FEEDERS TO BE REMOVED BACK TO PANEL BOARD.
4. ELECTRICAL EQUIPMENT REMOVED SHALL BE RETURNED TO OWNER OR DISCARDED PER OWNER DIRECTIVE.
5. THE CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF EXISTING TO REMAIN SYSTEM CIRCUITS FOR FIRE ALARM, POWER AND TELE COMMUNICATIONS, ETC., DURING DEMOLITION.
6. THE ELECTRICAL CONTRACTOR SHALL REMOVE ALL ABANDONED WIRING/CABLING NO LONGER IN USE BACK TO SOURCE.
7. UTILIZE, WHENEVER POSSIBLE, PRACTICAL, AND APPROVED BY THE ENGINEER, EXISTING OUTLET BOXES, RACEWAYS, ETC., COMPATIBLE WITH THE MATERIAL SPECIFIED FOR INSTALLATION IN THE NEW CONSTRUCTION AREAS. IN SUCH CASES, ALL ASSOCIATED CONDUITS AND WIRING SHALL BE ARRANGED TO ACCOMMODATE THE NEW CIRCUITING AS SHOWN ON THE DRAWING.
8. THE ELECTRICAL DEMOLITION PLANS INDICATE GENERAL INTENT AND ARE NOT INTENDED TO SHOW ALL COMPONENTS AND ITEMS TO BE REMOVED OR RETAINED. DEVICES AND EQUIPMENT LOCATED ON THE WALLS AND OR CEILINGS DESIGNATED TO BE REMOVED SHALL BE REMOVED/RELOCATED. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND ENGINEER OF ANY UNANTICIPATED OR HIDDEN CONDITIONS ENCOUNTERED DURING DEMOLITION.
9. THE CONTRACTOR SHALL CIRCUIT TRACE AND LABEL ALL EXISTING BRANCH AND FEEDERS WITHIN OR ASSOCIATED WITH DEMOLITION SCOPE PRIOR TO DEENERGIZING AND DISCONNECTION. ALL CIRCUITS WITHIN PANELBOARDS, LOAD CENTERS, MOTOR CONTROL CENTERS AND SWITCHBOARDS, IDENTIFIED FOR REMOVAL SHALL BE TRACED AND FIELD LABELED TO ENSURE THAT NO AREA OUTSIDE THE SCOPE IS AFFECTED.
10. CONTRACTOR SHALL OPEN EXISTING CEILINGS AS REQUIRED FOR INSTALLATION OF NEW WORK OR REMOVAL/MODIFICATION OF EXISTING SYSTEMS AND EQUIPMENT. CEILINGS TO BE CLOSED UPON COMPLETION OF WORK.

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rev. no. date revisions

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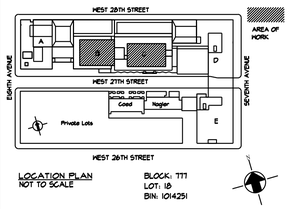

LOCATION PLAN NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
ELECTRICAL COVER SHEET

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
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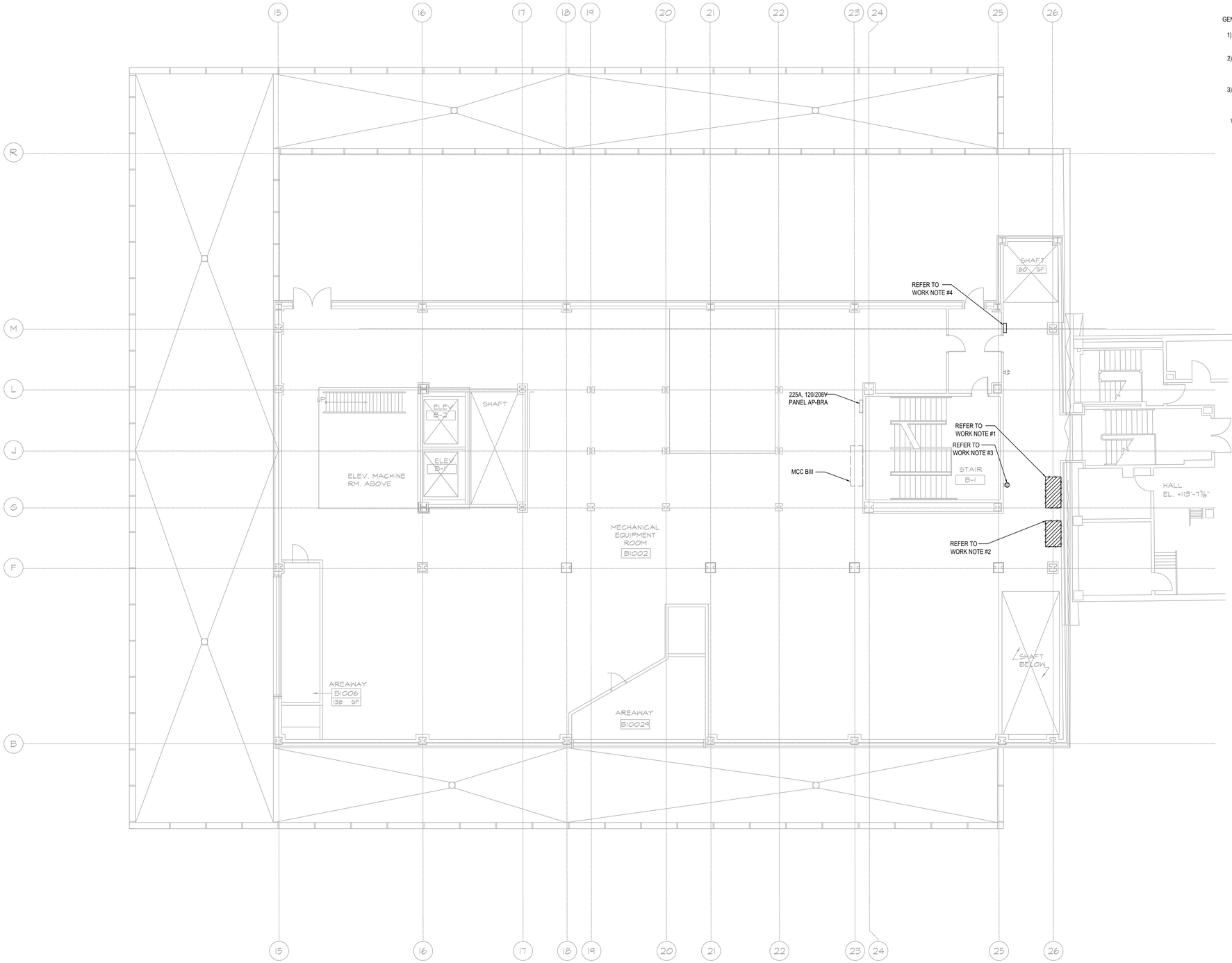
CHK BY:	WMA
DWG No:	E-001.00
SCALE: N.T.S	1 OF 11



GENERAL NOTES:

1) REFER TO THE E-000 SERIES FOR SYMBOL LIST, ABBREVIATIONS, NOTES, ETC.

2) REFER TO THE E-400 SERIES FOR STACKED "B" BUILDING ELECTRICAL CLOSET PART PLANS AND "C" BUILDING ELECTRIC HEATER POWER PLANS

3) REFER TO E-600 FOR RISER DIAGRAM, WIRE SIZES, AND ADDITIONAL INFORMATION.

WORK NOTES:

1) CONTRACTOR SHALL DEMOLISH EXISTING CHILLER AND REMOVE CONDUIT AND WIRING BACK TO THE SOURCE. COORDINATE WITH MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.

2) CONTRACTOR SHALL DEMOLISH EXISTING PUMPS AND REMOVE CONDUIT AND WIRING BACK TO THE SOURCE. COORDINATE WITH MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.

3) CONTRACTOR SHALL REMOVE THIS RECEPTACLE ALONG WITH THE CONDUIT AND WIRING ASSOCIATED.

4) CONTRACTOR SHALL DISCONNECT AND REMOVE THE EXISTING GLYCOL SYSTEM CONTROL PANEL. CONTRACTOR SHALL TRACE EXISTING WIRING, DE-ENERGIZE, AND TAG EXISTING WIRING FOR FUTURE USE.

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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NEW YORK CITY ENERGY CONSERVATION CODE

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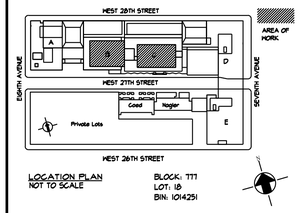
rev. no.	date	revisions
	06/16/2025	ISSUED FOR BID



Fashion Institute of Technology

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Lake Success, NY 11042 / (516) 328-1194

Structural Consultants
Darius Toraby Architects P.C.
236 West 27th Street 1401
New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

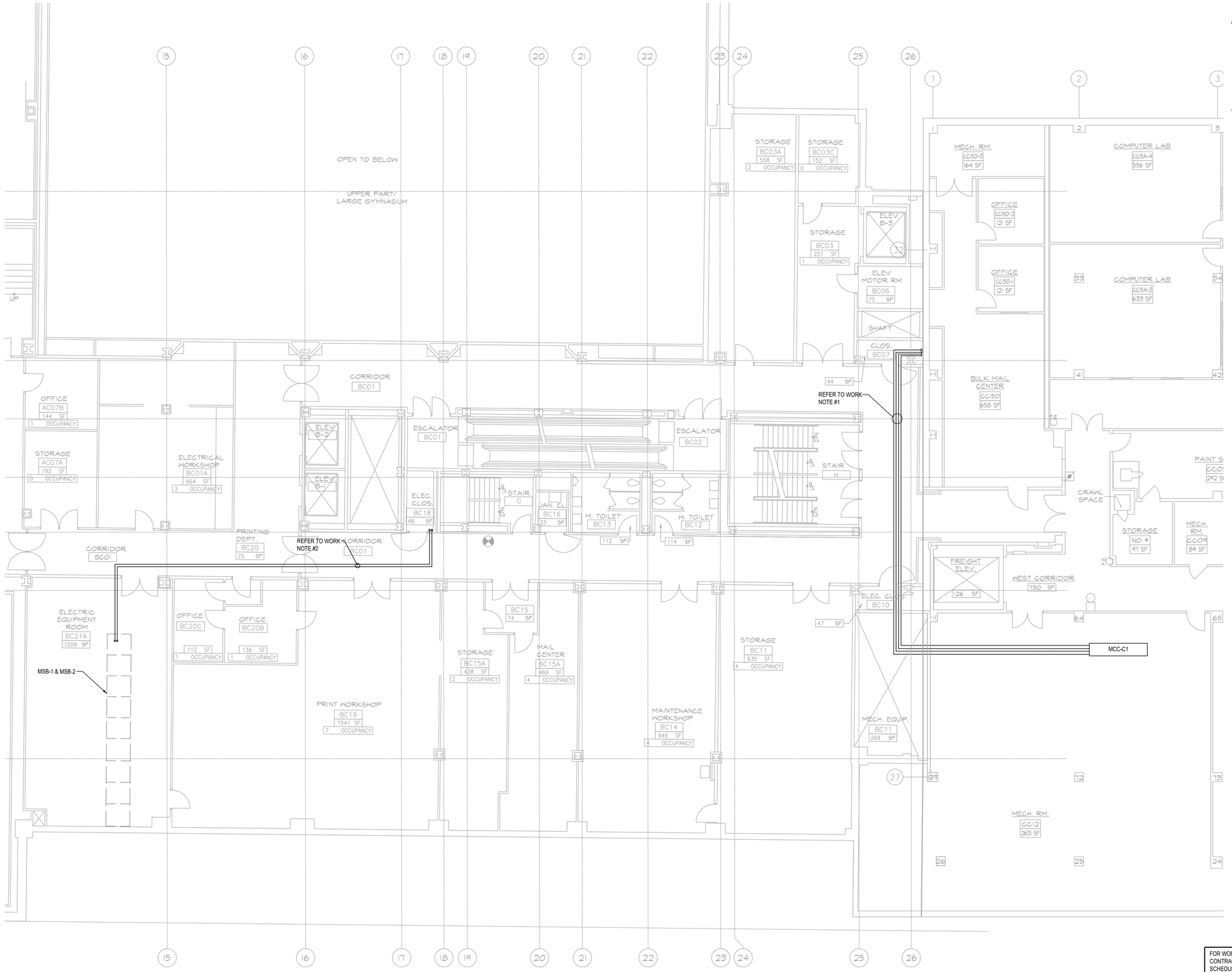
C1672

DRAWING TITLE:
10TH FLOOR ELECTRICAL
DEMOLITION PLAN

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	WMA
DWG No:	E-010.00
SCALE: 1/8" = 1'-0"	2 OF 11



GENERAL NOTES:

1) REFER TO THE E-000 SERIES FOR SYMBOL LIST, ABBREVIATIONS, NOTES, ETC.

2) REFER TO THE E-400 SERIES FOR STACKED "B" BUILDING ELECTRICAL CLOSET PART PLANS AND "C" BUILDING ELECTRIC HEATER POWER PLANS

3) REFER TO E-600 FOR RISER DIAGRAM, WIRE SIZES, AND ADDITIONAL INFORMATION.

WORK NOTES:

1) CONDUITS GOING UP STACKED ELECTRICAL CLOSET TO FEED NEW DRY-COOLERS AND PUMPS ON THE 10TH FLOOR. REFER TO E-400 SERIES AND DWG E-110 FOR ADDITIONAL INFORMATION. CONTRACTOR SHALL INCLUDE, AS PART OF THIS SCOPE OF WORK, CEILING TILE REPLACEMENT, APPROXIMATELY 2-FEET ON ALL SIDES OF NEW CONDUIT RUN. NEW CEILING TILES SHALL MATCH EXISTING. CONTRACTOR CAN REUSE EXISTING TILES TO THE FULLEST EXTENT POSSIBLE. HOWEVER, THESE MUST BE REPLACED IN-KIND IF DAMAGED REMOVAL/REINSTALLATION.

2) PROVIDE TWO(2) SETS OF (3)600KCMIL+(1)1/0G - 3"C EACH SET, ROUTED TO THE 10TH FL MECHANICAL ROOM. CONDUITS SHALL BE ROUTED AS CLOSE TO AND SUPPORTED BY THE STRUCTURAL CEILING AS POSSIBLE. REFER TO DWG E-110 FOR CONTINUATION.

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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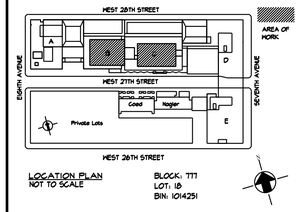

LOCATION PLAN NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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New York, NY 10001

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MGE
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Structural Consultants
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236 West 27th Street 1401
New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

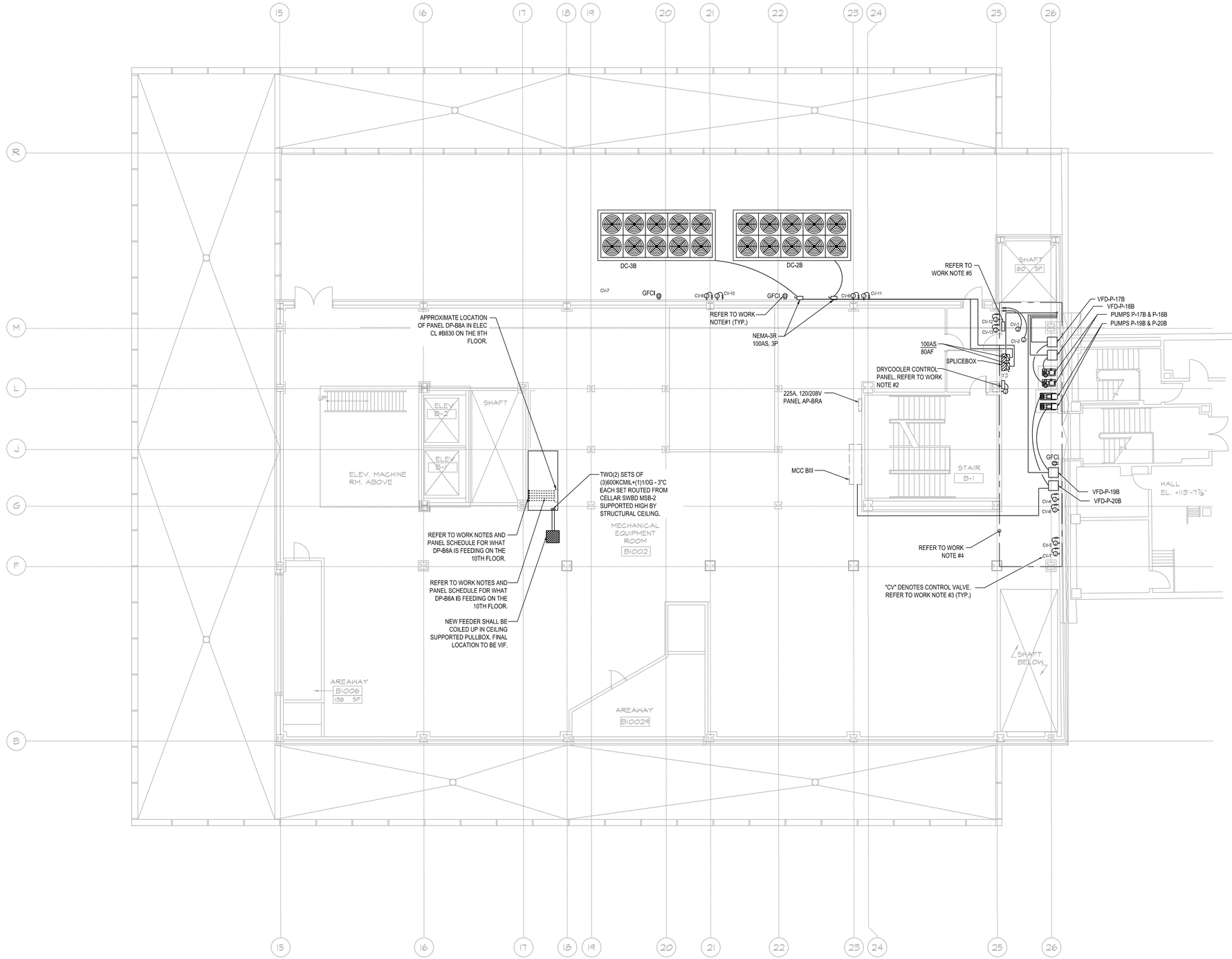
C1672

DRAWING TITLE:
CELLAR ELECTRICAL POWER PLAN

DOB NOW JOB•

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	WMA
DWG No:	E-100.00
SCALE: 1/8" = 1'-0"	3 OF 11



0 4' 8' 16'

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1) REFER TO THE E-000 SERIES FOR SYMBOL LIST, ABBREVIATIONS, NOTES, ETC.

2) REFER TO THE E-400 SERIES FOR STACKED "B" BUILDING ELECTRICAL CLOSET PART PLANS AND "C" BUILDING ELECTRIC HEATER POWER PLANS

3) REFER TO E-600 FOR RISER DIAGRAM, WIRE SIZES, AND ADDITIONAL INFORMATION.

WORK NOTES:

1) CONTRACTOR SHALL PROVIDE A 20A/1P CIRCUIT BREAKER AND 2#10-1#10G-3/4"C SIZE WIRE FOR THE RECEPTACLES FROM 8TH FLOOR PANEL DP-B8A CKT#33

2) CONTRACTOR SHALL PROVIDE A 20A/1P CIRCUIT BREAKER AND 2#10-1#10G-3/4"C SIZE WIRE FOR THE DRYCOOLER CONTROL PANEL FROM 8TH FLOOR PANEL DP-B8A CKT#35.

3) CONTRACTOR SHALL PROVIDE TWO 20A/1P CIRCUIT BREAKERS AND 2#10-1#10G-3/4"C SIZE WIRE FOR CONTROL VALVES FROM 8TH FLOOR PANEL DP-B8A CKT#37 & CKT#39. REFER TO E-700 SERIES FOR CIRCUIT INFORMATION. REFER TO MECHANICAL DRAWINGS FOR EXACT LOCATIONS AND ADDITIONAL INFORMATION.

4) CONTRACTOR SHALL RELOCATE EXISTING LIGHT FIXTURES AS NECESSARY TO ACCOMMODATE THE NEW PIPING RUNNING IN THIS AREA. COORDINATE WITH MECHANICAL DRAWINGS FOR THE PIPE ROUTING. IF LIGHT FIXTURE RELOCATION IS NECESSARY CONTRACTOR SHALL EXTEND WIRING AND CONDUIT AS REQUIRED AND SUBMIT NEW LIGHTING LOCATION SHOP DRAWING FOR EOR REVIEW.

5) CONTRACTOR SHALL UTILIZE EXISTING WIRING TO ENERGIZE THE NEW GLYCOL SYSTEM CONTROL PANEL.

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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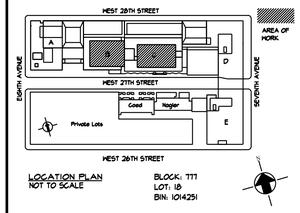
rev. no.	date	revisions
	06/16/2025	ISSUED FOR BID



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Structural Consultants

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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

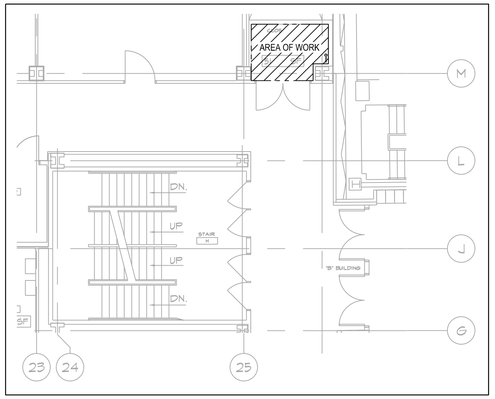
C1672

DRAWING TITLE:
10TH FLOOR ELECTRICAL POWER PLAN

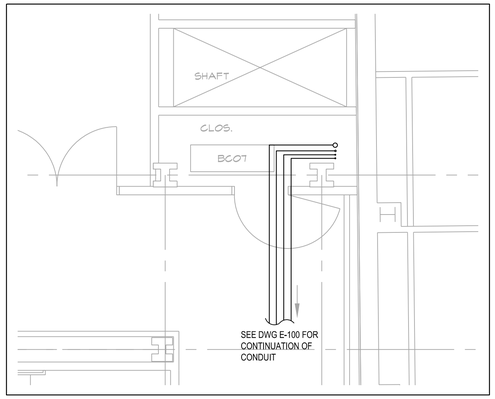
DOB NOW JOB#

SEAL & SIGNATURE:

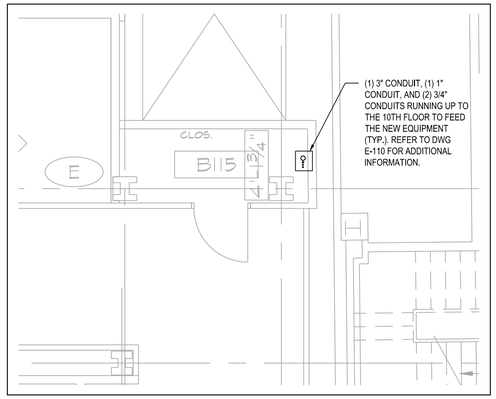
DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	DN
DWG No:	E-110.00
SCALE: 1/8" = 1' - 0"	4 OF 11



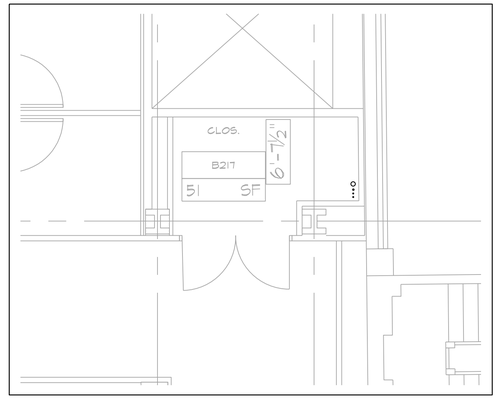
0 AREA OF WORK (TYP. CELLAR-TENTH FLOOR)
1/8"=1'-0"



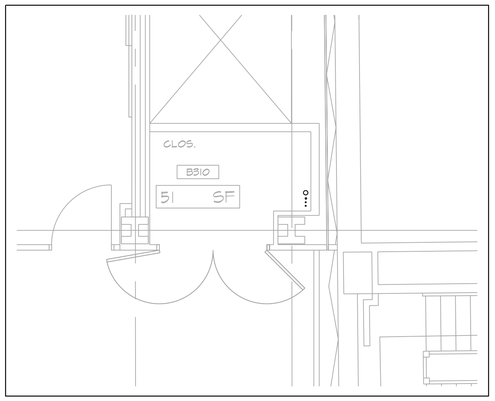
1 CELLAR ELECTRICAL PART PLAN
1/4"=1'-0"



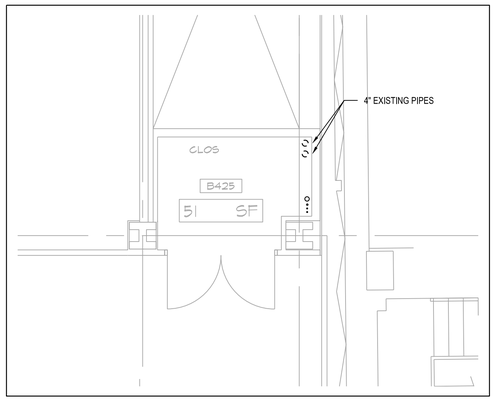
2 FIRST FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



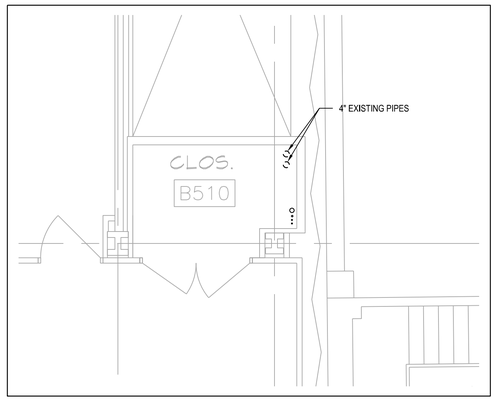
3 SECOND FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



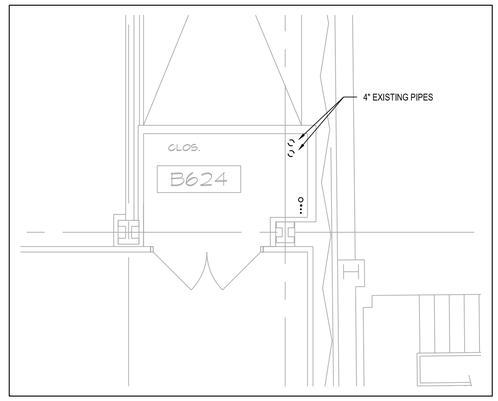
4 THIRD FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



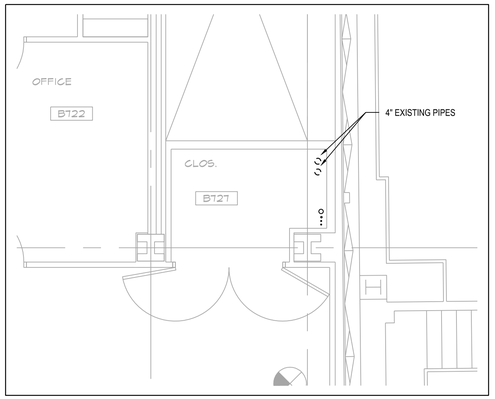
5 FOURTH FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



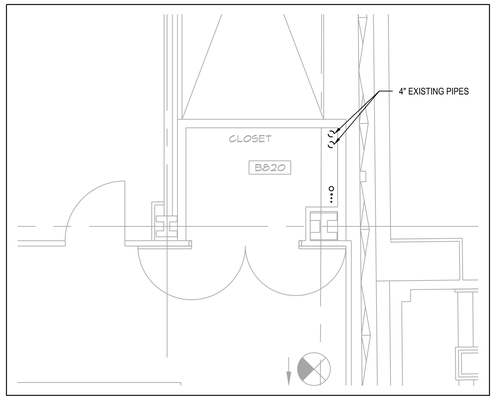
6 FIFTH FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



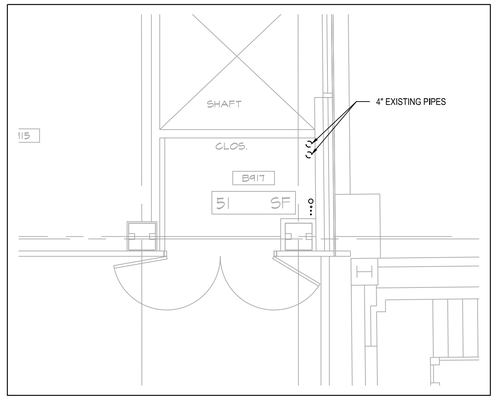
7 SIXTH FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



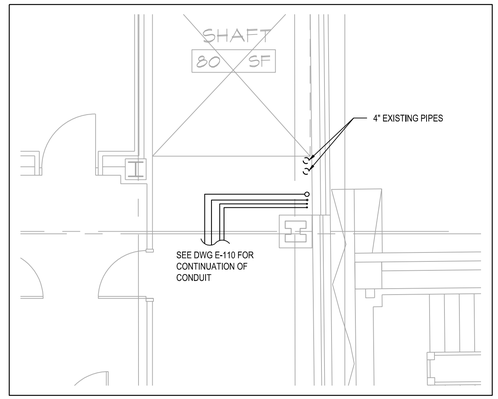
8 SEVENTH FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



9 EIGHTH FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



10 NINTH FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"



11 TENTH FLOOR ELECTRICAL PART PLAN
1/4"=1'-0"

NOTES:

1. PROVIDE FIRE RATING PENETRATION AS PER DETAIL AT ALL SLAB PENETRATIONS.

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

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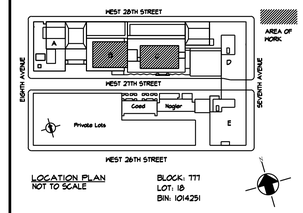

LOCATION PLAN
NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

Fashion Institute of Technology

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New York, NY 10001

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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

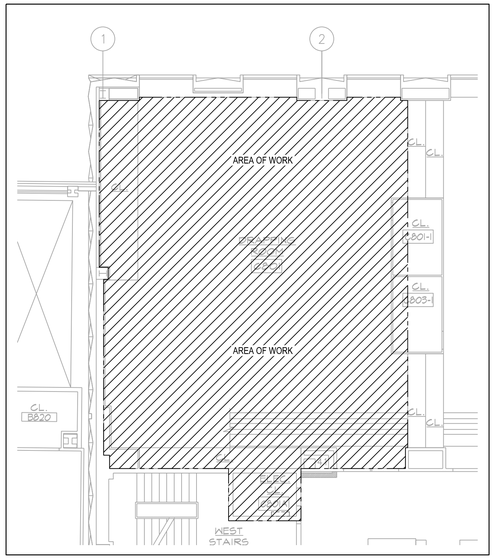
C1672

DRAWING TITLE:
CELLAR THRU 10TH FLOOR
CLOSET RISER ELECTRICAL
PART PLANS

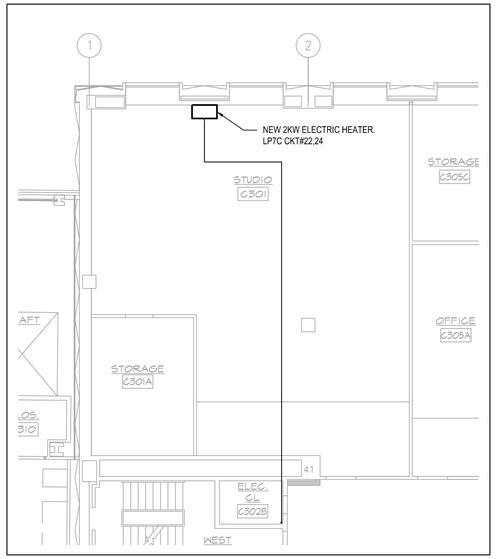
DOB NOW JOB#

SEAL & SIGNATURE:

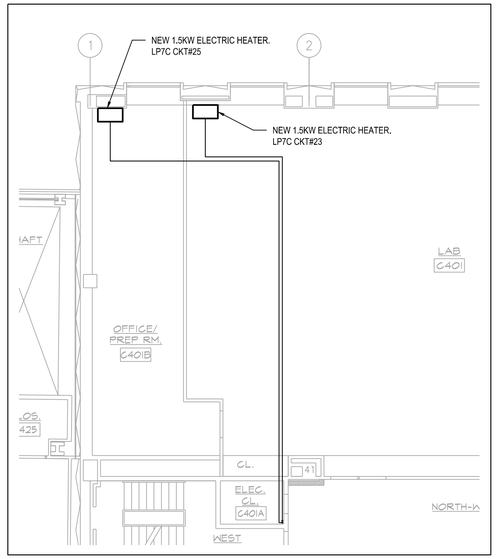
DATE:	06/16/2025
PROJECT No:	896963
DRAWING BY:	DG
CHK BY:	WMA
DWG No:	E-401.00
SCALE: AS NOTED	5 OF 11



0 AREA OF WORK (TYP. THIRD-EIGHTH FLOOR)
1/8"=1'-0"



1 THIRD FLOOR ELECTRICAL PART PLAN
1/8"=1'-0"



2 FOURTH FLOOR ELECTRICAL PART PLAN
1/8"=1'-0"

GENERAL NOTES:

1) REFER TO THE E-000 SERIES FOR SYMBOL LIST, ABBREVIATIONS, NOTES, ETC.
2) REFER TO THE E-400 SERIES FOR STACKED "B" BUILDING ELECTRICAL CLOSET PART PLANS AND "C" BUILDING ELECTRIC HEATER POWER PLANS
3) REFER TO E-600 SERIES FOR RISER DIAGRAM, WIRE SIZES, AND ADDITIONAL INFORMATION.
4) REFER TO E-700 SERIES FOR PANEL SCHEDULES.

WORK NOTES:

1) CONTRACTOR SHALL USE WIRE AND CONDUIT SIZE 2#10-1#10G-3/4"C TO FEED ALL ELECTRIC HEATERS
2) CONTRACTOR SHALL CORE DRILL AND RUN TWO 3/4" CONDUITS DOWN TO THE 4TH AND 3RD FLOORS TO FEED THE ELECTRIC HEATERS ON THOSE FLOORS.
3) CONTRACTOR SHALL INSTALL A 20A/1P BREAKER IN PANEL LP7C AT CKT#26 TO ENERGIZE THIS CONTROL VALVE. INSTALL THE MANUAL ON/OFF SWITCH ABOVE THE NEW CEILING IN LINE OF SITE OF THE CONTROL VALVE. REFER TO E-700 SERIES FOR ADDITIONAL CIRCUIT INFORMATION. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.

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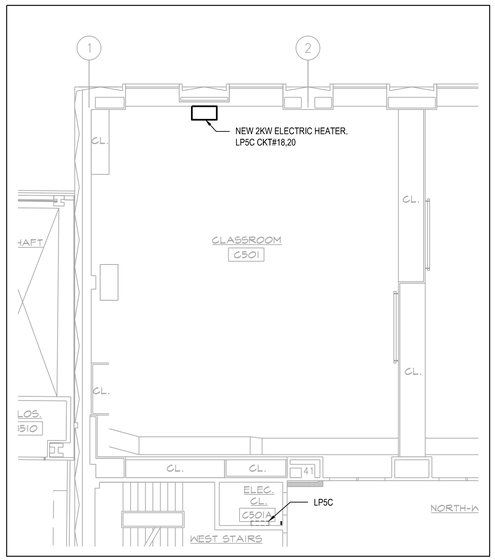
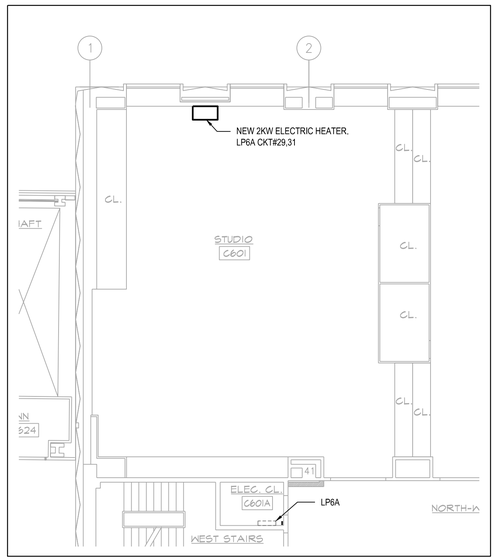
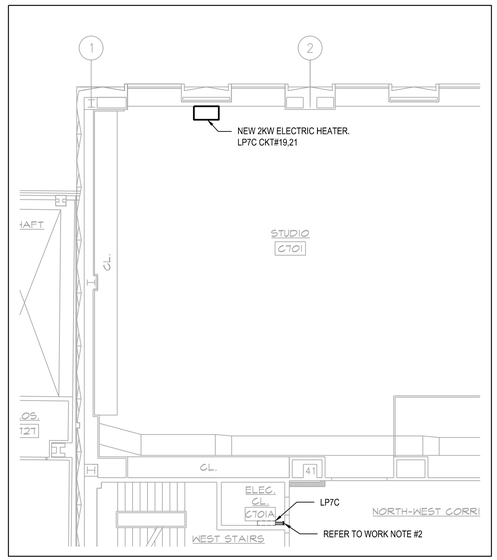


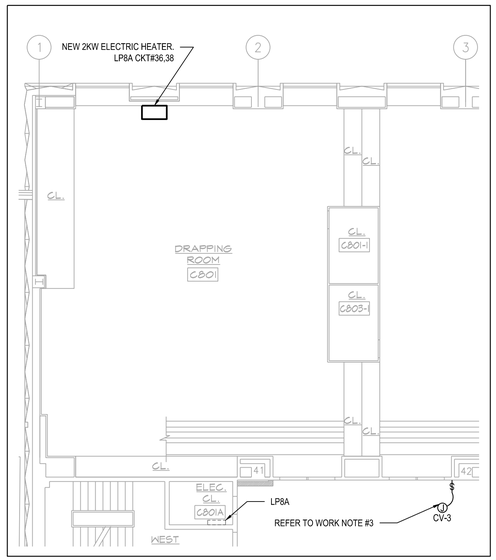
3 FIFTH FLOOR ELECTRICAL PART PLAN
1/8"=1'-0"



4 SIXTH FLOOR ELECTRICAL PART PLAN
1/8"=1'-0"



5 SEVENTH FLOOR ELECTRICAL PART PLAN
1/8"=1'-0"



6 EIGHTH FLOOR ELECTRICAL PART PLAN
1/8"=1'-0"

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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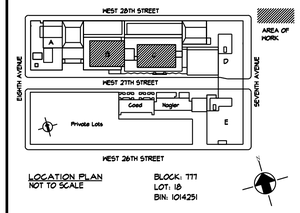

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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

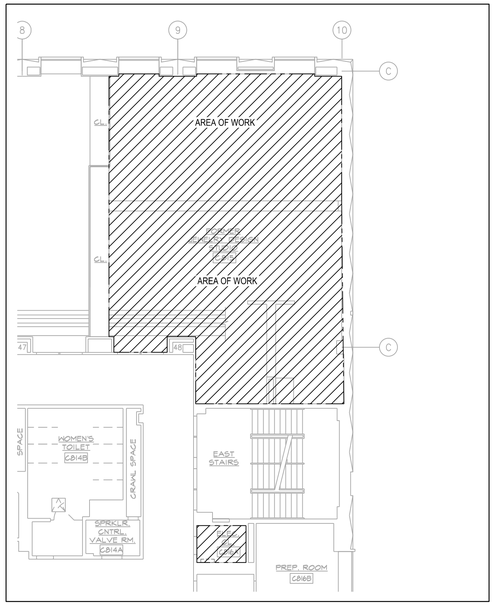
C1672

DRAWING TITLE:
THIRD THRU EIGHTH FLOORS
WEST PERIMETER ROOM
ELECTRICAL PART PLANS

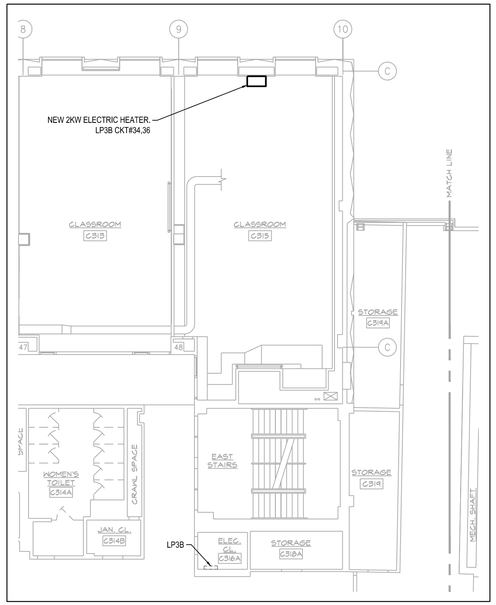
DOB NOW JOB#

SEAL & SIGNATURE:

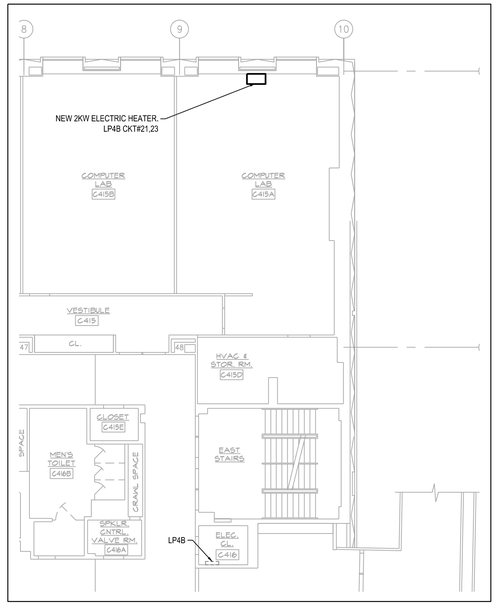
DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	WMA
DWG No:	E-402.00
SCALE: AS NOTED	6 OF 11



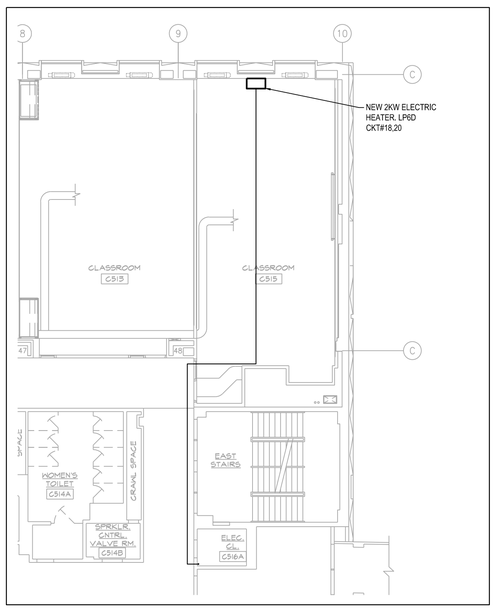
0 AREA OF WORK (TYP. THIRD-EIGHTH FLOOR)
3/32"=1'-0"



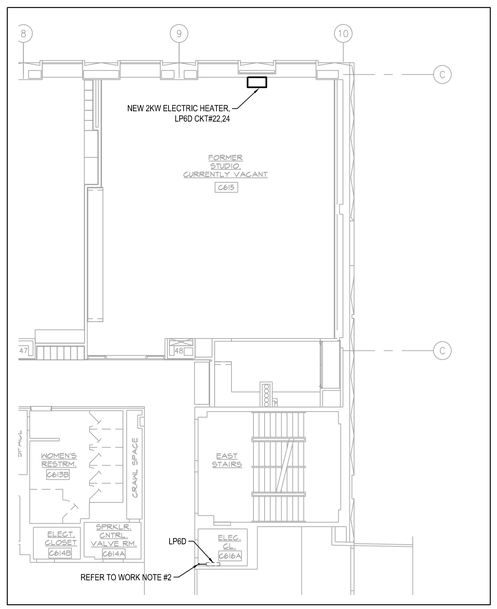
1 THIRD FLOOR ELECTRICAL PART PLAN
3/32"=1'-0"



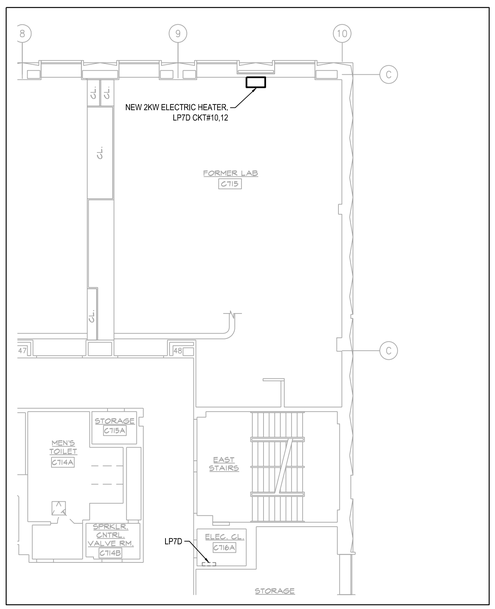
2 FOURTH FLOOR ELECTRICAL PART PLAN
3/32"=1'-0"



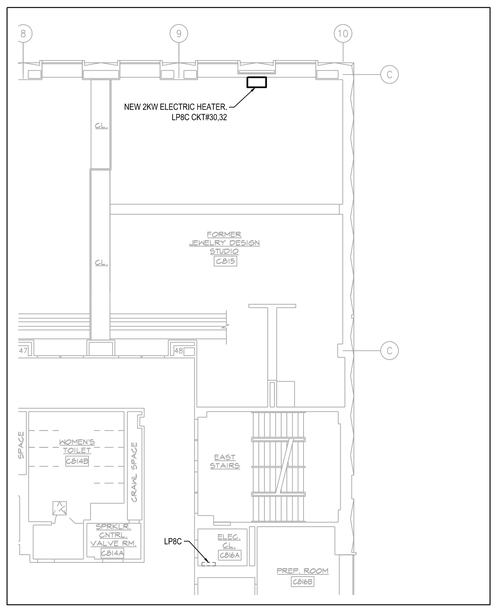
3 FIFTH FLOOR ELECTRICAL PART PLAN
3/32"=1'-0"



4 SIXTH FLOOR ELECTRICAL PART PLAN
3/32"=1'-0"



5 SEVENTH FLOOR ELECTRICAL PART PLAN
3/32"=1'-0"



6 EIGHTH FLOOR ELECTRICAL PART PLAN
3/32"=1'-0"

0 8' 16' 32'

SCALE: 3/32" = 1'-0"

GENERAL NOTES:

1) REFER TO THE E-000 SERIES FOR SYMBOL LIST, ABBREVIATIONS, NOTES, ETC.
2) REFER TO THE E-400 SERIES FOR STACKED "B" BUILDING ELECTRICAL CLOSET PART PLANS AND "C" BUILDING ELECTRIC HEATER POWER PLANS
3) REFER TO E-600 SERIES FOR RISER DIAGRAM, WIRE SIZES, AND ADDITIONAL INFORMATION.
4) REFER TO E-700 SERIES FOR PANEL SCHEDULES.

WORK NOTES:

1) CONTRACTOR SHALL USE WIRE AND CONDUIT SIZE 2#10-1#10G-3/4"C TO FEED ALL ELECTRIC HEATERS
2) CONTRACTOR SHALL CORE DRILL AND RUN ONE 3/4" CONDUIT DOWN TO THE 5TH FLOOR TO FEED THE ELECTRIC HEATER ON THAT FLOOR.

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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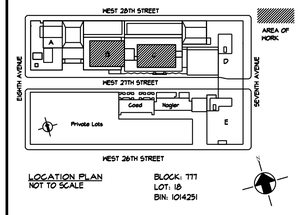

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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

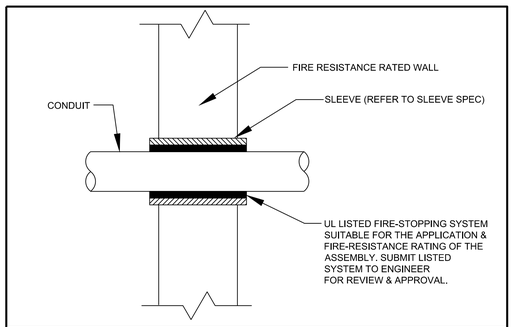
C1672

DRAWING TITLE:
THIRD THRU EIGHTH FLOORS
EAST PERIMETER ROOM
ELECTRICAL PART PLANS

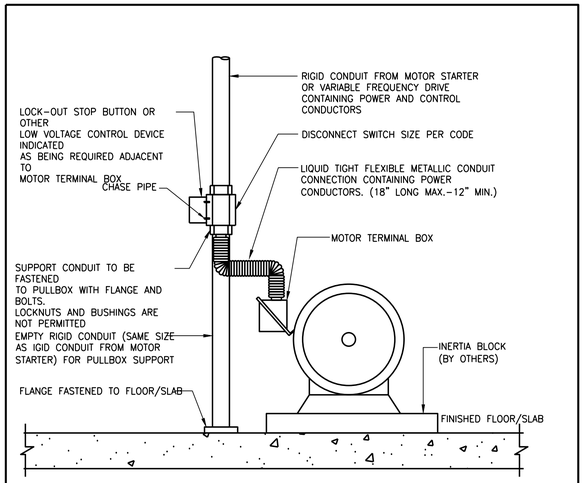
DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	CTD
DWG No:	E-403.00
SCALE: AS NOTED	7 OF 11



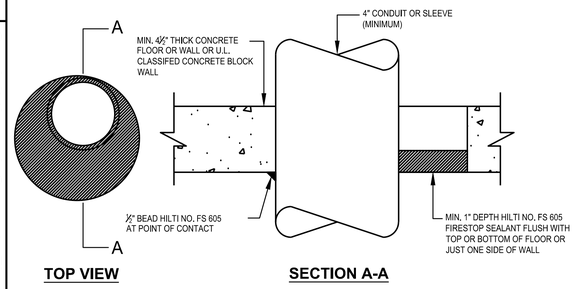
1 **Conduit Penetration Thru Fire Rated Wall / Partition**
Not to Scale



NOTE:
1. MOTOR SHALL BE FURNISHED AND INSTALLED BY OTHERS AND WIRED BY ELECTRICAL CONTRACTOR.

3 **Floor Mounted Motor Connection**
Not to Scale

2 **Conduit through Concrete Floor or Block Wall**
Not to Scale



TOP VIEW SECTION A-A

NOTES:

1. CONDUIT MAY BE CENTERED OR OFFSET IN HOLE. MAXIMUM DIAMETER OF HOLE OPENING IS 14 INCHES.
2. TEMPORARY FORMS MAY BE REQUIRED TO SUPPORT THE FIRESTOP SEALANT WHILE IT CURES.
3. FOR CONDUIT SLEEVE INSTALLATIONS PROVIDE AROUND CONDUCTORS WITHIN SLEEVE.

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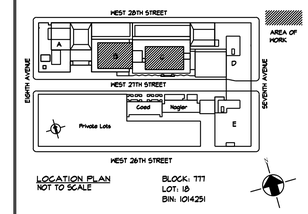

LOCATION PLAN
NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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236 West 27th Street 1401
New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
ELECTRICAL DETAILS

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	CTD
DWG No:	E-501.00
SCALE: N.T.S	8 OF 11

GENERAL NOTES:

1) REFER TO THE E-000 SERIES FOR SYMBOL LIST, ABBREVIATIONS, NOTES, ETC.

2) REFER TO THE E-400 SERIES FOR STACKED "B" BUILDING ELECTRICAL CLOSET PART PLANS AND "C" BUILDING ELECTRIC HEATER POWER PLANS

3) REFER TO E-600 FOR RISER DIAGRAM, WIRE SIZES, AND ADDITIONAL INFORMATION.

RISER NOTES:

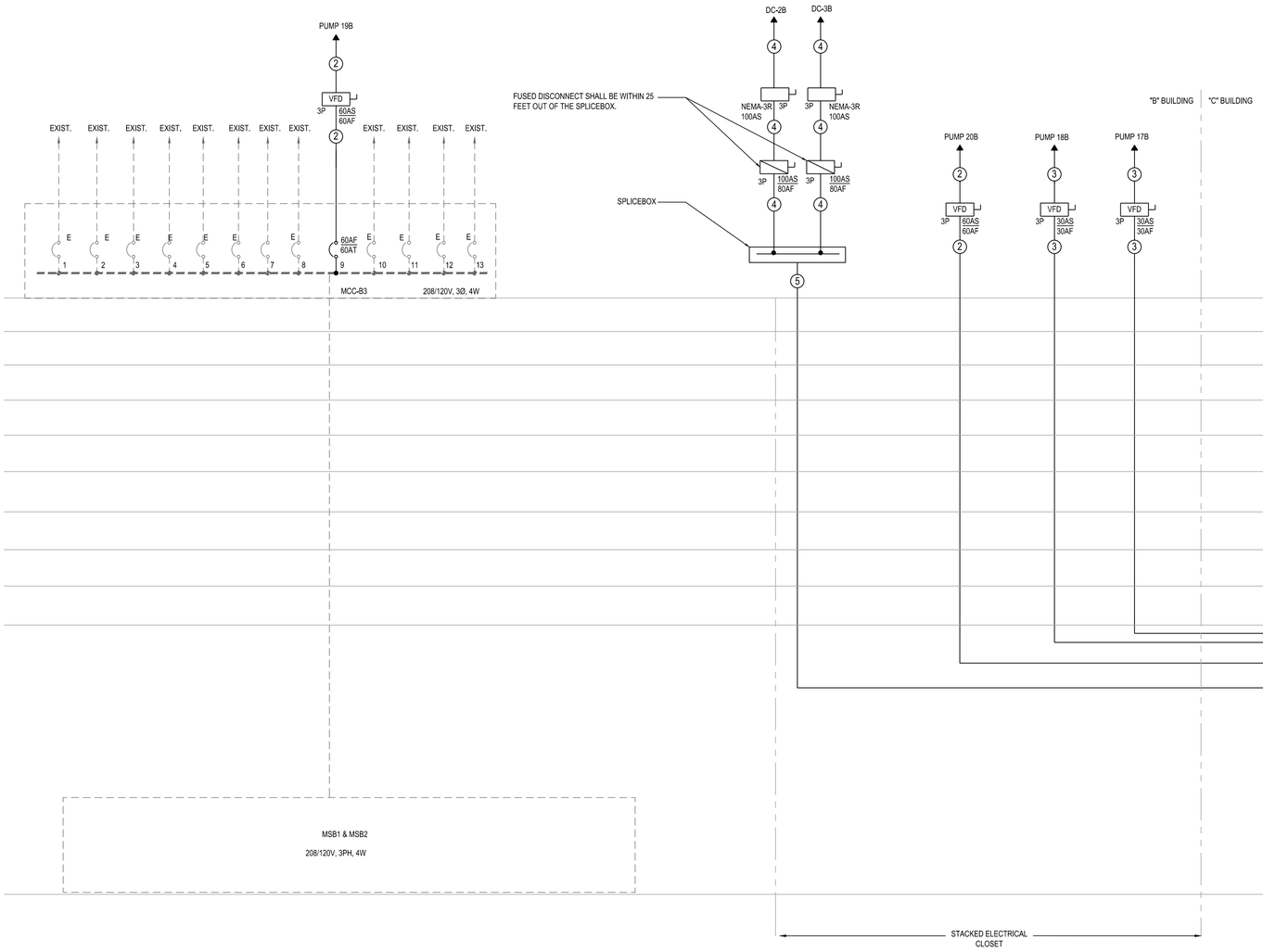
1) CONTRACTOR SHALL PROVIDE FIRE-STOPPING FOR ALL PENETRATIONS THROUGH WALLS AND SLABS.

LEGEND

——— INDICATES NEW

– – – INDICATES EXISTING TO REMAIN

WIRING AND CONDUIT SCHEDULE	
1	(2) 3#600 + 1#3G IN 3"C
2	3#6 + 1#10G IN 1"C
3	3#10 + 1#10G IN 3/4"C
4	3#3 + 1#8G IN 1"C
5	3#4/0 + 1#4G IN 2"C



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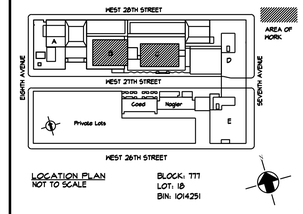

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PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
ELECTRICAL RISER DIAGRAM

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	WMA
DWG No:	E-601.00
SCALE: N.T.S	9 OF 11

MAIN DISTRIBUTION PANEL

MCC-C1

EXISTING

LOCATION: C BUILDING CELLAR
SERVICE: 208/120 3 PHASE 4 WIRE + GROUND
MAIN BUS SIZE: 800 AMPS
NEUTRAL BUS: YES
MOUNTING: SURFACE
INTERRUPTING CAPACITY: 100kAIC
GROUNDING: PROVIDE EQUIPMENT GROUND BUS NO ISOLATED GROUND BUS
REMARKS:

CIRCUIT NUMBER	PROTECTIVE DEVICE TYPE	SWITCH (AMPS)	POLES	FUSE (AMP)	FEEDER	LOAD	REMARKS
1	CIRCUIT BKR		3			EXISTING LOAD	
2	CIRCUIT BKR		3			EXISTING LOAD	
3	CIRCUIT BKR		3			EXISTING LOAD	
4	CIRCUIT BKR	150	3	150		DRYCOOLERS DC-2B & DC-3B	REFER TO E-600 SERIES FOR ADDITIONAL INFORMATION
5	CIRCUIT BKR		3			SPARE	
6	CIRCUIT BKR		3			SPARE	
7	CIRCUIT BKR		3			EXISTING LOAD	
8	CIRCUIT BKR		3			EXISTING LOAD	
9	CIRCUIT BKR	60	3	60		PUMP-20B	REFER TO E-600 SERIES FOR ADDITIONAL INFORMATION
10	CIRCUIT BKR		3			EXISTING LOAD	
11	CIRCUIT BKR		3			EXISTING LOAD	
12	CIRCUIT BKR	30	3	30		PUMP-18B	
13	CIRCUIT BKR	30	3	30		PUMP-17B	REFER TO E-600 SERIES FOR ADDITIONAL INFORMATION
14	CIRCUIT BKR		3			EXISTING LOAD	
15	CIRCUIT BKR		3			EXISTING LOAD	
16	CIRCUIT BKR		3			EXISTING LOAD	
17	CIRCUIT BKR		3			EXISTING LOAD	

MAIN DISTRIBUTION PANEL

MCC-B3

EXISTING

LOCATION: B BUILDING 10TH FLOOR
SERVICE: 208/120 3 PHASE 4 WIRE + GROUND
MAIN BUS SIZE: 250 AMPS
NEUTRAL BUS: YES
MOUNTING: SURFACE
INTERRUPTING CAPACITY: 100kAIC
GROUNDING: PROVIDE EQUIPMENT GROUND BUS NO ISOLATED GROUND BUS
REMARKS:

CIRCUIT NUMBER	PROTECTIVE DEVICE TYPE	SWITCH (AMPS)	POLES	FUSE (AMP)	FEEDER	LOAD	REMARKS
1	CIRCUIT BKR		3				
2	CIRCUIT BKR		3			EXISTING LOAD	
3	CIRCUIT BKR		3			EXISTING LOAD	
4	CIRCUIT BKR		3			EXISTING LOAD	
5	CIRCUIT BKR		3			EXISTING LOAD	
6	CIRCUIT BKR		3			EXISTING LOAD	
7	CIRCUIT BKR		3			EXISTING LOAD	
8	CIRCUIT BKR		3			EXISTING LOAD	
9	CIRCUIT BKR	60	3	60		PUMP-19B	REFER TO E-600 SERIES FOR ADDITIONAL INFORMATION
10	CIRCUIT BKR		3			EXISTING LOAD	
11	CIRCUIT BKR		3			EXISTING LOAD	
12	CIRCUIT BKR		3			EXISTING LOAD	

PANEL DESIGNATION:

LP8A

EXISTING

LOCATION: 8TH FLOOR WEST ELEC. CLOSET
VOLTAGE: 208Y/120 VOLTS 3 PHASE
MAIN: 200A MCB: 200A
MOUNTING: SURFACE
LUGS: FEEDTHRU
GND BUS: NORMAL
AIC RATING: TBD KA
NO. OF POLES: 24

								BUS TYPE			
				X	MLO			SHUNT TRIP MCB			
				X	FLUSH			NEMA ENCLOSURE	1		
					SUBFEED			STAINLESS STEEL			
				X	ISOL.			200% NEUTRAL			
								LOCKING BREAKERS			

REMARKS: EXISTING CIRCUIT #36 SHALL BE RELOCATED TO CKT#37 TO ACCOMMODATE THE 2P BREAKER FOR THE ELEC. HEATER. EXTEND WIRE AS NECESSARY.

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/8	1	0			2	20/8		EXISTING LOAD
EXISTING LOAD		20/7	3		0		4	20/7		EXISTING LOAD
EXISTING LOAD		20/6	5			0	6	20/6		EXISTING LOAD
EXISTING LOAD		20/5	7	0			8	20/5		EXISTING LOAD
EXISTING LOAD		20/4	9		0		10	20/4		EXISTING LOAD
EXISTING LOAD		20/3	11			0	12	20/3		EXISTING LOAD
EXISTING LOAD		20/2	13	0			14	20/2		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/0	17			0	18	20/0		EXISTING LOAD
EXISTING LOAD		20/1	19	0			20	20/1		EXISTING LOAD
EXISTING LOAD		20/1	21		0		22	20/1		EXISTING LOAD
EXISTING LOAD		20/1	23				24	20/1		EXISTING LOAD
EXISTING LOAD		20/1	25				26	20/1		EXISTING LOAD
EXISTING LOAD		20/1	27				28	20/1		EXISTING LOAD
EXISTING LOAD		20/1	29				30	20/1		EXISTING LOAD
EXISTING LOAD		20/1	31				32	20/1		EXISTING LOAD
EXISTING LOAD		20/1	33				34	20/1		EXISTING LOAD
EXISTING LOAD		20/1	35				36	20/2P	1000	RM C801 2KW ELEC. HEATER
EXISTING LOAD		20/1	37			1,000	38		1000	

PANEL DESIGNATION:

LP7C

EXISTING

LOCATION: 7TH FLOOR WEST ELEC. CLOSET
VOLTAGE: 208Y/120 VOLTS 3 PHASE
MAIN: 90A MCB: 90A
MOUNTING: SURFACE
LUGS: FEEDTHRU
GND BUS: NORMAL
AIC RATING: TBD KA
NO. OF POLES: 24

								BUS TYPE			
				X	MLO			SHUNT TRIP MCB			
				X	FLUSH			NEMA ENCLOSURE	1		
					SUBFEED			STAINLESS STEEL			
				X	ISOL.			200% NEUTRAL			
								LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/1	1	0			2	20/8		EXISTING LOAD
EXISTING LOAD		20/1	3		0		4	20/7		EXISTING LOAD
EXISTING LOAD		20/1	5			0	6	20/6		EXISTING LOAD
EXISTING LOAD		20/1	7	0			8	20/5		EXISTING LOAD
EXISTING LOAD		20/1	9		0		10	20/4		EXISTING LOAD
EXISTING LOAD		20/1	11			0	12	20/3		EXISTING LOAD
EXISTING LOAD		20/1	13	0			14	20/2		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/1	17			0	18	20/0		EXISTING LOAD
RM C701 2KW ELEC. HEATER	1000	20/2P	19	1,000			20	20/1		EXISTING LOAD
	1000		21		2,000		22	20/2P	1000	RM C301 2KW ELEC. HEATER
RM C401 1KW ELEC. HEATER	1500	20/1	23				24		1000	
RM C401B 1KW ELEC. HEATER	1500	20/1	25				26	20/1	500	CONTROL VALVE CV3

PANEL DESIGNATION:

LP6A

EXISTING

LOCATION: 6TH FLOOR WEST ELEC. CLOSET
VOLTAGE: 208Y/120 VOLTS 3 PHASE
MAIN: 100A MCB: 100A
MOUNTING: SURFACE
LUGS: FEEDTHRU
GND BUS: NORMAL
AIC RATING: TBD KA
NO. OF POLES: 24

								BUS TYPE			
				X	MLO			SHUNT TRIP MCB			
				X	FLUSH			NEMA ENCLOSURE	1		
					SUBFEED			STAINLESS STEEL			
				X	ISOL.			200% NEUTRAL			
								LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/1	1	0			2	20/1		EXISTING LOAD
EXISTING LOAD		20/1	3		0		4	20/1		EXISTING LOAD
EXISTING LOAD		20/1	5			0	6	20/1		EXISTING LOAD
EXISTING LOAD		20/1	7	0			8	20/1		EXISTING LOAD
EXISTING LOAD		20/1	9		0		10	20/1		EXISTING LOAD
EXISTING LOAD		20/1	11			0	12	20/1		EXISTING LOAD
EXISTING LOAD		20/1	13	0			14	20/1		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/1	17			0	18	20/1		EXISTING LOAD
EXISTING LOAD		20/1	19	0			20	20/1		EXISTING LOAD
EXISTING LOAD		20/1	21		0		22	20/1		EXISTING LOAD
EXISTING LOAD		20/1	23				24	20/1		EXISTING LOAD
EXISTING LOAD		20/1	25				26	20/1		EXISTING LOAD
EXISTING LOAD		20/1	27				28	20/1		EXISTING LOAD
RM C601 2KW ELEC. HEATER		20/2P	29				30	20/1		EXISTING LOAD
			31				32			SPACE

FOR WORKING HOURS AND SCHEDULE OF THE PROJECT REFER TO SECTION III CONTRACT TERMS AND CONDITIONS PARAGRAPH WORK HOURS AND PROJECT SCHEDULE. ALL WORK SHOULD BE COORDINATED WITH FIT AND THE CONTRACTOR SHALL SUBMIT EVERY WEEK THE TWO WEEKS LOOK AHEAD OF SCHEDULE TO FIT AND ENGINEER.

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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 2020 NEW YORK CITY ENERGY CONSERVATION CODE.

MG Engineering D.P.C. / we engineer success
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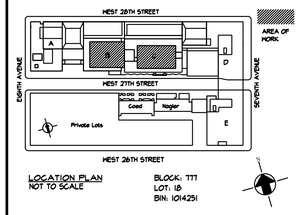
rev. no. date revisions

06/16/2025 ISSUED FOR BID



Fashion Institute of Technology
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Darius Toraby Architects P.C.
236 West 27th Street 1401
New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
ELECTRICAL PANEL SCHEDULES I

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	WMA
DWG No:	E-701.00
SCALE: N.T.S	10 OF 11

PANEL DESIGNATION: LP5C

EXISTING

LOCATION: 5TH FLOOR WEST ELEC. CLOSET

VOLTAGE:	208Y/120	VOLTS	3 PHASE			BUS TYPE					
MAIN:	90A	MCB: 90A	X	MLO		SHUNT TRIP MCB					
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE		1			
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL					
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL					
AIC RATING:	TBD	KA	NO. OF POLES:		24	LOCKING BREAKERS					

REMARKS: EXISTING CIRCUIT #18 SHALL BE RELOCATED TO CKT#19 TO ACCOMMODATE THE 2P BREAKER FOR THE ELEC. HEATER. EXTEND WIRE AS NECESSARY.

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/8	1	0			2	20/8		EXISTING LOAD
EXISTING LOAD		20/7	3		0		4	20/7		EXISTING LOAD
EXISTING LOAD		20/6	5			0	6	20/6		EXISTING LOAD
EXISTING LOAD		20/5	7	0			8	20/5		EXISTING LOAD
EXISTING LOAD		20/4	9		0		10	20/4		EXISTING LOAD
EXISTING LOAD		20/3	11			0	12	20/3		EXISTING LOAD
EXISTING LOAD		20/2	13	0			14	20/2		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/1	17				18	20/2P	1000	RM C501 2KW ELEC. HEATER
EXISTING LOAD		20/1	19			1,000	20		1000	

PANEL DESIGNATION: LP3B

EXISTING

LOCATION: 3RD FLOOR EAST ELEC. CLOSET

VOLTAGE:	208Y/120	VOLTS	3 PHASE			BUS TYPE					
MAIN:	200A	MCB: 150A	X	MLO		SHUNT TRIP MCB					
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE		1			
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL					
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL					
AIC RATING:	TBD	KA	NO. OF POLES:		24	LOCKING BREAKERS					

REMARKS: EXISTING CIRCUIT #34 SHALL BE RELOCATED TO CKT#37 TO ACCOMMODATE THE 2P BREAKER FOR THE ELEC. HEATER. EXTEND WIRE AS NECESSARY.

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/1	1	0			2	20/1		EXISTING LOAD
EXISTING LOAD		20/1	3		0		4	20/1		EXISTING LOAD
EXISTING LOAD		20/1	5			0	6	20/1		EXISTING LOAD
EXISTING LOAD		20/1	7	0			8	20/1		EXISTING LOAD
EXISTING LOAD		20/1	9		1,000		10	20/1	1000	EXISTING LOAD
EXISTING LOAD		20/1	11			1,000	12	20/1	1000	EXISTING LOAD
EXISTING LOAD		20/1	13	0			14	20/1		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/1	17			0	18	20/1		EXISTING LOAD
EXISTING LOAD		20/1	19	0			20	20/1		EXISTING LOAD
EXISTING LOAD		20/1	21		0		22	20/1		EXISTING LOAD
EXISTING LOAD		20/1	23				24	20/1		EXISTING LOAD
EXISTING LOAD		20/1	25				26	20/1		EXISTING LOAD
EXISTING LOAD		20/1	27				28	20/1		EXISTING LOAD
EXISTING LOAD		20/1	29				30	20/1		EXISTING LOAD
EXISTING LOAD		20/1	31				32	20/1		EXISTING LOAD
RECEPTACLES	600	20/1	33				34	20/1		EXISTING LOAD
DC-1B & 2B CONTROL PANEL	600	20/1	35				36	20/1		EXISTING LOAD
CONTROL VALVES 1,2,12,13	800	20/1	37				38	20/1		SPARE
CONTROL VALVES 4,5,6,7,8,9,10,11	800	20/1	39				40	20/1		SPARE
SPARE		20/1	41				42	20/1		SPARE

PANEL DESIGNATION: LP6D

EXISTING

LOCATION: 6TH FLOOR EAST ELEC. CLOSET

VOLTAGE:	208Y/120	VOLTS	3 PHASE			BUS TYPE					
MAIN:	150A	MCB: 150A	X	MLO		SHUNT TRIP MCB					
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE		1			
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL					
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL					
AIC RATING:	TBD	KA	NO. OF POLES:		24	LOCKING BREAKERS					

REMARKS: EXISTING CIRCUIT #18 SHALL BE RELOCATED TO CKT#28 TO ACCOMMODATE THE 2P BREAKER FOR THE ELEC. HEATER. EXTEND WIRE AS NECESSARY.

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/8	1	0			2	20/8		EXISTING LOAD
EXISTING LOAD		20/7	3		0		4	20/7		EXISTING LOAD
EXISTING LOAD		20/6	5			0	6	20/6		EXISTING LOAD
EXISTING LOAD		20/5	7	0			8	20/5		EXISTING LOAD
EXISTING LOAD		20/4	9		0		10	20/4		EXISTING LOAD
EXISTING LOAD		20/3	11			0	12	20/3		EXISTING LOAD
EXISTING LOAD		20/2	13	0			14	20/2		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/0	17			1,000	18	20/0	1000	RM C515 2KW ELEC. HEATER
EXISTING LOAD		20/1	19	1,000			20	20/1	1000	
EXISTING LOAD		20/1	21		#REF!		22	20/1	1000	RM C615 2KW ELEC. HEATER
EXISTING LOAD		20/1	23				24	20/1	1000	
EXISTING LOAD		20/1	25				26	20/1		EXISTING LOAD
EXISTING LOAD		20/1	27				28	20/1		**EXISTING LOAD**
EXISTING LOAD		20/1	29				30	20/1		EXISTING LOAD
SPACE		20/1	31				32	20/1		EXISTING LOAD
EXISTING LOAD		20/1	33				34	20/1		SPACE
SPACE		20/1	35				36	20/2P		EXISTING LOAD
EXISTING LOAD		20/1	37			0	38			EXISTING LOAD

PANEL DESIGNATION: LP4B

EXISTING

LOCATION: 4TH FLOOR EAST ELEC. CLOSET

VOLTAGE:	208Y/120	VOLTS	3 PHASE			BUS TYPE					
MAIN:	200A	MCB: 150A	X	MLO		SHUNT TRIP MCB					
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE		1			
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL					
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL					
AIC RATING:	TBD	KA	NO. OF POLES:		24	LOCKING BREAKERS					

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/1	1	0			2	20/1		EXISTING LOAD
EXISTING LOAD		20/1	3		0		4	20/1		EXISTING LOAD
EXISTING LOAD		20/1	5			0	6	20/1		EXISTING LOAD
EXISTING LOAD		20/1	7	0			8	20/1		EXISTING LOAD
EXISTING LOAD		20/1	9		1,000		10	20/1	1000	EXISTING LOAD
EXISTING LOAD		20/1	11			1,000	12	20/1	1000	EXISTING LOAD
EXISTING LOAD		20/1	13	0			14	20/1		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/1	17			0	18	20/1		EXISTING LOAD
EXISTING LOAD		20/1	19	0			20	20/1		EXISTING LOAD
RM C415A 2KW ELEC. HEATER	1000	20/2P	21		1,000		22	20/1		EXISTING LOAD
	1000		23				24	20/1		EXISTING LOAD
EXISTING LOAD		20/1	25				26	20/1		EXISTING LOAD

PANEL DESIGNATION: LP7D

EXISTING

LOCATION: 7TH FLOOR EAST ELEC. CLOSET

VOLTAGE:	208Y/120	VOLTS	3 PHASE			BUS TYPE					
MAIN:	90A	MCB: 90A	X	MLO		SHUNT TRIP MCB					
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE		1			
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL					
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL					
AIC RATING:	TBD	KA	NO. OF POLES:		24	LOCKING BREAKERS					

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/1	1	0			2	20/1		EXISTING LOAD
EXISTING LOAD		20/1	3		0		4	20/1		SPACE
EXISTING LOAD		20/1	5			0	6	20/1		EXISTING LOAD
EXISTING LOAD		20/1	7	0			8	20/1		EXISTING LOAD
EXISTING LOAD		20/1	9		1,000		10	20/1	1000	RM C715 2KW ELEC. HEATER
EXISTING LOAD		20/1	11			1,000	12	20/1	1000	
EXISTING LOAD		20/1	13	0			14	20/1		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/1	17			0	18	20/1		EXISTING LOAD
EXISTING LOAD		20/1	19	0			20	20/1		EXISTING LOAD
EXISTING LOAD		20/1	21		0		22	20/1		EXISTING LOAD
EXISTING LOAD		20/1	23				24	20/1		EXISTING LOAD
SPACE		20/1	25				26	20/1		SPACE

PANEL DESIGNATION: DP-B8A

EXISTING

LOCATION: 8TH FLOOR ELEC. CLOSET

VOLTAGE:	208Y/120	VOLTS	3 PHASE			BUS TYPE					
MAIN:	225A	MCB:	X	MLO		SHUNT TRIP MCB					
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE		1			
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL					
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL					
AIC RATING:	TBD	KA	NO. OF POLES:		42	LOCKING BREAKERS					

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/1	1	0			2	20/1		EXISTING LOAD
EXISTING LOAD		20/1	3		0		4	20/1		EXISTING LOAD
EXISTING LOAD		20/1	5			0	6	20/1		EXISTING LOAD
EXISTING LOAD		20/1	7	0			8	20/1		EXISTING LOAD
EXISTING LOAD		20/1	9		0		10	20/1		EXISTING LOAD
EXISTING LOAD		20/1	11			0	12	20/1		EXISTING LOAD
EXISTING LOAD		20/1	13	0			14	20/1		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/1	17			0	18	20/1		EXISTING LOAD
EXISTING LOAD		20/1	19	0			20	20/1		EXISTING LOAD
EXISTING LOAD		20/1	21		0		22	20/1		EXISTING LOAD
EXISTING LOAD		20/1	23				24	20/1		EXISTING LOAD
EXISTING LOAD		20/1	25				26	20/1		EXISTING LOAD
EXISTING LOAD		20/1	27				28	20/1		EXISTING LOAD
EXISTING LOAD		20/1	29				30	20/1		EXISTING LOAD
EXISTING LOAD		20/1	31				32	20/1		EXISTING LOAD
EXISTING LOAD		20/1	33				34	20/1		EXISTING LOAD
EXISTING LOAD		20/1	35				36	20/1		EXISTING LOAD
EXISTING LOAD		20/1	37				38	20/1		EXISTING LOAD
EXISTING LOAD		20/1	39				40	20/1		EXISTING LOAD
EXISTING LOAD		20/1	41				42	20/1		EXISTING LOAD

PANEL DESIGNATION: LP8C

EXISTING

LOCATION: 8TH FLOOR EAST ELEC. CLOSET

VOLTAGE:	208Y/120	VOLTS	3 PHASE			BUS TYPE					
MAIN:	200A	MCB: 200A	X	MLO		SHUNT TRIP MCB					
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE		1			
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL					
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL					
AIC RATING:	TBD	KA	NO. OF POLES:		24	LOCKING BREAKERS					

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		20/1	1	0			2	20/1		EXISTING LOAD
EXISTING LOAD		20/1	3		0		4	20/1		EXISTING LOAD
EXISTING LOAD		20/1	5			0	6	20/1		EXISTING LOAD
EXISTING LOAD		20/1	7	0			8	20/1		EXISTING LOAD
EXISTING LOAD		20/1	9		0		10	20/1		EXISTING LOAD
EXISTING LOAD		20/1	11			0	12	20/1		EXISTING LOAD
EXISTING LOAD		20/1	13	0			14	20/1		EXISTING LOAD
EXISTING LOAD		20/1	15		0		16	20/1		EXISTING LOAD
EXISTING LOAD		20/1	17			0	18	20/1		EXISTING LOAD
EXISTING LOAD		20/1	19	0			20	20/1		EXISTING LOAD
EXISTING LOAD		20/1	21		0		22	20/1		EXISTING LOAD
EXISTING LOAD		20/1	23				24	20/1		EXISTING LOAD
EXISTING LOAD		20/1	25				26	20/1		EXISTING LOAD
EXISTING LOAD		20/1	27				28	20/1		EXISTING LOAD
EXISTING LOAD		20/1	29				30	20/2P		RM C815 2KW ELEC. HEATER
EXISTING LOAD		20/1	31				32			

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rev. no. date revisions

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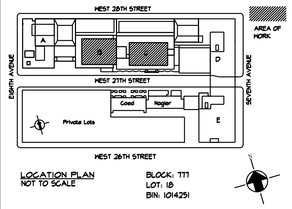

LOCATION PLAN NOT TO SCALE

BLOCK: 777
LOT: 18
BIN: 1014251

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New York, NY 10001 / (212) 242-2955

PROJECT:
227 WEST 27TH STREET
NEW YORK, NY 10001
NEW WATERSIDE ECONOMIZER

C1672

DRAWING TITLE:
ELECTRICAL PANEL SCHEDULES II

DOB NOW JOB#

SEAL & SIGNATURE:

DATE:	06/16/2025
PROJECT No:	8969.63
DRAWING BY:	DG
CHK BY:	WMA
DWG No:	E-702.00
SCALE: N.T.S	11 OF 11

FASHION INSTITUTE OF TECHNOLOGY NEW WATERSIDE ECONOMIZER
227 WEST 27TH STREET, NEW YORK, NY 10001

GENERAL NOTES:

1. WHERE NEW WORK IS REQUIRED AND IT CONFLICTS WITH EXISTING STRUCTURAL, MECHANICAL OR CODE LIMITATIONS, THE CONTRACTOR, BUILDER, OR THOSE IN RELEVANT OR CONTINGENT TRADES SHALL INFORM THE OWNER AND ARCHITECT OF SUCH, PRIOR TO PROCEEDING WITH SUCH WORK.
2. NO WORK OF ANY TRADE IS TO BE CARRIED OUT IN THE EVENT OF CONFLICT OF INFORMATION. CLARIFICATIONS OF THIS NATURE ARE TO BE MADE BY THE ARCHITECT OR OWNER.
3. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH APPLICABLE LOCAL CODE REQUIREMENTS AND ANY AGENCIES HAVING JURISDICTION, AS WELL AS ALL MANAGEMENT REGULATIONS.
4. ALL WORK SHALL BE DONE IN A FIRST CLASS WORK- MAN LIKE MANNER AND FABRICATED WITH FIRST CLASS MATERIALS. CONTRACTOR SHALL SUBMIT THE PROPOSED WORK SCHEDULE WITH HIS LUMP SUM BID THAT WILL NOT BE CHANGED EXCEPT WITH THE APPROVAL OF THE OWNER AND ARCHITECT.
5. EXISTING PROPERTY AND NEW WORK IS TO BE PROPERLY PROTECTED AGAINST DAMAGES UNTIL THE COMPLETION OF THE JOB, AT WHICH TIME IT SHALL BE LEFT BROOM CLEAN.
6. AT DEMOLISHED OR CHOPPED AWAY LOCATIONS, PATCHING SHALL BE DONE WITH LIKE MATERIALS OR AS SPECIFIED.
7. THE SUBCONTRACTORS' WORK UNDER THE BUILDER (GENERAL CONTRACTOR) SHALL BE FULLY COORDINATED SO AS TO AVOID UNNECESSARY DEMOLITION OR CONFLICT OF WORK SEQUENCE OF VARIOUS TRADES AND WORKMEN.
8. THE CONTRACTOR SHALL FILE CERTIFICATES OF WORKMENS' COMPENSATION, COMPREHENSIVE AUTO LIABILITY, COMPREHENSIVE GENERAL LIABILITY, AND
9. EMPLOYER'S LIABILITY INSURANCES WITH THE OWNER AND ARCHITECT. THE CONTRACTOR IS ALSO TO OBTAIN PERMITS AND PAY ALL FEES REQUIRED BY NYC DEPARTMENT OF BUILDINGS AND ANY OTHER AUTHORITIES HAVING JURISDICTION.
10. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO INSURE THE SAFETY OF THE PUBLIC, WORKMEN, VEHICLES, EXISTING STRUCTURES AND OCCUPANTS OF THE BUILDING.
11. A LICENSED ELECTRICIAN SHALL PERFORM ANY AND ALL ELECTRICAL WORK IN ACCORDANCE WITH NY STATE ELECTRICAL CODE AND NBFU CODE AND SHALL REGISTER SAID WORK WITH NY STATE DEPARTMENT OF WATER, GAS, AND ELECTRICITY. PRIOR TO FINAL PAYMENT TO THE BUILDER, A COMPLETION CERTIFICATE SHALL BE ISSUED TO THE OWNER.
12. ANY AND ALL PLUMBING WORK SHALL PERFORMED BY A LICENSED PLUMBER WHO IS RESPONSIBLE FOR FILING ALL WORK THAT IS TO BE PERFORMED.
13. REFER TO THE PROJECT MANUAL'S SECTION FOR ADDITIONAL NOTES AND CONDITIONS. THE SUBMISSION OF THE CONTRACTOR'S BID IMPLIES THAT ALL DRAWINGS, SPECIFICATIONS, AND NOTES HAVE BEEN READ, UNDER-STOOD AND INCORPORATED AS PART OF THE BID AMOUNT WITH ALL ITS PREREQUISITES AND TERMS. ALL STRUCTURAL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE STRUCTURAL ENGINEER AND NY STATE BUILDING CODE REQUIREMENTS.

TENANT SAFETY NOTES

1. CONSTRUCTION WORK SHELL BE CONFINED TO THE BUILDING EXTERIOR AND WILL NOT CREATE DUST, DIRT, OR OTHER SUCH INCONVENIENCES TO OTHER APARTMENT UNITS WITHIN THE BUILDINGS OR ADJACENT PROPERTY (S) IN ALL MAJOR AREA (S) OF WORK.
2. CONSTRUCTION OPERATING WILL NOT BLOCK HALLWAY OR MEANS OF ACCESS FOR TENANTS OF THE BUILDINGS.
3. CONSTRUCTION OPERATING WILL NOT INVOLVE INTERRUPTION OF HEATING, WATER, OR ELECTRICAL SERVICE TO THE TENANTS IF BUILDINGS.
4. CONSTRUCTION OPERATING WILL BE CONFINED TO NORMAL WORKING HOURS: 8:00AM TO 5:00PM, MONDAY TO FRIDAY, EXCEPT LEGAL HOLIDAYS.
5. ALL WORKERS SHALL CONFORM TO HOUSE RULES.

PROPERTY DATA

ADDRESS:	340 8TH AVE
BOROUGH:	MANHATTAN
BLOCK:	777
LOT:	18
LOT AREA:	59,350 SF
LOT FRONTAGE:	406.8'
LOT DEPTH:	197.5'
YEAR BUILT:	1971
NUMBER OF FLOORS:	10
LAND USE:	EDUCATIONAL (W1)

SPECIAL/PROGRESS INSPECTIONS (NYC BC 2022)		
CONTROLLED/SPECIAL INSPECTIONS	CODE/ SECTION	REPORTS REQ'D
STRUCTURAL STEEL-DETAILS	BC 1705.2.2 (2022)	TR-1
STRUCTURAL STEEL-HIGH STRENGTH BOLTING	BC 1705.2.3	TR-1
STRUCTURAL STEEL-WELDING	BC 1705.2.1	TR-1
FINAL INSPECTION	28-116.2.4.2, NYC BC 110.5 DIRECTIVE 14 (1975)AND 1RCNY § 101-10	TR-1

CONTROLLED/SPECIAL/PROGRESS INSPECTIONS (NYC BC 2022)		
CONTROLLED/SPECIAL INSPECTIONS	CODE/SECTION	REPORTS REQ'D
FINAL INSPECTION	NYC BC 109.5/ DIRECTIVE 14 (1975)	TR-1

ZONING NOTES

ZONING MAP:	8D
ZONING DISTRICT:	C6-2
COMMERCIAL OVERLAY:	NONE
SPECIAL DISTRICT:	NONE

DRAWING INDEX

T-100 COVER SHEET
A-001 AREA OF WORK
A-002 EXISTING STEEL FRAME
A-003 PROPOSED STEEL FRAME
A-004 CONNECTION DETAILS

STRUCTURAL STEEL NOTES:

1. STRUCTURAL STEEL HAS BEEN DESIGNED IN ACCORDANCE WITH THE NYC. BUILDING CODE. ALL STEEL TO BE ASTM A992 HAVING A MINIMUM YIELD OF 50,000 PSI U.O.N. ALL STEEL TO BE DOMESTIC ONLY.
2. AISC SPECIFICATIONS FOR "ALLOWABLE STRESS DESIGN (ASD) FOR STRUCTURAL STEEL IN BUILDINGS" - LATEST EDITION SHALL APPLY, EXCEPT AS MODIFIED BY THE NOTES, SCHEDULES AND DETAILS SHOWN ON THE STRUCTURAL DRAWINGS OR ANY RESTRICTIVE REQUIREMENTS OF THE BUILDING CODE. ALL LATERAL CONNECTIONS SHOWN ON S-100'S ARE DESIGNED USING "ALLOWABLE STRESS DESIGN".
3. THE FRAME SHALL BE CARRIED UP TRUE AND PLUMB AND TEMPORARY BRACING SHALL BE INTRODUCED WHEREVER NECESSARY TO TAKE CARE OF ALL LOADS TO WHICH THE STRUCTURE MAY BE SUBJECTED, INCLUDING EQUIPMENT AND OPERATION OF SAME SUCH BRACING SHALL BE THE RESPONSIBILITY OF THE STEEL CONTRACTOR AND SHALL BE LEFT IN PLACE AS LONG AS REQUIRED FOR SAFETY.
4. ALL CONNECTIONS SHALL BE IN ACCORDANCE WITH AISC SPECIFICATIONS.
5. ALL WELDED CONNECTIONS SHALL CONFORM TO THE NEW YORK CITY BUILDING CODE. PROVISIONS SHALL BE MADE FOR FIELD INSPECTION AND TESTING OF WELDS. ALL SHOP WELDS SHALL BE TESTED BY ANY OF APPROVED METHODS AND SHALL BE CERTIFIED.
6. ALL BOLT STEEL SHALL CONFORM TO THE FOLLOWING ASTM DESIGNATIONS, LATEST EDITION: HIGH STRENGTH TENSION CONTROL BOLTS A-325 AND A-490, U.O.N.
7. ALL BOLTS SHALL BE 3/4" XX FI XX MINIMUM ON HOLES 13/16" UNLESS OTHERWISE SHOWN ON THE DRAWINGS.
8. ALL SHOP CONNECTIONS SHALL BE HIGH STRENGTH BOLTED OR WELDED.
9. ALL COLUMN SPLICES, CONNECTIONS OF BEAMS TO COLUMNS, CONNECTION WITHIN THREE FEET OF COLUMNS, CONNECTIONS OF OR TO DIAGONAL MEMBERS, AND ALL BEAMS CARRYING MACHINE LOADS SHALL BE HIGH STRENGTH SUP CRITICAL CONNECTIONS.
10. IN ADDITION TO MOMENT CONNECTION, PROVIDE AISC STANDARD SHEAR CONNECTIONS FOR ALL GRAVITY AND WIND LOADS AS SHOWN IN THE TYPICAL SHEAR CONNECTION DETAILS.
11. ALL SHEAR CONNECTORS SHALL BE XX 3/4 FI XX HEADED STUDS AND 4 7/8" LONG.
12. ALL ENDS OF COLUMNS AT SPLICES AND ALL OTHER BEARING CONNECTIONS SHALL BE MILLED TO COMPLETE TRUE BEARING.
13. PROVISIONS SHALL BE MADE FOR CONNECTIONS OF OTHER TRADES INCLUDING CUTTING AND PUNCHING OF STRUCTURAL MEMBERS, WHERE REQUIRED BY THE DRAWING OR BY INFORMATION FURNISHED PRIOR TO FABRICATION. ALL TRADES APPLYING POINT LOADS TO STRUCTURE MUST SUBMIT LOAD AND LOCATION TO ENGINEER OF RECORD FOR REVIEW
14. THE USE OF A CUTTING TORCH IN THE FIELD WILL NOT BE PERMITTED.
15. WELDING ELECTRODES SHALL CONFORM TO THE E70XX CLASSIFICATION OF THE AMERICAN WELDING SOCIETY.
16. CONTRACTOR SHALL PROVIDE STIFFENERS PER CHAPTER K OF AISC SPECIFICATION (LRFD). FOR THE NON SEISMIC CONDITIONS.
17. ALL WELDERS SHALL BE LICENSED BY THE STATE OF NEW YORK
18. AREAS OF STRUCTURAL STEEL LEFT UNPAINTED TO ALLOW FOR WELDING OR BOLTING, SHALL RECEIVE A FIELD APPLICATION OF METAL PROTECTION.
19. STRUCTURAL STEEL THAT WILL REMAIN EXPOSED TO VIEW SHALL RECEIVE AN ADDITIONAL COAT OF METAL PROTECTION, OF ANOTHER COLOR, AFTER ERECTION.
20. MISC. METAL CONTRACTOR TO SURVEY IN PLACE STRUCTURAL STEEL PRIOR TO DEVELOPING SHOP DWGS. AND FABRICATING.
21. ALL EXPOSED STEEL, INCLUDING BUT NOT LIMITED TO LINTELS. DUNNAGE AND ROOF ENCLOSURES EXPOSED TO THE WEATHER AND STRUCTURAL TUBES PARTIALLY OR FULLY EMBEDDED IN THE EXTERIOR WALL MUST BE HOT DIPPED GALVANIZED INDICATE SUCH ON SHOP DWGS.
22. STRUCTURAL STEEL FABRICATOR TO SUBMIT QUALIFICATIONS OF DETAILER WHO MUST HAVE A MINIMUM EXPERIENCE OF FIVE YEARS AND BE LICENSED IN THE STATE OF NY. THE ENGINEER OF RECORD RESERVES THE RIGHT TO REJECT THE SUBMITTED DETAILER IF THEIR QUALIFICATIONS DO NOT MEET THE REQUIRED MINIMUM.
23. STRUCTURAL STEEL FABRICATOR TO SUBMIT SIGNED SEALED BY NYSPE CALCULATIONS OF ALL CONNECTIONS, TYPICAL AND OTHERWISE, PRIOR TO SUBMITTING SHOP DWGS. ALLOW TWOWEEKS FOR REVIEW.
24. ALL CONTRACTORS PER CONTRACT ARE REQUIRED TO COORDINATE THEIR TRADE WITH ALL CONTRACT DWGS.
25. PROVIDE STRUCTURAL STEEL SIZES SHOWN ON PLAN. IF NOT AVAILABLE SIZE MUST BE MANUFACTURED BY EQUIVALENT PLATES AND FULL PEN WELDS AT NO ADDITIONAL COST TO OWNER.
26. STEEL FABRICATOR AND DETAILER TO BE CERTIFIED BY AISCS.

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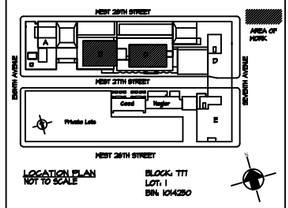

LOCATION PLAN NOT TO SCALE
BLOCK: 777
LOT: 1
BIN: 1014250

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New York, NY 10001

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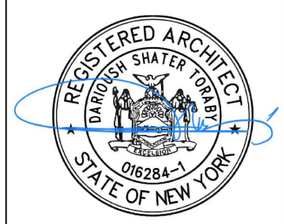


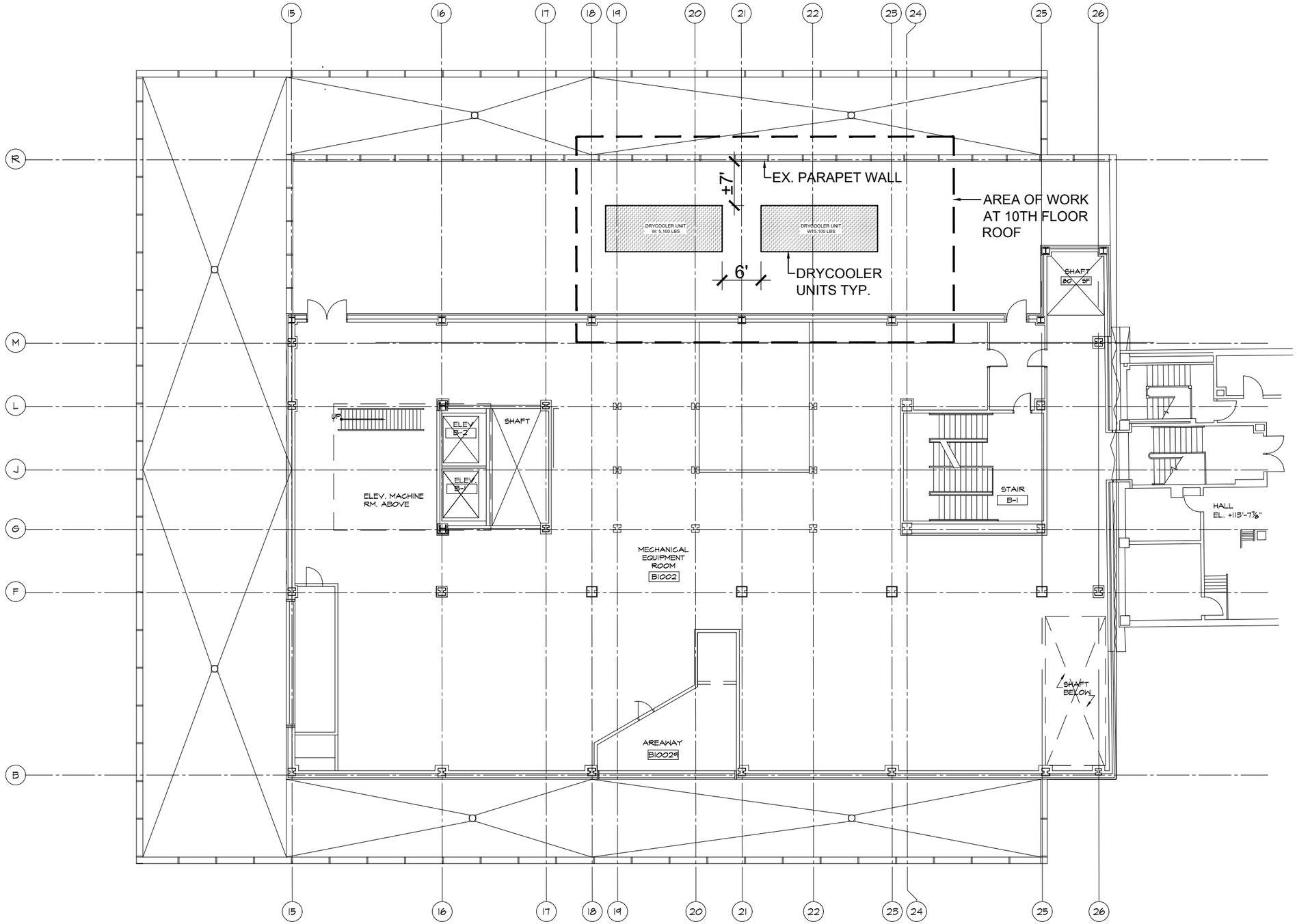
PROJECT:
340 8TH AVENUE
NEW YORK, NY 10001
NEW WATER SIDE ECONOMIZER

C1672

DRAWING TITLE:
COVER SHEET

DOB #:

DATE:	04/01/2025
PROJECT No:	8969.63
DRAWING BY:	R.M
CHK BY:	D.T
DWG No:	T-100.00
SCALE:AS NOTED	1 OF 5



1 / A-001 ACADEMIC TENTH FLOOR PAN

1/16" = 1'-0"

NOTES:
1. GC TO VERIFY ALL FIELD DIMENSIONS & REPORT ANY DISCREPANCIES
2. STEEL SHOP DRAWINGS TO BE PROVIDED FOR APPROVAL BY PE.

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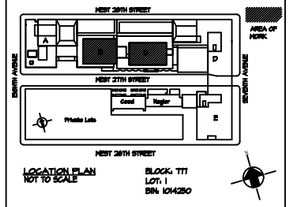

LOCATION PLAN NOT TO SCALE

BLOCK: 771
LOT: 1
BIN: 1014250

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SEAL & SIGNATURE:

REGISTERED ARCHITECT
DARIUSH SHATER TORABY
016284-1
STATE OF NEW YORK

PROJECT:
340 8TH AVENUE
NEW YORK, NY 10001
NEW WATER SIDE ECONOMIZER

C1672

DRAWING TITLE:
AREA OF WORK

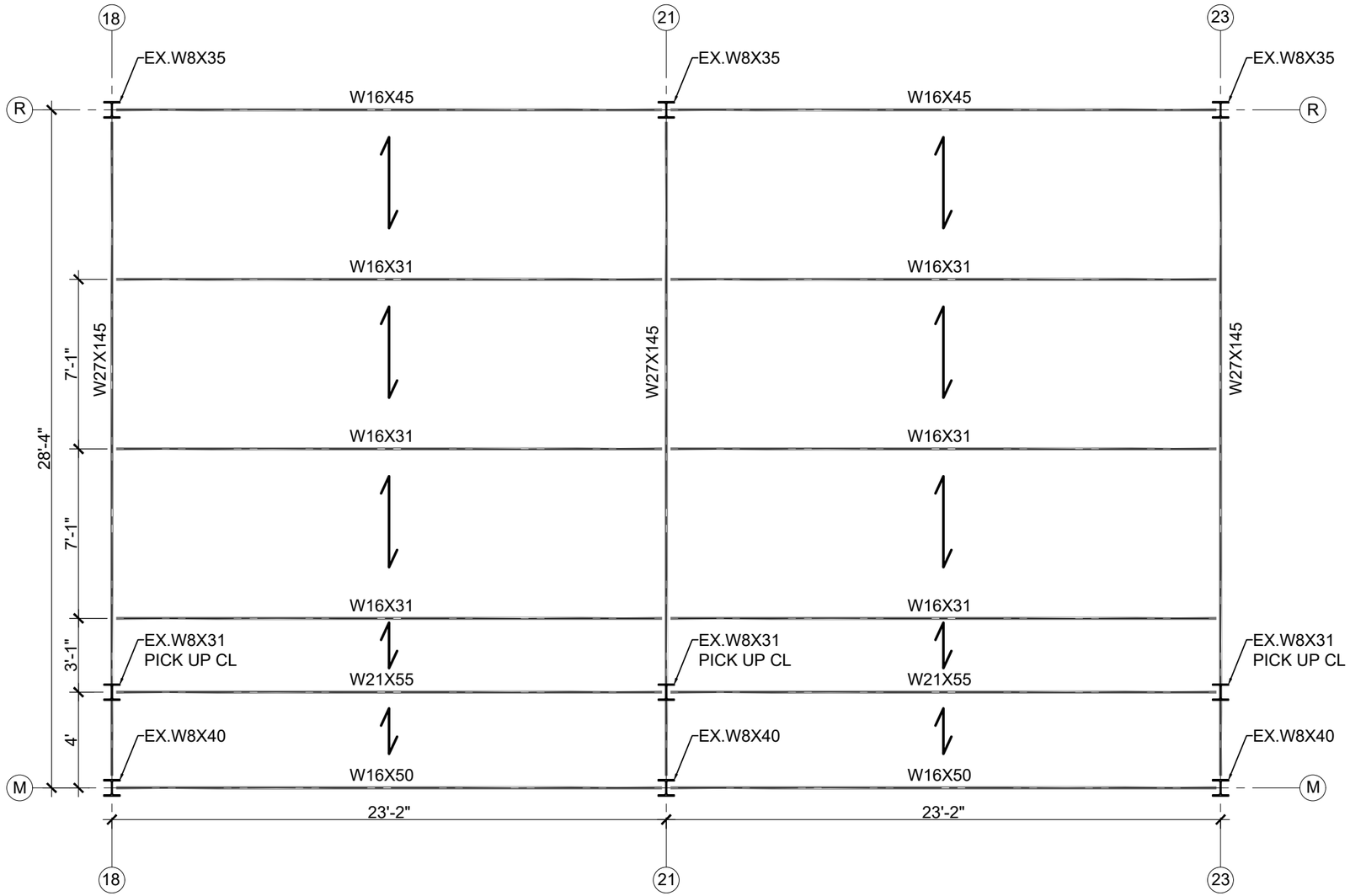
DOB #:

DATE:	04/01/2025
PROJECT No:	8969.63
DRAWING BY:	R.M
CHK BY:	D.T
DWG No:	A-001.00
SCALE:	AS NOTED

KEY:

EXISTING UNIT

EX. STEEL FRAME



1 / A-002 ROOF PLAN OF EXISTING STEEL FRAME

3/16" = 1'-0"

NOTES:
1. GC TO VERIFY ALL FIELD DIMENSIONS & REPORT ANY DISCREPANCIES
2. STEEL SHOP DRAWINGS TO BE PROVIDED FOR APPROVAL BY PE.

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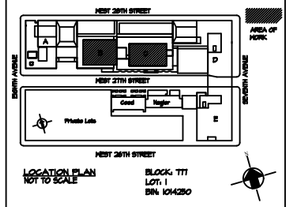

LOCATION PLAN NOT TO SCALE

BLOCK: 777
LOT: 1
BIN: 1014250

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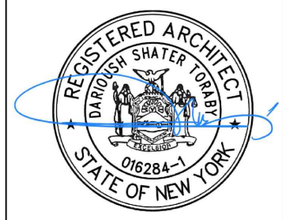


PROJECT:
340 8TH AVENUE
NEW YORK, NY 10001
NEW WATER SIDE ECONOMIZER

C1672

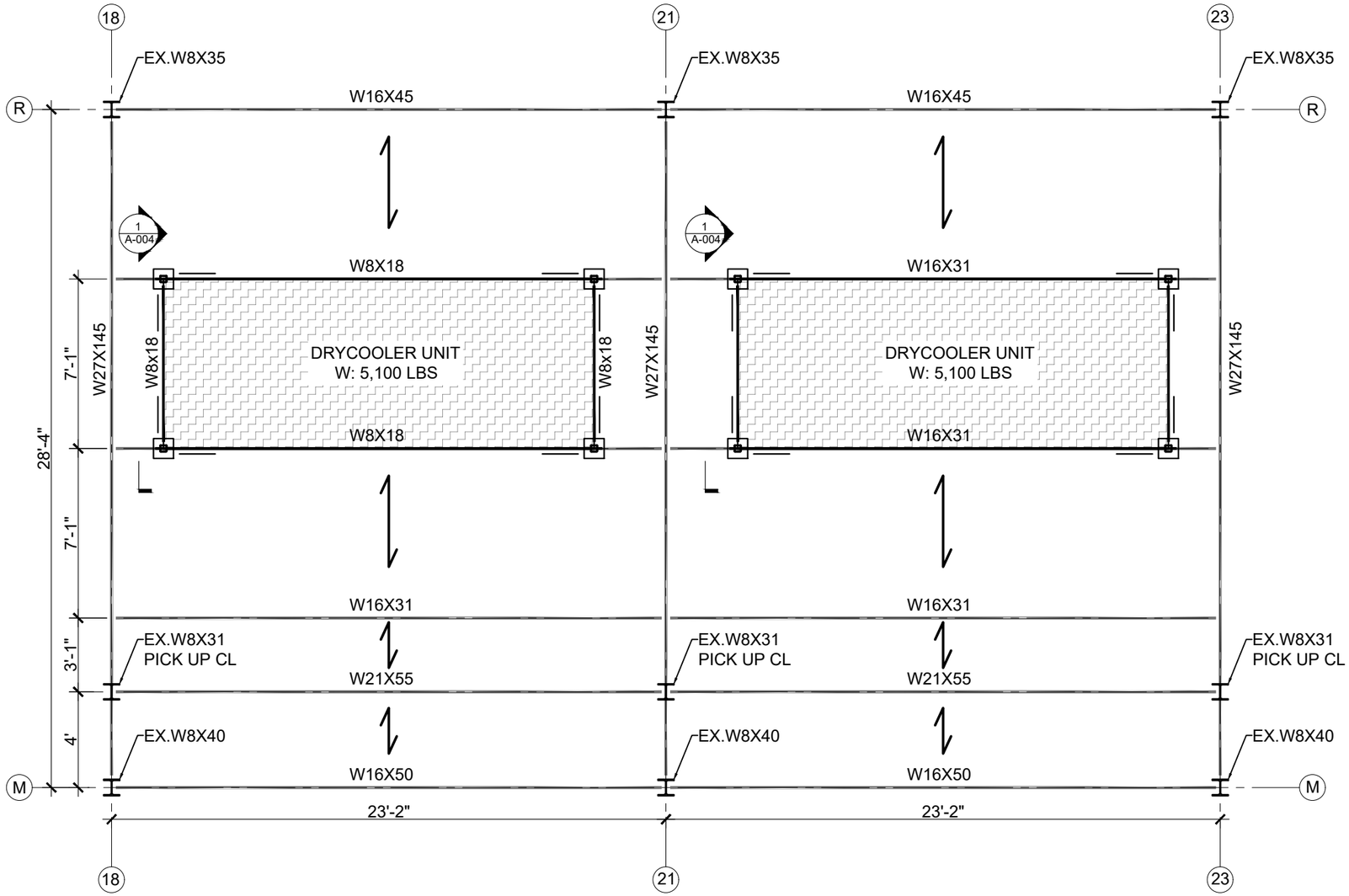
DRAWING TITLE:
EXISTING STEEL FRAME

DOB #:

DATE:	04/01/2025
PROJECT No:	8969.63
DRAWING BY:	R.M
CHK BY:	D.T
DWG No:	A-002.00
SCALE:	AS NOTED

KEY:

- PROPOSED UNIT
- PROPOSED STEEL FRAME
- HSS 4X4X$\frac{5}{16}$" POST TYP.
- EX. STEEL FRAME



1 / A-002 ROOF PLAN OF PROPOSED STEEL FRAME

3/16" = 1'-0"

NOTES:

1. GC TO VERIFY ALL FIELD DIMENSIONS & REPORT ANY DISCREPANCIES
2. STEEL SHOP DRAWINGS TO BE PROVIDED FOR APPROVAL BY PE.

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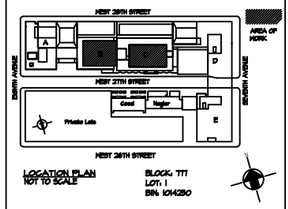

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SEAL & SIGNATURE:

REGISTERED ARCHITECT
DARIUSH SHATER TORABY
016284-1
STATE OF NEW YORK

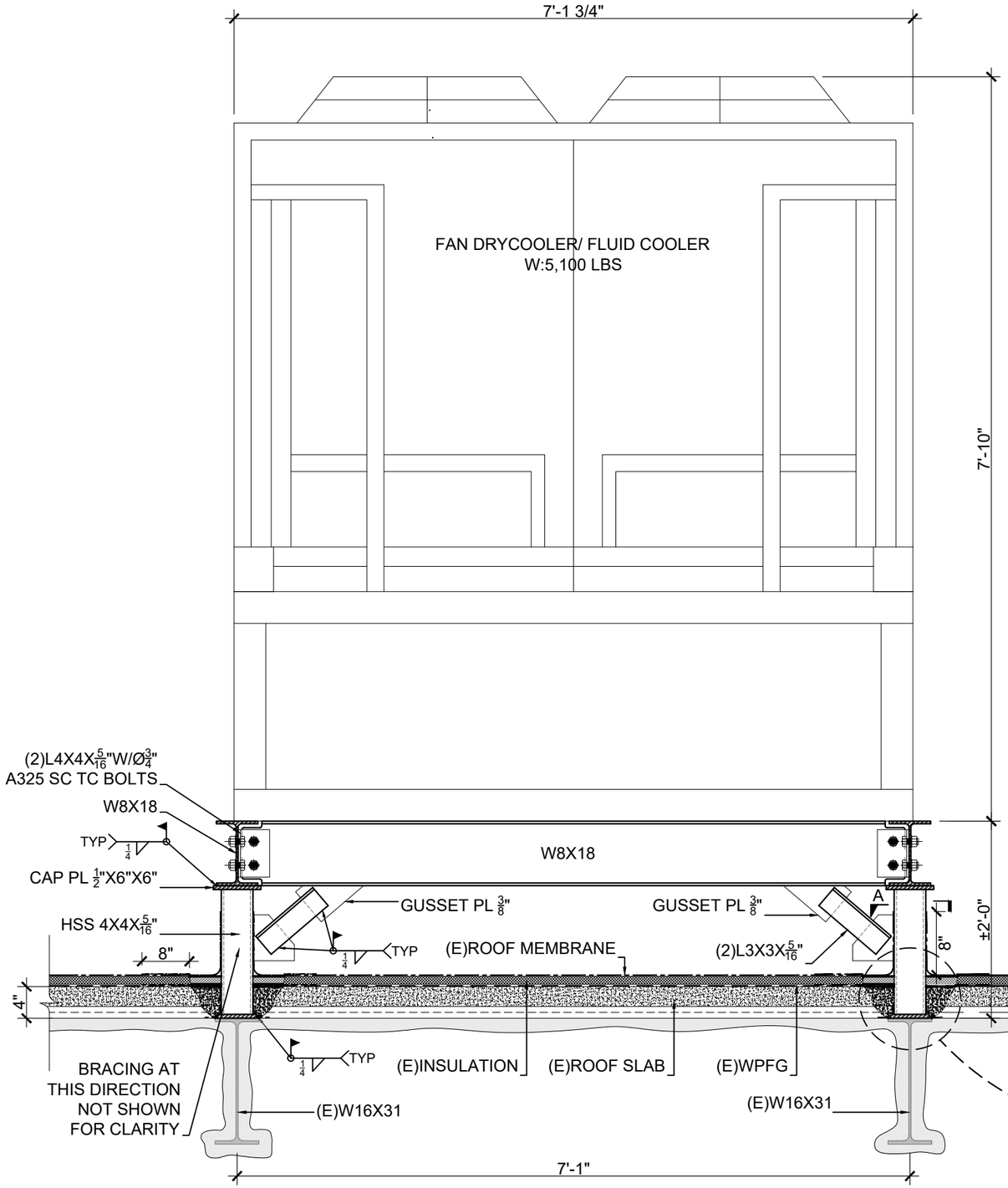
PROJECT:
340 8TH AVENUE
NEW YORK, NY 10001
NEW WATER SIDE ECONOMIZER

C1672

DRAWING TITLE:
PROPOSED STEEL FRAME

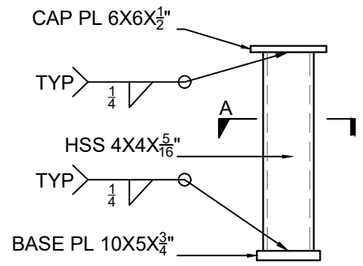
DOB #:

DATE:	04/01/2025
PROJECT No:	8969.63
DRAWING BY:	R.M
CHK BY:	D.T
DWG No:	A-003.00
SCALE:	AS NOTED



1 / A-004 SECTION AT PROPOSED STEEL DUNNAGE

3/4" = 1'-0"



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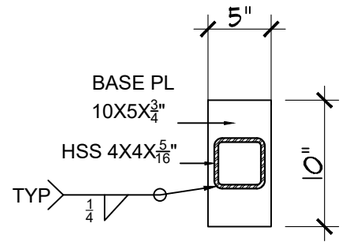
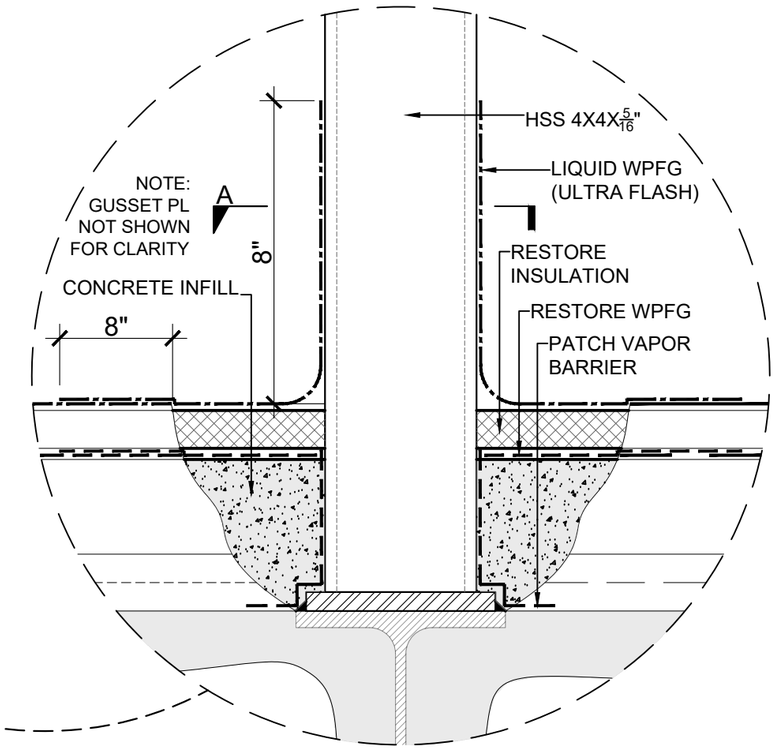


SECTION A



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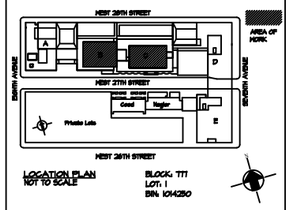

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SEAL & SIGNATURE:

REGISTERED ARCHITECT
DARIOUSH SHATER TORABY
016284-1
STATE OF NEW YORK

PROJECT:
340 8TH AVENUE
NEW YORK, NY 10001
NEW WATER SIDE ECONOMIZER

C1672

DRAWING TITLE:
CONNECTION DETAILS

DOB #:

DATE:	04/01/2025
PROJECT No:	8969.63
DRAWING BY:	R.M
CHK BY:	D.T
DWG No:	A-004.00
SCALE:AS NOTED	5 OF 5