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NOTICE TO ALL FIRMS

Date: January 24, 2025

To: All Prospective Bidders

From: Sam Li
Director of Procurement Services

Re: Addendum Number 3
IFB # C1651 – Haft Theater Renovations

Summary

1) **The hold on this project has been released.**
2) **The bid due date for this project is now February 3, 2025, 12:00 PM. We must receive the bids on or before February 3, 2025, 12:00 PM**
3) Addendum #3 for bid C1651 responds to bidder questions, coordinates work amongst all design disciplines and provides clarity to scope lacking clear definition of work. All drawing modifications are clouded accordingly, and all modified specifications are highlighted in the table of contents. (See updated specifications and drawings)
4) Addendum #3 also includes a revised Attachment C: Bid Analysis Form with a separate line for finishes, and both alternates. Please complete and submit this updated form with your bid.
5) All contractors must comply with New York State Labor Law Section 220-I and submit their NYS DOL Certificate of Contractor Registration with their bid.

Questions

Q1. Kindly provide the Bid Bond Form.

A1. If you are referring to a Bid Bond Form, we don't provide this form. Your bonding company should have their own bid bond form.

Q2. Are there any liquidated damages on this project?

A2. There is no liquidated damage for this project.

Q3. Material hoist option(s) to 3rd floor dressing rooms, appears steps only?

A3. Hoist are acceptable. Material can be loaded from the first floor lobby, through corridor D294, into the auditorium and up the ramp on house right to the stage.

Q4. Please confirm the subfloor of the dressing rooms is concrete?

A4. Confirmed.

Q5. Will 3rd floor dressing rooms be one mobilization? Rubber Base in Projection Room same mobilization?

A5. All work in C1651 shall be in one phase. GC shall determine critical path method chart.

Q6. Rubber Base at 2nd floor Lobby Millwork (Add alternate #1) See A.803.00, one mobilization?

A6. All work within the Second Floor Lobby (C214), Restroom 1 (C214A), Restroom 2 (C214B), ADA Restroom (C216B), and stair (directly connected to the lobby) shall be part of Add-Alternate #1. All other work outside the delineated area shall be part of base bid.

Q7. We respectfully request a 3-week extension from the current bid date. This is required to allow for additional time to compile an accurate and reasonable bid and for our vendor to develop accurate quotations.

A7. Two-week extension was provided in Addendum #1. Unless otherwise noted, there will be no further extension.

Q8. RFI: Section 9 "Information Tech Systems" – labor and material costs, I don't see a bid section for specs on this. Please advise.

A8. GC to refer to TE series drawings and specifications. Addendum #2 includes the following additions

a. Specification Sections 27 00 05, 27 05 26, 27 15 10, 28 00 05, 28 05 13, & 28 13 07
b. Drawings TE601.00 Telecommunication Details & TE602.00 Telecom Details

Q9. RFI: BOM AV SECTION –

Q9a. Owner furnished Shure Wireless microphone receiver, qty. 3 – Can you please provide the Model #?

Q9b. Auditorium Portable Equipment, patch cables, "contractor nominated" – do you have a list of acceptable mfgs?

Q9c. Microphone, Stands & Accessory Allowance - $5000, contractor nominated" – are you just asking the vendor to put in a cost line here of $5K? Can you please clarify the ask here?

Q9d. There is no projection screen in BOM. The spec section and drawings calls for providing a projection screen (See highlighted item below), but there is no projection screen specs, size or or model # in the AV BOM. "Draper StageScreen" is a series. Can you please clarify.

RFI: AV SPEC SECTION

Performance Video Projection System – **A fixed-frame batten-mounted projection screen** and video projector shall be provided for presentation use. To accommodate the flexible video deployment as required per production or event, connection points for coaxial and category cable (AVoverIP) video are provided throughout the space, with specific connectivity for presentation positions from the stage.

Basis of design manufacturers can include:

- o Projector – Christie 4k, 20,000 lumens
- o **Screen – Draper StageScreen**

A9a. Shure ULX-D Quad Receivers (x3) in their H50 band. "ULXD4QH50"

A9b. Approved manufacturers for wire and cable listed in 274116 Part 2.1E: 1. Approved manufacturers:

a. Belden
b. Berk-Tek
c. Liberty
d. Crestron
e. Extron
f. West-Penn

All other equipment shall be selected by the contractor in accordance with 274116 Part 1.10C, Shop Drawing Submittals.

A9c. The vendor shall include a line cost of $5000, with exact equipment to be selected with input from FIT and audiovisual designer.

A9d. TA series plans updated to include projector screen from a line set. 274116 Schedule A revised to show specifications for projector screen.

Q10. Please provide imagery of the site that we're not shown to contractors during the walkthrough.

A10. *Click here to access Openspace* to see portions of the project captured with 360 cameras. The content of the scans are for general information only as they represents portions of the site and not the project in its entirety.

Q11. Provide a detailed phasing and logistic plan for this project we will need to price.

A11. This project does not include phasing.

Q12. Who is building FA Vendor?

A12. **High Rise Fire Protection Corp.** Fire Alarm Vendor
Fatmir Isakoski Assoc. PM fisakoski@highrisefire.com (C) 1 917 685 3965 (O) 1-718-369-3434

Q13. Who is building BMS vendor?

A13. **ADVANTEX Solutions** BMS Vendor
Giovanni Natale gnatale@advantexsolutions.com. (C) 917-682-2521 (O) 718-278-2290
See section 230900.1 & 230901 for more information.

Q14. Please provide contact information of all required or preferred building vendors or build system vendors.

A14. Refer to project manual for preferred vendors not listed in the addendum.

Q15. Provide responsibility matrix of all lighting fixtures, AV systems, theater equipment, general equipment.

A15. For AV equipment, See 27 41 16 Schedule A. For theatrical equipment & lighting fixtures, refer to drawings.

Q16. Hardware sets are missing from door schedule. Please provide.

A16. See Section 08 87 00 for door hardware.

Q17. Why is providing a list of qualifications with our bid grounds for possible disqualification? Qualifying or better put clarifying ones bid provides a way to communicate how we have formulated our proposal giving you a better understanding and re-assurance our interpretation of the bid documentation. Is qualifying/clarifying ones proposal 100% grounds for disqualification?

A17. Please provide only the items that are requested in the bid. If your firm happens to be the lowest bidder, we will review your bid for completeness and request clarification if needed.

Q18. Does FIT have a vendor that it already uses for its rigging or stage servicing etc?

A18. Refer to section 11 61 33 for pre-approved stage rigging manufactures.

Q19. Work hours? Regular / Overtime hours?

A19. See section 06 00 00 and Section 01 10 00 for work hours and noisy work during Overtime, including, but not limited to core drilling and pencil rod installation for ceiling framing. Deliveries shall be coordinated with owner at start of the work day.

Q20. Duct Cleaning. Please confirm the exact scope of ductwork to be cleaned as the spec/drawings are not clear. If the ductwork to be cleaned is not shown on the drawings and called out specifically on drawing notes, please advise sq. ft. of ductwork to be utilized for bidding estimation purposes.

A20. No duct cleaning required.

Q21. Controls / BMS? Any Controls vendor specified / existing BMS vendor? None specified in specs.

A21. See specifications 230900.1 for Automatic Temperature Control Electric & Section 230901 for Building Automation System. See Q13 for contact.

Q22. Temporary Heat. Please confirm if temporary heating & cooling required during construction period?

A22. None.

Q23. Existing Equipment. Please provide existing equipment schedule for service & repair?

A23. No existing equipment to be serviced.

Q24. The Christie projector specified on the BOM is EOL and will no longer be available to order by the time this bid is awarded. The Christie 4K22A-HS is being replaced with the Christie 4K2100A-JS. Can the architect review and advise if this replacement is acceptable, or if they want to specify another brand and/or model?

A24. Acceptable replacement. See revised schedule A in section 274116.

Q25. Some of our subcontractors would like to see the Level 3M Mezzanine for this project. Please advise if a second-walk through is possible.

A25. As stated in Section 06 00 00, Section II. Sub-Section VI. Pre-Bid Site Inspection and Questions, "We highly encourage the Bidder to invite their sub-contractors as this will be the one and only site visit prior to awarding the project."

Q26. We need further clarification regarding the Liquidated Damages. We need to provide clearer information to our bonding company.

A26. There are no liquidated damages.

Q27. There are no hardware sets called out on the hardware schedule.
Also, we don’t have any plumbing drawings. Will plumbing be required for this project?”

A27. Refer to specification section 087000 for hardware specifications.

Q28. Drawings indicate that 2nd floor lobby and 3 public restrooms shall be part of Add Alternate 1 and even the tagged keynote confirms that. However in specifications under section 012300 - Alternates, the schedule of alternate calls for outlined part on drawing A.102 which is same as the 2nd floor lobby and restroom to be the part of base bid and Alternate 1 is related to mechanical, electrical, plumbing and audiovisual system. Please confirm if the finishes scope is to be broken between base bid and Alternate 1 or is the entire finishes scope including the alternate areas to be included in the base bid?

A.28. As highlighted on A.102.00, All scope within 2nd floor lobby, (3) public restrooms, and adjacent stair shall be part of add alternate #1, including, but not limited to all mechanical, plumbing, electrical, fire alarm, audio visual and IT work within and serving this area. In the base bid, all work within the outline remains in its current condition and is not part of the scope of work.

Q29. Self Level Underlayment is required for all new LVT-1, please advise.

A29. Provide 1/4" of underlayment for level surface. See finish schedule A.900.00

Q30. Drawing A900.00 for RB-01 Rubber Base; Comments Column Straight profile. See section 096513-2 para 2.1B.1b. Please advise if cove for this bid scope.

A30. See revised finish schedule for RB-01, RB-02, RB-03, & RB-04. Straight and cove are applicable.

Q31. Attachment C Bid Analysis Form required with bid?

A31. Yes, required for complete bid.

Q32. Attachment C Bid Analysis Form, Which line(s) will be for; Flooring LVT-01? Rubber Base RB-01? Self Level Underlayment?

A32. See revised bid form in Section 00 60 00 Invitation to Bid. Line 7 FINISHES was added for all Division 09 finishes.

Q33. Please advise us if the Railroad Protective Liability Insurance is required for either solicitation.

A33. Railroad Protective Liability Insurance is not required for this solicitation.

Q34. We were looking at the drawings for this project to determine if we will make a bid and noticed that the plumbing drawings do not show a riser diagram. Can you provide the domestic water and Sanitary Riser diagram for the plumbing drawings?

A34. The information is on the plans and specifications. The diagram will be added if the AHJ requires it.

Q35. Could you please confirm if there are any specific MWBE requirements or goals associated with this project?

A35. 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."

Q36. Door schedule and specs do not specify hardware sets. Please provide specs.

A36. Addendum #2 clarifies the hardware sets on A.800.00. See revised specification sections 080671 "door hardware schedule", 081113 "hollow metal doors and frames", and 087100 "door hardware" for additional information.

Q37. What are the M/WBE-SDVOB utilization goals for this project?

A37. See answer to Q35.

Q38. Please confirm project start/finish dates. Specs indicate ~3 months to accomplish the entirety of this project, which seems untenable and/or extraordinarily expensive.

A38. The milestones are as follows:

Tuesday, July 1st, 2025: GC Mobilization
Friday, September 26th, 2025: Substantial Completion
Friday, October 10th, 2025: Final Completion & demobilization

The start date is fixed and the contractor may submit schedule extensions in writing for ownership to evaluate.

Q39. Please specify liquidated damages/day amount for schedule overrun.

A39. See answer to Q2.

Q40. Please verify the 35% maximum subcontracting requirement listed on Attachment 'A.' I doubt 35% is achievable by 99% of contractors, given the MEP trades' scopes.

A40. Per Addendum #1, The subcontracting limit for this project has increased from 35% to 80%.

Q41. Confirm LRP-01 as a mains fed panel with 100A MCB or feed through panel requiring both normal and emergency discrete feeds.

A41. There is no LRP on this project per plans and device schedule. See addendum sheets for schedule and one line revisions. LCP-01 is a mains fed panel. Reuse existing normal/emergency feeds from DRd system. Disregard feed-through language on one line diagram.

Q42. Reference 116113-15: Verify if Type LCC: ETC Ion XE 20 Theatrical Lighting Control Console is 12K or 2K.

A42. Provide Ion XE 12K

Q43. QT1.03 indicates ET12 as 1-RJ45 not 2-Network receptacles per QT5.02. Verify quantity of receptacles.

A43. ET12 should be a single RJ45 connection per QT1.03. Disregard note on schedule in QT5.02

Q44. Confirm 116119 Add Alternate requires (4) GTW2 with white finish per QT6.01. Confirm the base 116113 package requires (4) CD-EG2P with black finish per QT5.02/9.

A44. Quantities stated here are correct. Disregard white color note on QT6.01. All nodes to be black.

Q45. State required cable management for onstage theatrical lighting electrics as pantograph cable management devices per 116116-6/2.4A2 or multicable extensions noted on 116136-16/2.10.

A45. Provide Multicable extensions to match existing system.

Q46. Reference QT6.01 provide inventory for bidding purpose regarding PWR-EXT/ VIF CONVERT EXISTING NEMA L5-20 LOOSE CABLE TO NEMA 5-15 EDISON.

A46. Inventory unavailable. Provide $5000 allowance for loose cable conversion and refurbishment.

Q47. Confirm Ride Thru Kits are required on both LCP and LRP.

A47. Ride Thru Kit only required for LCP-01. Disregard LRP note in one line diagram.

Q48. The 116113-14/2.5-11. D.I.N. Enclosure containing the following: does not appear on QT documentation. Verify its requirements.

A48. Disregard section 116113.2.5. D.I.N. Enclosure not required.

Q49. Verify if the Overstage Electrics and BXBM-1 are requiring Edison connectors as flush mount duplex Edison receptacles or installed on 18” pigtails as both are required on QT5.01.

A49. Provide pigtails as shown in the details.

Q50. Are fixtures indicated at catwalk on EL103M existing to remain?

A50. Yes, Catwalk light fixtures are existing to remain

Q51. Are fixtures indicated at Loudspeaker and Organ Chamber existing to remain?

A51. Yes, light fixtures to remain.

Q52. Are the switches indicated on ED103M existing to remain?

A52. Yes, the switches are existing to remain.

Q53. Who is the existing Fire Alarm equipment manufacturer?

A53. Assume Edwards as basis of design. See Q12 for fire alarm vendor to further coordinate.

Q54. Who currently services the existing Fire Alarm system?

A54. See Q12 for fire alarm vendor.

Q56. Drawing ED-102 makes use of Alphabetical general notes but the general notes are blank on the right side of the drawing.

A56. Disregard general notes on this sheet. Refer to general demolition notes on cover sheet.

Q57. Drawing ED-103 makes use of Alphabetical general notes but the general notes are blank on the right side of the drawing.

A57. Disregard general notes on this sheet. Refer to general demolition notes on cover sheet.

Q58. Drawing ED-103M makes use of Alphabetical general notes but the general notes are blank on the right side of the drawing.

A58. Disregard general notes on this sheet. Refer to general demolition notes on cover sheet.

Q59. DSP is undersized, the max Dante from 110 is 32x32. A QSC Core 610 is recommended to be added.

A59. DSP is appropriately sized for the Audio System as designed. Dante is not needed for all channels of audio. The surround speakers are controlled through AES67, so the Left, Center, and Right channels are the primary outputs that will use Dante through the DSP. This places the number of inputs and outputs below 32, giving the user spare channels for future use.

Q60. Dante license 64x64 won't work on Core 110 – larger DSP is needed.

A60. License is updated to 32x32 in Addendum 3.

Q61. NO NVX Director in spec, which is 100% recommended.

A61. According to Crestron, NVX Director is intended for large, multi-venue installations. Given the robust SDI video distribution system and limited number of NVX endpoints in the system, it is not needed.

Q62. Flow drawings to not show all details of I/O, Make or Model. NOT 100% clear what is going on with the black magic switcher.

A62. Flow diagrams show design intent for the system. Audiovisual Contractor is responsible for creating shop drawings with exact I/O, Make and Model. Any questions regarding design intent should be sent as a separate RFI clearly showing which sheet(s) remain unclear.

Q62. The mixer cannot be controlled from the Crestron control processor.

A63. The drawings and specifications do not state that the mixer shall be controlled from the control processor. No automixing system shall be used in this space.

Q64. No volume control is included in the various rooms.

A64. All rooms with backstage monitoring include a CP1V device for volume control. See TA102.00, TA103.00, and TA103M.00 for exact placement.

Q65. There is no specification for the quantity of custom plates.

A65. Custom plates shall be furnished for the total number of devices of each type are included in the plans. See TA102.00, TA103.00, and TA103M.00 for exact quantity and placement. Details about connectors and layout can be found on TA65x.00 series drawings.

Q66. Elevations on sheet A.201 and A.202 shows WT-02 wall base at tiled walls. However, no tile base given in finish schedule with WT-02 tag and also no detail for tile base in specifications. Please clarify if WT-02 tile base is to be installed at tiled walls along with its specs.

A66. WT-01 and WT-02 are the same tile. At areas called out WT-02, use WT-01 at 4" height.

Q67. On sheet A.201 enlarged plan for 2nd floor lobby, at Corridor C210 FT-01 is tagged at floor however, floor tile hatch is not shown unlike other FT-01 locations. Also in finish schedule FT-01 location is shown to be restroom only. Please clarify if FT-01 is to be installed at Corridor C210 as well?

A67. No new finishes installed at Corridor C210. FT-01 is floor tile for restrooms C214A, C214B, & C216B.

Q68. Please confirm if WICKS is applicable on this project.

A68. WICKS Law does not apply to this project.

THIS ADDENDUM IS PART OF THE CONTRACT DOCUMENT AND SHALL BE INCLUDED WITH YOUR REQUEST FOR PROPOSAL SUBMITTAL. YOUR SIGNATURE BELOW WARRANTS THAT YOU UNDERSTAND THIS ADDENDUM AND THAT YOU HAVE MADE THE APPRORIATE ADJUSTMENTS IN YOUR PROPOSAL AND CALCULATIONS.

_____
Signature

_____
Print Name and Title of Authorized Representative

_____
Print Name of Company/Partnership/Individual

_____
Date

ATTACHMENT C – BID ANALYSIS FORM (Updated 1/24/2025)

FASHION INSTITUTE OF TECHNOLOGY
HAFT THEATER RENOVATIONS
INVITATION FOR BID NUMBER C1651
NYS PREVAILING WAGE SCHEDULE PRC # 2024015263

BID BREAKDOWN

Line	Description	Total Labor Cost	Total Materials, Tools & Equipment	Line Total
1	SELECTIVE DEMOLITION	$	$	$
2	MASONRY	$	$	$
3	CARPENTRY	$	$	$
4	DOORS	$	$	$
5	WINDOWS	$	$	$
6	STAIRS	$	$	$
7	FINISHES	$	$	$
8	THEATRICAL SYSTEMS	$	$	$
9	AUDIO VISUAL SYSTEMS	$	$	$
10	INFORMATION TECH. SYSTEMS	$	$	$
11	MECHANICAL	$	$	$
12	PLUMBING	$	$	$
13	ELECTRIC	$	$	$
14	FIRE ALARM	$	$	$
15	FIRE RESISTENT PROTECTION	$	$	$
16	GENERAL REQUIREMENTS	$	$	$
17	GENERAL CONDITIONS	$	$	$

ADD ALTERNATE 1 – PRICE **$_____**

ADD ALTERNATE 2 – PRICE **$_____**

TOTAL BID PRICE (1-17) (Do Not Include Add. Alt Price) **$_____**

As stated in Section IV of the front-end documents: Subcontracting shall be permitted not to exceed 80% 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: _____

Email Address: _____

Telephone:_____

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.

EXHIBIT C: SPECIFICATIONS

Addendum No. 3

DLRGROUP

ARCHITECTURE ENGINEERING PLANNING INTERIORS

FIT - HAFT THEATER - INTERIOR RENOVATIONS

FASHION INSTITUTE OF TECHNOLOGY

Project Manual

ISSUED FOR ADDENDUM #3 - C1651

DLR Group Project No. 57-23140-00

JANUARY 23, 2025

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Project Coordination
4. Work under Owner's separate contracts.
5. Access to site
6. Indoor air quality during construction
7. Coordination with occupants.
8. Work restrictions.
9. Specification and drawing conventions.
10. Correlation and intent of the contract documents
11. Miscellaneous provisions.
    a. Request for Interpretation
    b. Proposal Requests

1.3 PROJECT INFORMATION

A. Project Identification:

Fashion Institute of Technology
Haft Theater
New York, NY 10001

B. Owner

Fashion Institute of Technology
Haft Theater
New York, NY 10001

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Provide labor, materials, tests, tools and equipment to renovate supporting spaces of the Morris W. and Fannie B. Haft Theater ("Haft Theater"). These spaces include the 2nd floor lobby, public restrooms, dressing rooms, and performance space. Additionally, the project includes infrastructure upgrades to theatrical, audio visual, and information technology systems.

B. Type of Contract:

1. Project will be constructed a single Prime Contract. Contracts for this Project include the following:

a. Prime Contract, including general trades, electrical, mechanical, plumbing, and specialties including audiovisual, information technology and theatrical systems.

C. Prime Contractor: Work in the Prime Contract includes, but is not limited to, the following:

1. General trades work.
2. Interior finish work.
3. Mechanical work.
4. Electrical work.
5. Fire Alarm work.
6. Theatrical Systems
7. Audiovisual systems
8. Information Technology systems.
9. Selective demolition and cutting and patching not identified as work under other contracts.

D. Temporary facilities and controls in the General Trades Contract include, but are not limited to, the following:

1. Temporary facilities and controls that are not otherwise specifically assigned to the Electrical Contract.
2. Unpiped temporary toilet fixtures (if Owner's facilities are not available for use), wash facilities, and drinking water facilities, including disposable supplies.
3. General waste disposal facilities.
4. Barricades, warning signs, and lights.
5. Security enclosure and lockup.
6. Environmental protection.
7. Restoration of Owner's existing facilities used as temporary facilities.
8. Staging and scaffolding as needed.
9. Temporary heating, cooling and ventilation, including temporary connections.
10. Indoor air quality measures as identified below.

1.5 PROJECT COORDINATION

A. Prime Contractor coordination activities of Project include, but are not limited to, the following:

1. Provide overall coordination of the Work, including that of owner direct purchase contracts.
2. Coordinate compliance with FIT's fire safety requirements during construction.
3. Coordinate shared access to workspaces.
4. Coordinate product selections for compatibility.
5. Provide overall coordination of temporary facilities and controls.
6. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
7. Coordinate construction and operations of the Work with work performed by each Contract.
8. Coordinate sequencing and scheduling of the Work. Include the following:

    a. Initial Coordination Meeting: At earliest possible date, arrange and conduct a meeting with contractors for sequencing and coordinating the Work; negotiate reasonable adjustments to schedules.
    b. Prepare a combined contractors' construction schedule for entire Project. Base schedule on preliminary construction schedule. Secure time commitments for performing critical construction activities from contractors. Show activities of each contract on a separate sheet. Prepare a simplified summary sheet indicating combined construction activities of contracts.

        1) Submit schedules for approval.
        2) Distribute copies of approved schedules to contractors.

9. Provide photographic documentation.
10. Provide quality-assurance and quality-control services.
11. Coordinate sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections.
12. Provide information necessary to adjust, move, or relocate existing utility structures affected by construction.
13. Provide progress cleaning of common areas and coordinate progress cleaning of areas or pieces of equipment where more than one contractor has worked.
14. Coordinate cutting and patching.
15. Coordinate protection of the Work.
16. Coordinate firestopping.
17. Coordinate completion of interrelated punch list items.
18. Coordinate preparation of Project record documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
19. Print and submit record documents if installations by more than one contractor are indicated on the same contract drawing or shop drawing.
20. Collect record Specification Sections from contractors, collate Sections into numeric order, and submit complete set.
21. Coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.

B. Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of the Work. Each Contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Unless otherwise indicated, the work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
2. Blocking, backing panels, sleeves, and metal fabrication supports for the work of each contract shall be the work of each contract for its own work.
3. Furnishing of access panels for the work of each contract shall be the work of each contract for its own work. Installation of access panels shall be the work of each contract for its own work.
4. Painting for the work of each contract shall be the work of the General Construction Contract.
5. Cutting and Patching: Provided under each contract for its own work.
6. Through-penetration firestopping for the work of each contract shall be provided by each contract for its own work.

C. Temporary facilities and controls in the Prime Contractors Contract include, but are not limited to, the following:

1. Installation, operation, maintenance, and removal of each temporary facility necessary for its own normal construction activity, and costs and use charges associated with each facility, except as otherwise provided for in this Section.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Temporary enclosures for its own construction activities.
4. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.
5. Progress cleaning of work areas affected by its operations on a daily basis.
6. Secure lockup of its own tools, materials, and equipment.
7. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
8. FIT’s fire safety requirements during construction.

1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

B. Preceding Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations may be partially conducted simultaneously with Work under this Contract.

1. JVN Restoration - Asbestos Remediation at 2nd Floor lobby ceiling and pipe insulation

a. Charlie Tardy - charlie@jvnr.com

C. Concurrent Work: Owner will separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.

1. JVN Restoration – Asbestos Remediation at 2nd Floor Lobby doors during GC demolition

a. Charlie Tardy - charlie@jvnr.com

2. To be determined – Roof Renovation at Haft Theater Roof

a. Project scheduled for bidding in February 2025.

1.7 ACCESS TO SITE

A. Prime Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

1. 2nd Floor Theater will remain offline during the schedule as defined in Section 006000.
2. 1st Floor entry will remain open and will require separation
3. 2nd Floor Lobby will remain open and will require separation.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Connections to Electrical Equipment and Systems: Contractor is not permitted to tie into electrical equipment or systems until the FIT Facilities Management Department has reviewed and approved the connection.

1. Submit written procedures to the Owner’s Representative, detailing the proposed connection Work.
2. After procedures have been approved, notify the Owner’s Representative at least three working days prior to the connection Work so that arrangements can be made to have a FIT Facilities Management Department Representative witness the Work.

1.8 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas where work is being performed. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.9 INDOOR AIR QUALITY DURING CONSTRUCTION

A. Dust, odor, and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust, odor, and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Other dust and odor-control measures.

B. Filter Replacement: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system.

C. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

2. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
3. Protect air-handling equipment.
4. Provide walk-off mats at each entrance through temporary partition if Owner will occupy all or part of premises during construction. Revise to suit Project. See the Evaluations.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: As indicated in Owner's General Requirements.

1. Unless noted otherwise, Work is to be performed between the hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, legal and union holidays excluded.
2. Major mobilization if required is to be performed at night, between the hours of 9:00 p.m. to 6:00 a.m., Monday through Friday.
3. All work conducted which causes significant noise that is considered a disturbance to the school shall be conducted, at contractor's expense, during the time period between 9:00 p.m. and 7:00 a.m. Work considered to be a disturbance or a disruption to the school includes but is not necessarily limited to installation of pencil rods at existing concrete substrate.
4. Hours for Utility Shutdowns: As approved in writing by Owner with not less than 72 hours' notice. Shutdowns shall be conducted, at contractor's expense, during the time period between 10:00 p.m. and 6:00 a.m.
5. Hours for Core Drilling: As approved in writing by Owner with not less than 72 hours notice. Core drilling shall be conducted, at Contractor's expense, during the time period between 10:00 p.m. and 6:00 a.m.
6. 24 Hour Access: The Owner will make the work site available as needed, including three shifts (24 hour access) as coordinated and approved in writing by Owner. All additional costs associated with work outside of normal business working hours shall be accounted for in the Contractor's bid.
7. Weekend Hours: As approved in writing by Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, any level of odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than 72 hours in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

G. Employee Identification: Comply with the Facility's Visitor Identification Policy. A copy of the current policy will be distributed at the initial job meeting.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.12 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

A. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the work by the Contractor. The contract Documents are complementary,

and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

B. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by Addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

C. If an item is shown on the Drawings but not specified, the Contractor shall provide the item of the same quality as similar items specified, as determined by the Architect. If an item is specified but not shown on the Drawings, it shall be located as directed by the Architect.

D. The Drawings are indications of the design intent as well as specific instructions. The "details" included on Drawings show the intent of all similar areas. If questions arise about the construction of an area not specifically detailed, consult with the Architect who will provide further "details" and instructions. Such further documentation, if consistent with the Contract Documents, shall not alter the Contract Sum.

E. If the Contractor, in the course of construction, finds any conflict, error, or discrepancy on or between the Drawings and Specifications or any of the related Contract Documents, such conflict, error, or discrepancy shall be immediately referred to the Architect, in writing. Architect shall issue an interpretation, in writing, to the Contractor within (10) days after receipt of the written request. No additional compensation will be paid to the Contractor as a result of an interpretation of the Contract Documents.

1.13 MISCELLANEOUS PROVISIONS

A. Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Request for Interpretation (RFI):

1. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form bound in the Project Manual.
2. Architect’s Action: Architect will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
3. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly.
4. On receipt of Architect’s action, update RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five days if contractor disagrees with response.

C. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Use form acceptable to Architect.

1.14 Retain this article only when Project is subject to unusual general requirements that do not belong elsewhere but that affect entire Project. See the Evaluations for model text. Delete article if there are no unusual requirements.

A. <**Insert miscellaneous provisions**>.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1

1. Base Bid: **All work, but the lobby as indicated by the outline on Drawing A.102.000 and A.202.00, exclusive of Rooms C214, C214A, C214B, C216B, C236 & Stairs adjacent to the lobby.**
2. Alternate: **All work within the lobby as indicated by the outline on Drawing A.102.000 and A.202.00. All related work within the area of Alternate No. 1 related to mechanical, electrical, plumbing, and audiovisual systems shall be part of the alternate.**

B. Alternate No. 2

1. Base Bid: **No modification to the ladders at the stage**
2. Alternate: **Provide Fall Restraint System to existing ladders at the stage. See A.500.00 for more information.**

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 012300 "Alternates" for products selected under an alternate.
2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.

b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups.

1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.

5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports and documents as specified.

F. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of

manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Demolish and remove mockups when directed unless otherwise indicated.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections.

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

3. See individual identification sections in Divisions 21, 23, and 26 for additional identification requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

   a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.

   a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.

   a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Field engineering.
2. Installation of the work.
3. Cutting and patching.
4. Coordination of Owner's portion of the Work.
5. Progress cleaning.
6. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be

relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Air or smoke barriers.
   d. Fire-suppression systems.
   e. Plumbing piping systems.
   f. Mechanical systems piping and ducts.
   g. Control systems.
   h. Communication systems.
   i. Fire-detection and -alarm systems.
   j. Conveying systems.
   k. Electrical wiring systems.
   l. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Sprayed fire-resistive material.
   e. Equipment supports.

f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Architect promptly.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Demolition and removal of selected portions of interior of building.
2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.

D. Existing to Remain (ETR): Existing items of construction that are not to be removed.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.
6. Review and finalize protection requirements.
7. Review procedures for noise control and dust control.
8. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property , for dust control , for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Temporary interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials:

1. It is not expected that hazardous materials will be encountered in the Work.

a. Hazardous materials will be removed by Owner before start of the Work.
b. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Inventory and record the condition of items to be removed for salvage or reinstallation. Photograph or video conditions that might be misconstrued as damage caused by removal.
2. Photograph or video existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

3.2 PREPARATION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 011000 “Summary"

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.3 UTILITY SERVICES AND BUILDING SYSTEMS

A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If disconnection of utilities and building systems will affect adjacent occupied parts of the building, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to those parts of the building.
4. Demolish and remove existing building systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment and components.

5. Abandon existing building systems, equipment, and components indicated on Drawings to be abandoned in place.

    a. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    b. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

6. Remove and reinstall/salvage existing building systems, equipment, and components indicated on drawings to be removed and reinstalled or removed and salvaged:

    a. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment and components; when appropriate, reinstall, reconnect, and make equipment operational.

b. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and components and deliver to Owner.

3.4 SALVAGE/REINSTALL

A. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Protect items from damage during transport and storage.

B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least two hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete:

1. Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
2. Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Resilient Floor Coverings: Remove floor coverings and adhesive in accordance with recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Miscellaneous framing and supports.
2. Metal ladders.

B. Products furnished, but not installed, under this Section include the following:
1. Loose steel lintels & C-shape members

C. Related Sections
1. Section 116133 Motorized Rigging

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Fixed Rung Ladder
2. Guardrail and Metal Walkway at Catwalk at Slab above Projection Room
3. **Motorized Rigging**

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
2. Metal ladders.
3. Metal walkway systems and guardrails
4. Motorized Rigging

C. Delegated Design Submittals: Ladders, walkways, guardrails, **& motorized rigging**, including analysis data signed & sealed by the qualified professional engineer responsible for preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

C. Delegated design engineer qualifications.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders, walkways, and guardrails

B. Structural Performance of Ladders, walkways, & guardrails: Ladders are to withstand the effects of loads and stresses within limits and under conditions specified in ANSI/ASC A14.3.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2.3 FERROUS METALS

A. Recycled Content of Steel Products: Post consumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. 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.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Steel Tubing: ASTM A 500, cold-formed steel tubing.

E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Minimum Size of Channels: 1-5/8 by 1-5/8 inches
2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0677-inch (1.7-mm) minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ISO 898-1, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

E. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.5 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 1-inch- diameter, steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
7. Prime ladders, including brackets and fasteners, with primer specified in Section 099123 "Interior Painting."
8. Provide vertical cable fall protection system at each ladder location, including but not limited to top and bottom brackets, stainless steel cable, cable guide, and detachable cable sleeve.

    a. Basis-of-Design Product: Subject to compliance with requirements, provide 3M DBI-SALA Lad-Saf Cable Vertical Safety System, or approved equal.

2.8 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches unless otherwise indicated.

1. Metal walkway systems
2. Metal guardrails

2.9 METAL WALKWAY SYSTEMS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. See Section 10 26 53 for miscellaneous safety specialties required.

2.10 METAL GUARDRAILS

A. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

    a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
    b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

2.11 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

A. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Section 099123 "Interior Painting."

B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLATION OF METAL LADDERS

A. Secure ladders to adjacent construction with the clip angles attached to the stringer.

B. Install brackets as required for securing of ladders welded or bolted to structural steel or built into masonry or concrete.

END OF SECTION 055000

SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads.
2. Steel tube railings and guards attached to metal stairs.
3. Steel tube handrails attached to walls adjacent to metal stairs.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs, railings, and guards.

1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
2. Deliver such items to Project site in time for installation.

C. Schedule installation of railings and guards so wall attachments are made only to completed walls.

1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

1. Abrasive nosings.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

C. Samples for Verification: For each type and finish of nosing.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs, railings and guards,, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).

2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Tubing for Railings and Guards: ASTM A513/A513M.

D. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

2.3 ABRASIVE NOSINGS

A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
2. Nosings, Square-Back Units: 1-7/8 inches (48 mm) wide, without lip.

2.4 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."

2.6 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings and guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs, railings, and guards in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 - Completely sanded joint with some undercutting and pinholes okay.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.

2.7 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Commercial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Stringers: Fabricate of steel as indicated on Drawings.

a. Stringer Size: As required to comply with "Performance Requirements" Article As indicated on Drawings.
b. Provide closures for exposed ends of channel and rectangular tube stringers.
c. Finish: Shop primed.

2. Platforms: Construct of steel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article and as indicated on Drawings.

a. Provide closures for exposed ends of channel and rectangular tube framing.
b. Finish: Shop primed.

3. Weld stringers to headers; weld framing members to stringers and headers.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch (1.7 mm).

1. Steel Sheet, Uncoated: Cold -rolled steel sheet unless otherwise indicated.
2. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
3. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
4. Shape metal pans to include nosing integral with riser.
5. Attach abrasive nosings to risers.
6. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.8 FABRICATION OF STAIR RAILINGS AND GUARDS

A. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-1/2-inch- (38-mm-) diameter top and bottom rails and 1-1/2-inch- (38-mm-) diameter posts.
2. Picket Infill: 1/2-inch- (13-mm-) square pickets unless otherwise indicated on drawings, spaced to prohibit the passage of a 4-inch (100-mm) diameter sphere.

B. Welded Connections: Fabricate railings and guards with welded connections.

1. Cope components at connections to provide close fit, or use fittings designed for this purpose.
2. Weld all around at connections, including at fittings.
3. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
4. Obtain fusion without undercut or overlap.
5. Remove flux immediately.
6. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 - Completely sanded joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.

C. Form changes in direction of railings and guards as follows:

1. As detailed.

D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing and guard members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

G. Connect posts to stair framing by direct welding unless otherwise indicated.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

2.9 FINISHES

A. Finish metal stairs after assembly.

B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal stair components unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.

a. Clean bottom surface of plates.

b. Set plates for structural members on wedges, shims, or setting nuts.
c. Tighten anchor bolts after supported members have been positioned and plumbed.
d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.
2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Comply with requirements for welding in "Fabrication, General" Article.

E. Place and finish concrete fill for treads and platforms

1. Install abrasive nosings with anchors fully embedded in concrete.
2. Center nosings on tread width.

3.3 INSTALLATION OF RAILINGS AND GUARDS

A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.

1. Space posts at spacing indicated or, if not indicated, as required by design loads.
2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
4. Secure posts, rail ends, and guard ends to building construction as follows:

a. Anchor posts to steel by welding to steel supporting members.

END OF SECTION 055113

SECTION 057000 - DECORATIVE METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Decorative metal panels.
2. Decorative metal corner guards.

1.2 COORDINATION

A. Coordinate installation of anchorages for decorative metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

B. Shop Drawings: Show fabrication and installation details for decorative metal.

1. Include plans, elevations, component details, and attachment details.
2. Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

1. Provide four samples of blackener on steel substrate, one each for three- through six-coat application.
2. Provide sample of clear coat on brass substrate, for two-coat application.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing decorative metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Use materials with smooth, flat surfaces unless otherwise indicated. Use materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.2 BRASS

A. Plate, Sheet, Strip, and Bars: ASTM B36/B36M, Alloy UNS C26000 (cartridge brass, 70 percent copper).

2.3 STEEL AND IRON

A. Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Sheet, Cold Rolled: ASTM A1008/A1008M, either commercial steel or structural steel, exposed.

2.4 FASTENERS

A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.

C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Steel Blackener:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Permalac NT Blackener, or approved equal.
2. Sheen: As selected by Architect from manufacturer’s full range.

B. Brass Clear Coat:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Permalac NT, or approved equal.
2. Sheen: As selected by Architect from manufacturer’s full range.

2.6 FABRICATION, GENERAL

A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

B. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

E. Mill joints to a tight, hairline fit. Cope or miter corner joints.

F. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Cut, reinforce, drill, and tap as needed to receive finish hardware, screws, and similar items unless otherwise indicated.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.

B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels.

C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work.

D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

E. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.

1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.

3.3 CLEANING AND PROTECTION

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.

C. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Fire-retardant-treated lumber.
3. Miscellaneous lumber.
4. Plywood backing panels.

1.2 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED LUMBER

A. General: Where fire-retardant-treated materials are indicated, materials are to comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Treatment is not to promote corrosion of metal fasteners.
2. Interior Type A: Treated materials are to have a moisture content of 28 percent or less when tested in accordance with ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency and other information required by authorities having jurisdiction.

E. Application: Treat all rough carpentry unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.5 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate blocking and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

D. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).

F. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

END OF SECTION 061000

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Banquette seating.
2. Veneer-faced paneling.

B. Related Requirements:

1. Section 061000 " Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples: For each exposed product and for each color and texture specified.

C. Samples for Verification:

1. Upholstery Fabric: Full width by 36-inch long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
2. Veneer-Faced Paneling for Transparent Finish: 12 by 12 inches (300 by 300 mm), for each species and cut. Include at least one face-veneer seam and finish as specified.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics of Upholstered Features:

1. Fabric and Padding:

a. Fabric: Class 1 according to DOC CS 191 or 16 CFR 1610, tested according to California Technical Bulletin 117-2000.
b. Padding: Comply with California Technical Bulletin 117-2000.

2. Full-Scale Fire Test: Comply with California Technical Bulletin 133.

2.2 ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
2. The Contract Documents may contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

B. Architectural Woodwork Standards Grade: Premium.

2.3 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. Softwood Plywood: DOC PS 1.

2.4 SEATING BOOTHS

A. Frame Construction:

1. Frames to be all hardwood construction, reinforced with glue blocks throughout. Straight top member.
2. Seating Types:

a. Seating booth units to be custom fabricated as detailed. Ends and exposed surfaces are to be finished. Concealed surfaces may remain unfinished. Seat backs and seats are upholstered smooth.

B. Fabric Upholstery:

1. Basis-of-Design Product UPH-01, UPH-02: As indicated on Sheet A900.00 Finish Schedule.
2. Upholstery Padding: Flexible, cellular, molded or slab polyurethane foam.

a. Pounding-Fatigue Performance: Grade AP (heavy-duty use) for seats and Grade BP (normal duty use) for backs; according to ASTM D3453.

3. Seat Backs: Fabric upholstered with padding over plywood, with concealed fasteners.

a. Padded Back Thickness: As indicated on drawings.

4. Seat: Two-part spring-supported, upholstered cushion.

a. Padded Seat Thickness: As indicated on drawings.

5. Tufting: Refer to Drawings for cushion tufting variations.

2.5 VENEER-FACED PANELING

A. Hardwood Veneer Plywood Paneling: Hardwood plywood panels complying with HPVA HP-1.

1. Face Veneer Species and Cut WD-01: As indicated on Sheet A900.00 Finish Schedule.

2. Veneer Matching: Selected for similar color and grain.
3. Construction: Veneer core.
4. Thickness: As indicated on drawings.
5. Glue Bond: Type II (interior).
6. Finish: Transparent, shop finish.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

2.7 FABRICATION

A. Fabricate interior finish carpentry to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
3. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
b. Verify that parts fit as intended and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

C. Upholstery: Fabricate fabric-covered cushions with molded padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.

1. Two-Part Seats: Upper part, an upholstered cushion with molded padding over support serpentine springs attached to plywood frame, with weight-distributing and abrasion-resistant sheeting separating padding from springs, and removable for reupholstering. Completely enclose hinges.
2. Upholstered Back: Padded cushion glued to a plywood inner panel and covered with replaceable fabric; Cushion fastened to seating booth back panel.

2.8 SHOP FINISHING

A. Finish interior finish carpentry with transparent finish indicated on Finish Schedule at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior architectural woodwork. Apply two coats to end-grain surfaces.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: System - 5, conversion varnish.
3. Staining: Match Architect's sample.
4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior finish carpentry and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

D. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 INSTALLATION OF SEATING BOOTHS

A. Seating booth units are to be delivered to the jobsite by the Contractor, uncrated/unpacked and carefully inspected before installation and placement.

B. Prior to acceptance, each seat shall be inspected to assure the following:

1. Seating booths are securely fastened in place.
2. Applied finishes are free from scratches or abrasions.

C. At completion of installation, surfaces and materials of the seating booths shall be cleaned of debris, dirt, and foreign materials.

3.5 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.

1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces.

B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetration firestopping systems.
2. Penetrations in fire-resistance-rated walls.
3. Penetrations in horizontal assemblies.
4. Penetrations in smoke barriers.
5. Exposed penetration firestopping systems.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.
2. Section 079200 "Joint Sealants" for non-fire-resistance-rated joint sealants.
3. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Unlisted Firestopping Systems: Obtain an Engineering Judgment (EJ) from firestopping manufacturer where no UL, FM Approvals, or other listed assembly is available for particular firestop configuration. Follow International Firestop Council (IFC) recommended guidelines for evaluating firestopping systems in EJs.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Listed System Designs: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Entity that has been approved by FM Approvals in accordance with FM Approvals 4991 or been evaluated by UL and found to comply with UL's "UL Solutions Qualified Firestop Contractor Program."

B. Manufacturer Qualifications: Entity that has received UL's "Firestop Movement Certification," which demonstrates that manufacturer's firestopping products designated with M-Ratings are based on exposure to cyclic movement and UL 1479 fire test evaluation when tested in accordance with ASTM E3037.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping systems when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping system materials in accordance with manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be accessed and installed in accordance with specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain penetration firestopping systems for each type of opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. A qualified testing agency, acceptable to authorities having jurisdiction, will perform penetration firestopping system tests.
2. Test in accordance with testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems installed with products bearing the classification marking of a qualified testing agency.

1) UL in its online directory "Product iQ."
2) Intertek Group in its "Directory of Building Products."
3) FM Approvals in its "Approval Guide."

B. Provide components for each penetration firestopping system that, upon curing, do not re-emulsify, dissolve, leach, break down, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water, or other forms of moisture characteristic during and after construction.

C. Provide components for each penetration firestopping system that do not contain ethylene glycol.

D. Provide components for each penetration firestopping system that are sufficiently flexible to accommodate movement, such as pipe vibration, water hammer, thermal expansion, and other normal building movement without damage.

E. Provide components for each penetration firestopping system that are appropriately tested for the thickness and type of insulation utilized.

2.3 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems must be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M; Fire Protection Products Division.
b. Hilti, Inc.
c. Nelson Firestop Products.
d. RectorSeal Corporation (The).
e. Specified Technologies, Inc.
f. USG Corporation.
g. Tremco Commercial Sealants and Waterproofing.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.

1. F-Rating: Not less than the fire-resistance rating of the wall penetrated.
2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of the floor penetrated.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined in accordance with UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E84 or UL 723.

2.4 ACCESSORIES

A. Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated, including but not limited to:

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.5 FILL MATERIALS

A. Cast-in-Place Firestopping Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestopping Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric strips for use around combustible penetrants.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Compressible, removable, and reusable intumescent pillows encased in fire-retardant polyester or glass-fiber cloth. Where exposed, and when required by a listed system, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed or dislodged.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

K. Thermal and Endothermic Wraps: Flexible, insulating, and fire-resistant protective wraps tested and listed for up to 2-hour fire ratings in accordance with ASTM E814 or UL 1479; for protecting membrane penetrations of utility boxes, critical electrical circuits, communications lines, and fuel lines, and for thermal barrier and circuit integrity protection in accordance with ASTM E1725 or UL 1724.

L. Fire-Rated Cable Sleeve Kits: Complete kits designed for new or existing cable penetrations through walls which accept standard accessories.

M. Fire-Rated Cable Pathways: Single or gangable device modules composed of a steel raceway with integral intumescent material and requiring no additional action in the form of plugs, twisting closure, putty, pillows, sealant, or otherwise to achieve fire and air-leakage ratings.

1. Fire-rated cable pathway devices are the preferred product for data, video, and communications cable penetrations. Install these devices in locations where frequent cable moves, add-ons, and changes will occur. Such devices must be:

a. Capable of retrofit around existing cables.
b. Designed so that two or more devices can be ganged together.
c. Maintenance-free so no action is required to activate the smoke- and fire-sealing mechanism.

2. Where fire-rated cable pathway devices are not practical, openings within walls and floors designed to accommodate data, video, and communications cabling must be provided with re-enterable products specifically designed for retrofit, such as retrofit devices for cable bundles, firestopping putty, plugs, or pillows.

N. Retrofit Device for Cable Bundles: Factory-made, intumescent, collar-like device for firestopping existing over-filled cable sleeves and capable of being installed around projecting sleeves and cable bundles.

O. Wall-Opening Protective Materials: Intumescent, non-curing putty pads or self-adhesive inserts for protection of electrical switch and receptacle boxes.

P. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestopping gasket for use around rectangular steel HVAC ducts without fire dampers.

Q. Firestopping Plugs: Flexible, re-enterable, intumescent, foam-rubber plug for use in blank round openings and cable sleeves.

R. Fire-Rated Cable Grommet: Molded two-piece grommet made of plenum-grade polymer and foam inner core for sealing small cable penetrations in gypsum walls up to 1/2 inch (13 mm) in diameter.

S. Closet Flange Gasket: Molded, single-component, flexible, intumescent gasket for use beneath a water closet (toilet) flange in floor applications.

2.6 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings in accordance with manufacturer's written instructions and with the following requirements:

1. Remove foreign materials from substrate surfaces that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates in accordance with penetration firestopping system manufacturer's written installation instructions, using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems in accordance with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. (4.57 m) from end of wall and at intervals not exceeding 30 ft. (9.14 m).

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified inspection agency to conduct and report on inspections in accordance with ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Intumescent gypsum wall framing gaskets.
2. Perimeter fire-barrier system.
3. Joints in or between fire-resistance-rated construction.
4. Joints in smoke barriers.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Unlisted Firestopping Systems: Obtain an Engineering Judgment (EJ) from firestop manufacturer where no UL, FM Approvals, or other listed assembly is available for particular firestop configuration. Follow International Firestop Council (IFC) recommended guidelines for evaluating firestop systems in EJs.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an EJ or equivalent fire-resistance-rated assembly developed in accordance with current IFC guidelines.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Listed System Designs: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written installation instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals in accordance with FM Approvals 4991 or been evaluated by UL and found to comply with UL's "UL Solutions Qualified Firestop Contractor Program."

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems in accordance with manufacturer's written installation instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed in accordance with specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. A qualified testing agency, acceptable to authorities having jurisdiction, will perform joint firestopping system tests.

2. Test in accordance with testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

    a. Joint firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.

        1) UL in its online directory "Product iQ."
        2) Intertek Group in its "Directory of Building Products."

2.3 JOINT FIRESTOPPING SYSTEM TYPES

A. General: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems must accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

1. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.
2. Provide products that, upon curing, do not re-emulsify, dissolve, leach, break down, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.
3. Provide firestop products that do not contain ethylene glycol.

B. Intumescent Gypsum Wall Framing Gaskets: Applied to steel tracks, runners, and studs prior to framing installation. Provide products with fire, smoke, and acoustical ratings that allow movement of up to 100 percent compression and/or extension when tested in accordance with UL 2079 or ASTM E1966; have an L Rating of less than 1 cfm/ft. (0.00115 cu. m/s x m) when tested in accordance with UL 2079; and a minimum Sound Transmission Class (STC) rating of 56 when tested in accordance with ASTM E90 or ASTM C919.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. CEMCO; California Expanded Metal Products Co.
    b. ClarkDietrich.
    c. International Fireproof Technology Inc.
    d. Specified Technologies Inc.

C. Perimeter Fire-Barrier System: Provide perimeter fire-barrier system that does not require direct screw attachment to mullions and transoms to support and fasten curtain-wall insulation for aluminum curtain-wall assemblies with one- or two-piece rectangular mullions at least 2-1/2 by 5 inches (64 by 127 mm). System will be tested in accordance with ASTM E2307 for up to two-hour fire resistance and with ASTM E1233/E1233M for wind cycling equivalent to 108 mph (174 km/h) wind for 500 cycles.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CEMCO; California Expanded Metal Products Co.
b. Grabber Construction Products, Inc.
c. Specified Technologies Inc.

D. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined in accordance with ASTM E1966 or UL 2079, with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the fire-resistive joint system to restrict the movement of smoke.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M Building and Construction.
b. Hilti, Inc.
c. RectorSeal Firestop; a CSW Industrials Company.
d. Specified Technologies Inc.
e. Tremco Incorporated.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

E. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined in accordance with UL 2079 based on testing at a positive pressure differential of 0.30 inch wg (74.7 Pa).

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M Building and Construction.
b. Hilti, Inc.
c. Nelson; Emerson Electric Co., Automation Solutions.
d. RectorSeal Firestop; a CSW Industrials Company.
e. Specified Technologies Inc.
f. Tremco Incorporated.

2. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.

F. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined in accordance with ASTM E84.

2.4 ACCESSORIES

A. Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing joint firestopping systems, clean joints in accordance with fire-resistive joint system manufacturer's written installation instructions and the following requirements:

1. Remove foreign materials from substrate surfaces that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates in accordance with joint firestopping system manufacturer's written installation instructions, using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Apply a suitable bond breaker to prevent three-sided adhesion in applications where condition occurs.

3.3 INSTALLATION

A. General: Install joint firestopping systems in accordance with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:

1. Apply elastomeric fill in voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.

2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge, so labels are visible to anyone seeking to remove joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections in accordance with ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

END OF SECTION 078443

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Urethane joint sealants.
2. Mildew-resistant joint sealants.
3. Butyl joint sealants.
4. Latex joint sealants.

B. Related Requirements:

1. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Mildew-resistant joint sealants.
2. Butyl joint sealants.
3. Latex joint sealants.

B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Manufacturers' special warranties.

B. Installer's special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Master Builders Solutions, brand of MBCC Group, a Sika company.
b. Pecora Corporation.
c. Polymeric Systems, Inc.
d. Sherwin-Williams Company (The).

B. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sika Corporation; MasterSeal NP 2 or a comparable product by one of the following:

a. Sherwin-Williams Company (The).

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sika Corporation; Sikasil-GP or comparable product by one of the following:

    a. GE Construction Sealants; Momentive Performance Materials Inc.
    b. The Dow Chemical Company.
    c. Tremco Incorporated.

2.5 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sika Corporation - Building Components; SikaLastomer-511 or comparable product by one of the following:

    a. Bostik; Arkema.
    b. Pecora Corporation.

2.6 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); 850A Siliconized Acrylic Latex Caulk or comparable product by one of the following:

    a. PPG Paints; PPG Industries, Inc.
    b. Pecora Corporation.
    c. Tremco Incorporated.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    1. Do not leave gaps between ends of sealant backings.
    2. Do not stretch, twist, puncture, or tear sealant backings.
    3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

    1. Place sealants so they directly contact and fully wet joint substrates.
    2. Completely fill recesses in each joint configuration.
    3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT SEALANT SCHEDULE

A. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

   a. Control and expansion joints in tile flooring.
   b. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces .

1. Joint Locations:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
   c. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

    a. Control joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
    c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    b. Tile control and expansion joints where indicated.
    c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

    a. Aluminum thresholds.
    b. Sill plates.
    c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 079219 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Acoustical joint sealants.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants, showing full range of available colors for each product exposed to view.

C. Acoustical Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Product Test Reports: For each type of acoustical joint sealant, for tests performed by qualified testing agency.

B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained between 40 and 95 deg F (4 and 35 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 60 and 90 deg F (16 and 32 deg C).

1.7 WARRANTY

A. Installer's Special Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Manufacturer's Special Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL JOINT SEALANTS

A. Acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies in accordance with ASTM E90.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Grabber Construction Products, Inc.
b. Hilti, Inc.
c. OSI Sealants; Henkel Corporation.
d. Pecora Corporation.
e. Specified Technologies Inc.

2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. OSI Sealants; Henkel Corporation.
b. Pecora Corporation.
c. Tremco Incorporated.
d. USG Corporation.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by acoustical joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended by acoustical joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written instructions for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079219

SECTION 080671 – DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Sliding Doors.
3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware”.
2. Division 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a

hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

1. Section 087100 – Door Hardware.
2. Section 281307 –Access Control and Alarm System

C. Manufacturer's Abbreviations:

1. MK - McKinney
2. OT - Other
3. RO - Rockwood
4. RU - Corbin Russwin
5. HS - HES
6. RF - Rixson
7. NO - Norton
8. PE - Pemko
9. ZE - Zero International
10. SU - Securitron

Hardware Sets

Set: 1.0

Doors: C292-2

6 Hinges	By STC Assembly Manufacturer.		OT	
1 Dust Proof Strike	570	US26D	RO	087100
2 Flush Bolt	555	US26D	RO	087100
1 Deadlock	ML2012 CT6B	626	RU	087100
2 Permanent Core	CR8000	626	RU	087100
2 Flush Pull	94Px94L	US26D	RO	087100
2 Surf Overhead Stop	9-X36	630	RF	087100
1 Sound Gasketing	By STC Assembly Manufacturer.		OT	

Notes: Architect to confirm opening is not in a path of egress & can be locked from both sides as requested.

Set: 2.0

Doors: C291A, C291B, C291C

6 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100
2 Surface Vert Rod Exit	PED5455T A T34M55ET M55 CT6B	630	RU	087100
2 Permanent Core	CR8000	626	RU	087100
2 Door Closer	7500 / P7500	689	NO	087100
2 Kick Plate	K1050 10" high CFC BEV	US32D	RO	087100
2 Door Stop	RM850 / RM860	US26D	RO	087100
1 Astragal	55FS-AA		ZE	087100
1 Astragal	555FS-AA		ZE	087100
1 Gasketing	7770AA		ZE	087100
2 Door Bottom	365AA		ZE	087100

Notes: Architect to confirm fire rated wood doors will accept requested automatic door bottoms & maintain fire rating.

Set: 2.1

Doors: C292-3

6 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100
2 Surface Vert Rod Exit	PED5455T A T34M55ET M55 CT6B	BSP	RU	087100
2 Permanent Core	CR8000	626	RU	087100
2 Surface Closer	7500 / P7500	BSP	NO	087100
2 Kick Plate	K1050 10" high CFC BEV	BSP	RO	087100
2 Door Stop	RM850 / RM860	US26D	RO	087100
1 Astragal	55FS-AA		ZE	087100
1 Astragal	555FS-AA		ZE	087100
1 Gasketing	7770BK		ZE	087100
1 Door Bottom	365AA		ZE	087100

Notes: Architect to confirm fire rated wood doors will accept requested automatic door bottoms & maintain fire rating.

Set: 3.0

Doors: C214C, C214D

6 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100	
2 Surface Vert Rod Exit	PED5410T A T3410ET M55	630	RU	087100	
2 Surf Overhead Stop	9-X36	BSP	RF	087100	
2 Surface Closer	7500 / P7500	BSP	NO	087100	
2 Kick Plate	K1050 10" high CFC BEV	BSP	RO	087100	
1 Astragal	S771x6BL		PE	087100	
1 Gasketing	S88BL		PE	087100	

Set: 4.0

Doors: C322A, C322B

3 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100	
1 Storeroom Lock	ML2057 107X CT6B	626	RU	087100	
1 Permanent Core	CR8000	626	RU	087100	
1 Electric Strike	1500C	630	HS	087100	⚡
1 Door Closer	7500 / P7500	689	NO	087100	
1 Door Stop	RM850 / RM860	US26D	RO	087100	
3 Silencer	608		RO	087100	
1 Wiring Diagram	Point to Point			281300	
1 Door Position Switch	By Security System Supplier		OT	281300	⚡
1 Card Reader	By Security System Supplier		OT	281300	
1 Request to Exit Sensor	By Security System Supplier		OT	281300	⚡
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	087100	⚡

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Inside activating request to exit switch shunts door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 5.0

Doors: D368, D371

3 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100
1 Entrance Lock	ML2054 107X CT6B	626	RU	087100
1 Permanent Core	CR8000	626	RU	087100
1 Door Closer	7500 / P7500	689	NO	087100
1 Door Stop	RM850 / RM860	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 6.0

Doors: D232, D235

3 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100
1 Entrance Lock	ML2054 107X CT6B	626	RU	087100
1 Permanent Core	CR8000	626	RU	087100
1 Conc Overhead Stop	1-X36	630	RF	087100
1 Door Closer	7500 / P7500	689	NO	087100
3 Silencer	608		RO	087100

Set: 7.0

Doors: C292-1

6 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100
1 Dust Proof Strike	570	US26D	RO	087100
1 Flush Bolt	2845	US26D	RO	087100
1 Classroom Lock	ML2055 107X CT6B &	626	RU	087100
1 Permanent Core	CR8000	626	RU	087100
1 Coordinator	2600 Series x Meg. Brkts.	US28	RO	087100
2 Surf Overhead Stop	9-X36	630	RF	087100
2 Door Closer	7500 / P7500	689	NO	087100
1 Astragal	S771x6BL		PE	087100
1 Gasketing	S88BL		PE	087100

Set: 8.0

Doors: C214B

3 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100
1 Passage Latch	ML2010 107X	626	RU	087100
1 Door Closer	7500 / P7500	689	NO	087100
2 Kick Plate	K1050 10" high CFC BEV	US32D	RO	087100
1 Door Stop	RM850 / RM860	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 9.0

Doors: C214A

3 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK	087100
1 Passage Latch	ML2010 107X	626	RU	087100
1 Conc Overhead Stop	1-X36	630	RF	087100
1 Door Closer	7500 / P7500	689	NO	087100
2 Kick Plate	K1050 10" high CFC BEV	US32D	RO	087100
3 Silencer	608		RO	087100

END OF SECTION 080671

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 09 Sections "Interior Painting" for field painting hollow metal doors and frames.
6. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access control system.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum **1/4-inch** space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Steelcraft (S).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Manufacturers Basis of Design:

1. Curries Company (CU) - Honeycomb Core - 707 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

    a. Curries Company (CU) - C Series.
    b. Curries Company (CU) - M Series.

C. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from **A60** metallic coated material, not less than **0.042 inches** thick.

C. Mortar Guards: Formed from same material as frames, not less than **0.016 inches** thick.

2.6 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.7 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than **18 inches** from top and bottom of frame. Space anchors not more than **32 inches** on-center and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than **18 inches** from top and bottom of frame. Space anchors not more than **32 inches** o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

9. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.8 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core five-ply flush wood veneer-faced doors and transom panels for transparent finish.
2. Light frames.

B. Related Requirements:

1. Section 081113 “Hollow Metal Doors and Frames” for hollow metal frames at wood doors.
2. Section 088000 "Glazing" for glass view panels in flush wood doors.
3. Section 088813 “Fire-Rated Glazing” for rated glass view panels in flush wood doors.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Solid-core five-ply flush wood veneer-faced doors and transom panels for transparent finish.
2. Light frames.

B. Product Data Submittals: For each product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door trim for openings.
5. Factory-machining criteria.
6. Factory- finishing specifications.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.

2. Door elevations, dimension and locations of hardware, lite cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.
8. Doors to be factory finished and application requirements.
9. Apply AWI Quality Certification Program label to Shop Drawings.

D. Samples for Initial Selection: For factory-finished doors.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Special warranties.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies complies with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies complies with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors and frames that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty also includes installation and finishing that may be required due to repair or replacement of defective doors and frames.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

1. Temperature-Rise Limit: Where indicated on Drawings, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

2.3 FLUSH WOOD DOORS AND FRAMES, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS AND TRANSOM PANELS FOR TRANSPARENT FINISH

A. Interior Doors, Solid-Core Five-Ply Veneer-Faced:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Lambton Doors.
   b. Masonite Architectural.
   c. Oshkosh Door Company.
   d. VT Industries, Inc.

2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
3. ANSI/WDMA I.S. 1A Quality Grade: Premium.
4. Faces: Single-ply wood veneer not less than 1/50 inch (0.508 mm) thick.

   a. Basis-of-Design Product WD-02: As indicated on Sheet A900.00 Finish Schedule.
   b. Room Match:

      1) Provide door faces of compatible color and grain within each separate room or area of building.

5. Exposed Vertical and Top Edges: Same species as faces - Architectural Woodwork Standards edge Type A .

a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
b. Fire-Rated Pairs of Doors:

1) Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

1) Screw-Holding Capability: 475 lbf (2110 N) in accordance with WDMA T.M. 10.

6. Core for Non-Fire-Rated Doors:

a. WDMA I.S. 10 structural composite lumber.

1) Screw Withdrawal, Door Face: 475 lbf (2110 N).
2) Screw Withdrawal, Vertical Door Edge: 475 lbf (2110 N).

7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.

8. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.7 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Architectural Woodwork Standards Grade: Premium.

    a. System-11, Polyurethane, Catalyzed.

2. Staining: Match Architect's sample.
3. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and frames.

B. Related Requirements:

1. Section 083123 "Floor Doors" for doors installed in floors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details material descriptions, dimensions of individual components and profiles, and finishes.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ACUDOR Products, Inc.
   b. Babcock-Davis.
   c. Milcor; Hart & Cooley, Inc.
   d. Nystrom, Inc.

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall and ceiling.
4. Door Size: As required to access systems, but not less than 24 by 24 inches.
5. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage, factory finished.

   a. Location: Typical unless otherwise indicated.

6. Metallic-Coated Steel Sheet for Door: Insert thickness, factory finished.

a. Location: Masonry walls, toilet rooms, and where indicated on drawings.

7. Frame Material: Same material, thickness, and finish as door.
8. Latch and Lock: Cam latch, screwdriver operated.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Frame Anchors: Same material as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

    a. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 083123 - FLOOR DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel floor doors.

B. Related Requirements:

1. Section 083113 "Access Doors and Frames" for wall- and ceiling-mounted access doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details materials, individual components and profiles, and finishes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Floor Doors: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency according to NFPA 288.

2.2 ALUMINUM FLOOR DOORS

A. Angle Frame Aluminum Floor Door:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Nystrom, Inc. Model FDNP, or approved equal.
2. Frame: Mill finish aluminum, angle profile.
3. Door: Single leaf; 1/4-inch-thick (6.4-mm-thick), diamond-pattern mill-finish aluminum plate.
4. Loading Capacity: 300 lbf/sq. ft. (14.4 kN/sq. m) pedestrian live load.
5. Hardware:

a. Material and Finish: Manufacturer's standard.
b. Hinges: Heavy-duty butt hinges with stainless steel pins.

c. Operating Mechanism: Adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with vinyl grip that allows for one-handed closure, and recessed lift handle.
d. Latch: Stainless steel slam latch.
e. Lock: Latch with removable handle.

B. Safety Accessories: Safety grate.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

C. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

D. Frame Anchors: Same material as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.4 FABRICATION

A. General: Provide floor doors manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure floor doors to types of supports indicated.

D. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that comes in contact with concrete.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions for installing floor doors.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083123

SECTION 083473.13 - METAL SOUND CONTROL DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the furnishing and installation of all metal sound retardant doors and frames and adjusting of all acoustical seals as scheduled on the drawings and specified herein.

1. Includes interior metal sound retardant doors with factory-primed steel finish.
2. Provide complete assemblies, including door, frame and seals.
3. Supervision by door manufacturer of adjusting acoustical seals.

B. Related Requirements:

1. Section 087100 "Door Hardware" for additional door hardware not specified here.

1.2 COORDINATION

A. Coordinate installation of anchorages for sound control door assemblies. Furnish setting drawings, templates, and directions for installing anchorages. Deliver sleeves, inserts, anchor bolts, and items with integral anchors to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review procedures for coordinating frame and anchor installation with wall construction.
2. Review required field quality-control procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include sound ratings, construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: For sound control door assemblies.

1. Include elevations of each door design.
2. Include details of sound control seals, door bottoms, and thresholds.
3. Include details of doors, including vertical- and horizontal-edge details and metal thicknesses.
4. Include frame details for each frame type, including dimensioned profiles and metal thicknesses.
5. Include locations of reinforcements and preparations for hardware.
6. Include details of each different wall opening condition.

7. Include details of anchorages, joints, field splices, and connections.
8. Include details of accessories.
9. Include details of conduits and preparations for power, signal, and control systems.
10. Schedule: Provide a schedule of sound control door assemblies prepared using same reference numbers for details and openings as those on Drawings. Coordinate with the Door Hardware Schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer, and acoustical testing agency.

B. Product Certificates: For each type of sound control door assembly.

1. Test Reports:

a. Certified laboratory reports, performed in accordance with ASTM E90 and ASTM E413, from independent testing laboratory qualified under the National Voluntary Laboratory Accreditation Program (NVLAP) supporting compliance of assemblies to specified requirements.
b. Minimum five (5) field tests, performed in accordance with ASTM E336 and ASTM E413 by five separate independent testing agencies, substantiating acoustical performance when installed at no less than five (5) FSTC ratings below the specified STC rating.

2. Certificates:

a. Products of this section, as provided, meet or exceed specified requirements.
b. Manufacturer of products of this section meet specified qualifications.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sound control door assemblies to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company that has regularly specialized in the manufacture of metal sound retardant doors for a period of at least five years.

1. The manufacturer shall submit laboratory and field tests.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer, with minimum five years’ documented experience installing systems specified in this section.

C. Acoustical Testing Agency Qualifications: An independent agency accredited as an acoustical laboratory according to the National Voluntary Laboratory Accreditation Program of NIST.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Avoid the use of nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sound control door assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet sound rating requirements.
b. Faulty operation of sound seals.
c. Deterioration of metals, metal finishes, and other materials beyond normal use or weathering.

2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sound Rating: Provide sound control door assemblies identical to those of assemblies tested as sound-retardant units by an acoustical testing agency, and have the following minimum rating:

1. STC Rating: As indicated in the Door Schedule. As calculated by ASTM E413 when tested in an operable condition according to ASTM E90.
2. NIC Rating: The doors shall provide a Noise Isolation Class (NIC) which is no less than 5 points below the scheduled STC performance. Test shall be measured in accordance with ASTM E336 and classified in accordance with ASTM E413.
3. The door shall be fully operable at the time of test and shall be opened and closed several times prior to measurement. The test shall be on the exact door/frame/seal assembly that

is to be supplied for the project. It shall be tested as a complete assembly. A test for the door and a separate test for the acoustical seals is not acceptable.

2.2 STEEL SOUND CONTROL DOORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Krieger Steel Products; NC3-16C-8550, or comparable products by one of the following:

1. Noise Barriers LLC.
2. Clark Door Ltd.
3. Other manufacturers must be approved in writing prior to bidding by the project's Acoustical Consultant.

B. Source Limitations: Obtain steel sound control door assemblies, including doors, frames, sound control seals, hinges, thresholds, and other items essential for sound control, from single source from single manufacturer.

2.3 MATERIALS

A. Galvanized Steel Sheet: ASTM A653/A653M, commercial quality, minimum G60 zinc coating.

B. Acoustical Material: Manufacturer's standard for required STC rating.

C. Primer: Meeting ASTM B117 salt spray for 150 hours, and ASTM D 1735 water fog test for organic coatings for 200 hours.

2.4 COMPONENTS

A. Steel Doors: Fabricate in accordance with approved shop drawings, 1-3/4 inches minimum thickness, and as follows:

1. Face Sheets:

   a. Doors for Exterior Use: Galvanized steel sheet, minimum 16 gage sheet thickness.
   b. Visible seams on face sheets not permitted.

2. Core:

   a. Stiffen face sheets with continuous vertical steel sections.
   b. Fill spaces between stiffeners with acoustical material.

3. Vertical Edges:

   a. Join face sheets at vertical edges by continuous welding:
   b. Join door faces by continuous weld on each edge, extending full door height.
   c. Grind, fill, and dress welds to provide smooth flush surface.
   d. Form edge profiles both vertical edges of doors with 1/8 inch in 2 inches bevel.
   e. Visible seams on vertical edges not permitted.

4. Horizontal edges:

    a. Close top and bottom edges of doors with continuous steel channels, 16 gage minimum; spot-weld channels to both door faces.
    b. Provide openings in bottom closure of exterior doors to permit escape of entrapped moisture.
    c. Provide additional flush closing channel at top edge of doors; spot-weld channel to both door faces.

5. Hardware Preparation:

    a. Mortise, reinforce, drill, and tap doors at factory for fully templated mortised hardware only, in accordance with approved hardware schedule and supplied templates.
    b. Provide reinforcing plates at surface-mounted or non-templated hardware locations. Surface applied hardware are drilled on site by others.

B. Frames: Fabricate in accordance with approved shop drawings, and as follows:

1. Frames for Exterior Use: Fabricate from galvanized steel sheet, minimum 14-gage thickness.
2. Form frame members straight, and of uniform profile through lengths, as welded units with integral trim, of sizes and profiles indicated.

    a. Weld contact edges of joints closed tight.
    b. Miter perimeter trim faces and weld continuously.

3. When shipping limitations so dictate, fabricate frames for large openings in sections designed for assembly in the field; install alignment plates or angles, of same material and gage as frame, at each joint.
4. Hardware Preparation:

    a. Mortise, reinforce, drill, and tap frames at factory for fully templated mortised hardware only, in accordance with Architect-approved shop drawings and supplied templates.
    b. Provide reinforcing plates at surface-mounted or non-templated hardware locations.

5. Floor Anchors:

    a. Fabricate of same material as frame material; minimum 14 gage.
    b. Weld anchors inside each jamb for floor anchorage.

6. Jamb Anchors:

    a. Fabricate of same material as frame material; weld anchors inside each jamb for wall anchorage.
    b. Provide anchor types for indicated adjacent wall construction:

        1) Frames for Installation in Masonry Walls: Adjustable jamb anchors, 16 gage, T-shape type.

7. Plaster Guards: Fabricate from minimum 22 gage steel; weld in place at hardware mortises on frames to be set in plaster, masonry, or concrete openings.
8. Provide welded frames with temporary steel spreader welded to jamb feet for bracing during shipping and handling.

C. Door Hardware: Supply gasketing systems, retainers, retainer covers, automatic door bottoms, fixed door bottoms, cam-lift hinges, thresholds, and sills as indicated on approved shop drawings, or specified in manufacturer's product data for project conditions, to achieve specified performance requirements.

1. Hardware Preparation: Factory prepare sound control doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.

   a. Reinforce doors to receive nontemplated mortised and surface-mounted door hardware.

2. Locate door and frame hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
3. Hardware Location on Doors and Frames:

   a. Hinges:

      1) Top: 5 inches from head of frame to top of hinge.
      2) Bottom: 10 inches from finished floor to bottom of hinge.

   b. Panic Hardware: 38 inches from finished floor to centerline of cross bar, or as indicated on hardware template.

4. Sill Condition: Furnish a smooth flush stainless steel or aluminum threshold for the door bottom to seal against when the door is in the closed position. The minimum width of the threshold shall be door thickness plus 4-inches to allow the threshold to extend a minimum of 1-1/2 inch beyond the face of the door on both sides of the opening.

   a. Finish: Clear anodic finish.

5. Other Hardware: Comply with requirements in Section 087100 "Door Hardware."

D. Finish:

1. All tool marks and surface imperfections shall be removed and exposed faces of all welded joints shall be dressed smooth.
2. Assemblies shall be treated and shall be coated on all accessible surfaces with a rust-inhibitive primer which meets ASTM B117 salt spray for 150 hours, and ASTM D1735 water fog test for organic coatings for 200 hours, and which is fully cured prior to shipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Prior to installation, check and correct frames for size, swing, squareness, alignment, twist and plumb.
2. Verify openings are in accordance with approved shop drawings.

B. Examination:

1. Examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
2. Transmit two copies of installer's report to Architect within 24 hours of receipt.
3. Proceed with installation only after unsatisfactory conditions have been corrected.
4. Beginning construction activities of this section indicates installer's acceptance of conditions.

C. Solidly grout fill frames where so indicated on the drawings or the approved submittals, eliminating all voids. The flanking path normally found behind the frame must be packed with either 6-12 lb rock wool insulation or grout filled to assure minimum sound transmission.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace sound control door frames to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install units in accordance with approved shop drawings and manufacturer's printed installation instructions; in addition, install steel components in accordance with HMMA 840.

B. Frames: Install sound control door frames in sizes and profiles indicated.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

   a. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, and dress; make splice smooth, flush, and invisible on exposed faces.
   b. Remove temporary braces only after frames or bucks have been properly set and secured.
   c. Check squareness, twist, and plumbness of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

C. Doors: Fit sound control doors accurately in frames, within clearances indicated below. Shim as necessary.

1. Non-Fire-Rated Doors: Fit non-fire-rated doors accurately in frames with the following clearances:

   a. Jambs: 1/8 inch.
   b. Head with Butt Hinges: 1/8 inch.
   c. Head with Cam-Lift Hinges: As required by manufacturer, but not more than 3/8 inch.
   d. Sill: Manufacturer's standard.
   e. Between Edges of Pairs of Doors: 1/8 inch.

D. Sound Control Seals: An authorized representative of the door manufacturer shall personally supervise adjusting of acoustical seals until any and all acoustical leaks have been resolved. All costs associated with this supervision shall be borne by the door manufacturer.

E. Cam-Lift Hinges: Install hinges according to manufacturer's written instructions.

F. Thresholds: Set thresholds in full bed of sealant complying with requirements in Section 079200 "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. For instances where the manufacturer cannot provide suitable laboratory and field test results for the complete door assembly the doors will be tested on site as follows:

1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
2. Testing Services: Perform testing for verification that assembly complies with NIC rating requirements.

   a. Field tests shall be conducted according to ASTM E336, with results calculated according to ASTM E413. Acceptable field NIC values shall be within 5 dB of scheduled laboratory STC values.
   b. Inspection Report: Acoustical testing agency shall submit report in writing to Architect and Contractor within 24 hours after testing.
   c. If tested door fails, replace or rework all sound control door assemblies to bring them into compliance at Contractor's expense.
   d. Additional testing and inspecting at Contractor's expense will be performed to determine if replaced or additional work complies with specified requirements.

3. Prepare test and inspection reports.

3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and adjust seals, door bottoms, and other sound control hardware items right before final inspection. Leave work in complete and proper operating condition.

B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.

1. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible, rust-inhibitive, air-drying primer.

END OF SECTION 083473.13

SECTION 085673 – ACOUSTICALLY RATED WINDOW ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustically-rated window assemblies.

1.2 PERFORMANCE REQUIREMENTS

A. Acoustically-rated window assemblies shall have a laboratory Sound Transmission Class (STC) rating as indicated on drawings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other wall components. Include provisions for anchoring, sealing perimeters, and protecting finishes.
4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for windows.

B. Shop Drawings: For acoustically rated windows.

1. Submit drawings showing complete details including all dimensions, materials, finishes, mounting hardware, seals, blocking and other pertinent information as may be required.

C. Samples: Submit sample of metal frame, in finish selected by Architect from manufacturer’s standards.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

1. Certified test reports indicating the acoustical performance of the window meets the Sound Transmission Class (STC) performance called out in the schedule or drawings, when tested in accordance with ASTM E90-90 and E413-87.

a. Reports should indicate that the test was performed on the windows and frames of the type to be supplied.
b. Test data shall indicate type of hardware used on the window.
c. Manufacturer shall indicate whether additional treatment of the window frame, by the insertion of grout or high-density glass/mineral fiber in the cavity between frame and wall, shall be necessary to meet the acoustical requirements of this specification.
d. Acoustical consultant shall be the judge of technical acceptability of submitted data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating acoustically rated windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: An installer acceptable to acoustically rated window manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace acoustically rated windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.

2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers offering products serving as basis of design that may be incorporated into the Work include, but are not limited to, the following:

1. Mon-Ray, Inc. Minneapolis, MN.
2. Wausau Window and Wall Systems, Wausau, WI.
3. Peerless Products, Inc., Shawnee Mission, KS.
4. St. Cloud Window, Inc., St. Cloud, MN.

2.2 ACOUSTICALLY RATED PROJECTION PORT AND CONTROL ROOM WINDOWS

A. Glass Assembly:

1. Window Type GL-03, GL-05: Fixed.

a. Glazing:

1) GL-05: Laminated glass, consisting of 1/4-inch thick lead free optically clear glass ply, 0.030 inch interlayer, and 1/4-inch thick lead free optically clear glass ply (1/2-inch nominal overall thickness), or as required to meet STC 35.
2) GL-03: Laminated glass, consisting of 1/4-inch thick clear glass ply, 0.030 inch interlayer, and 1/4-inch thick clear glass ply (1/2-inch nominal overall thickness), or as required to meet STC 35.

b. Configuration: Fixed assembly, installed in vertical plane per Drawings.

2. Window Type GL-04: Operable.

a. Glazing: Laminated glass shall be minimum 1/4-inch thick laminated glass or as required to meet STC rating, or as required to meet STC 35.
b. Configuration: Single horizontal sliding window, installed in vertical plane per Drawings.
c. Subject to compliance with requirements, Basis of Design Products include:

1) Series 450 by Mon-Ray, Inc.
2) Series 9530, 9535, or 9540 by Peerless Products, Inc.
3) Horizontal Sliding Window #940 by St. Cloud Window, Inc.
4) Series 4100 IHS by Wausau Windows.

B. Acoustically-Rated Window Assemblies shall be complete, window and frame assemblies that will meet or exceed the scheduled performance and STC rating indicated.

C. Single glazed acoustical window shall be factory glazed and sealed. Window system shall include: glass, aluminum framing and trim, sound deadening treatments, desiccants and all accessory items as shown on the drawings and required for a complete installation, including caulking and anchorage to adjacent construction.

D. Side-parting, single track, horizontal sliding window shall have meeting rails that interlock when closed. All perimeter, intermediate and center stile interfaces shall be sealed with pile or neoprene weather-stripping. Sash shall be removable to the inside for cleaning.

E. Frames shall be identical to that of the acoustically tested unit. Frame shall be free of defects impairing strength and durability.

F. Window assemblies shall be as noted, with metal frame, finish as selected by Architect from manufacturer's standard finishes.

G. Refer to Drawings for acoustically-rated window locations, details, and dimensions.

H. The glazing shall be as necessary to achieve the specified transmission loss performance and visual clarity requirements for function.

I. Basis of Design glazing manufacturer for lead-free optically clear glazing: Schott North America.

1. Additional Manufacturers and Products that may be considered if they meet or exceed the scheduled performance:

a. PPG, Starphire.
b. Pilkington, Optiwhite

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and me-chanical properties after fabrication and installation.

1. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
2. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
3. Interlayer Thickness: Provide thickness not less than needed to comply with requirements.
4. Interlayer Color: Clear.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, shape and strength complying with applications indicated and with a proven record of compatibility with surfaces contacted in installation.

B. Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain seal to comply with requirements.

C. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

D. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

E. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

F. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.5 FABRICATION

A. Assembly and adjustment of window units, frames, stop, glazing, acoustic seals, sound-absorbing material and concealed fasteners shall be performed at the factory. Each unit shall be shipped to the job site ready for installation and subsequent operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, and operational clearances.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install acoustically rated windows under direct supervision of the manufacturer or his representative using skilled mechanics. Anchorage to the building structure shall be in accordance with approved Shop Drawings.

1. Adjustment of frame and acoustic gaskets shall take place to ensure proper fit, and performance.

B. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components.

C. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

D. Install sealant on both sides of perimeter of each window. Sealant installation shall be performed as a part of this work to insure overall performance of the window system.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Install acoustically rated windows for a tight fit at contact points and for acoustic separation.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085673

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.

C. Related Sections:

1. Division 06 Section “Rough Carpentry”.
2. Division 08 Section “Hollow Metal Doors and Frames”.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “Sound Control Wood Door Assemblies”.
5. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.

4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during

the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

a. Hager Companies (HA) - BB Series, 5-knuckle.
b. McKinney (MK) - TA/T4A Series, 5-knuckle.
c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.2 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.

3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Ives (IV).
    c. Rockwood (RO).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Door Controls International (DC).
    b. Rockwood (RO).
    c. Trimco (TC).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Hiawatha, Inc. (HI).
    b. Rockwood (RO).
    c. Trimco (TC).

2.3 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Three (3).
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

F. Construction Keying: Provide temporary keyed construction cores.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.4 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.
c. Schlage (SC) - L9000 Series.

2.5 DEADLOCKS AND LATCHES

A. Mortise Deadlocks, Large Case: ANSI/BHMA A156.13 Grade 1 Certified Products Directory (CPD) listed large case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. One piece stainless steel bolts with a 1" throw. Deadlocks to be products of the same source manufacturer and keyway as other locksets.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.
c. Schlage (SC) - L9460 Series.

2.6 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.7 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

a. HES (HS) - 1500/1600 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.

b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
c. No catch points: addition of applied deflectors or other added components are not allowed.
d. No visible plastic.
e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
f. Constructed of all stainless steel.
g. Stainless steel pullman type latch with deadlock feature.
h. Narrow or wide style exterior trim as specified in the hardware sets.
i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
j. Ten-year limited warranty for mechanical features.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
b. Sargent Manufacturing (SA) - PE80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.

2.9 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - DC6000 Series.
    b. Norton Rixson (NO) - 7500 Series.
    c. Sargent Manufacturing (SA) - 351 Series.

2.10 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Hiawatha, Inc. (HI).
    c. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Norton Rixson (RF).
    b. Rockwood (RO).
    c. Sargent Manufacturing (SA).

2.11 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).
2. Reese Enterprises, Inc. (RE).
3. Zero (ZE).

2.12 ELECTRONIC ACCESSORIES

A. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:

a. Securitron (SU) - AQL Series.

2.13 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Glazing in doors
2. Glazing in mirrors
3. Glazing in acoustically rated interior windows

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product; 12 inches (300 mm) square.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."

2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

K. Safety Standards: Comply with CBC Chapter 24, safety glazing requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.

2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS IN DOORS (GL-01)

1. See Section 088813 for Fire Rated Glazing requirements.

2.3 MIRRORS (GL-02)

A. See Section 088300 for Mirrors

2.4 ACOUSTICALLY RATED PROJECTION PORT AND CONTROL ROOM WINDOWS (GL-03, GL-04, GL-05)

A. See Section 085673 Acoustically Rated Window Assemblies

1. Window Type GL-03, GL-05: Fixed.
2. Window Type GL-04: Operable

2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.4 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silvered flat glass mirrors.

B. Related Requirements:

1. Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Mirrors: Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

C. Samples: For each type of the following:

1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
2. Mirror Trim: 12 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of mirror.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors in accordance with mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

B. Source Limitations for Mirror Accessories: Obtain mirror-glazing accessories from single source.

2.2 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C1503.

1. Basis-of-Design = MR-1 = 24” x 36”
2. Basis-of-Design = MR-2 = 36” x 36”
3. Basis-of-Design = MR-3 = Varies (See plan for length) x 36”

B. Tempered Glass Mirrors: Mirror Glazing Quality Q3 for blemish requirements and complying with ASTM C1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.

1. Nominal Thickness: 6.0 mm.

C. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

2.4 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Aluminum J-Channel Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
2. Aluminum J-Channel Top Trim: J-channels formed with front leg and back leg not less than 5/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
3. Finish: Clear bright anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 COORDINATION

A. Refer to electrical work for surface mounted LED linear lights, WL-1 & WL-2

2.6 FABRICATION

A. Shop fabricate mirrors to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts, so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Flat polished.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

D. Highlight electrical coordination for light fixtures.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced National Glass Association (NGA) publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

1. NGA Publications: "Glazing Manual" and "Installation Techniques Designed to Prolong the Life of Flat Glass Mirrors."

B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.

3.3 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer and NGA's publication "Proper Procedures for Cleaning Flat Glass Mirrors."

END OF SECTION 088300

SECTION 088813 - FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-resistance-rated glazing.

1.2 DEFINITIONS

A. Fire-Resistance-Rated Glazing: Glazing that prevents spread of fire and smoke and radiant heat and complies with requirements for rated walls and rated openings; capable of blocking radiant heat

B. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

C. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product; 12 inches square.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and glass testing agency.

B. Product Certificates: For each type of glass and glazing product.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the NGA's Certified Glass Installer Program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during remainder of construction period.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Tempered Glazing Units with Clear Intumescent Interlayer: Manufacturer agrees to replace units that deteriorate within specified warranty period. Deterioration of tempered glazing units with clear intumenscent interlayer is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass contrary to manufacturer's written instructions. Evidence of failure is air bubbles within units, or obstruction of vision by contamination or deterioration of intumescent interlayer.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Glass: For each glass type, obtain from single source from single manufacturer.

B. Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

A. Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.

1. Product GL-01
2. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

B. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.5 FIRE-RESISTANCE-RATED GLAZING

A. General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.

B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.

C. Fire-Resistance-Rated Framing and Doors: Fire-resistance-rated glazing with 60-, 90-, and 120-minute ratings requires framing and doors from glass supplier, tested as an assembly complying with ASTM E119 or UL 263.

D. Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, low-iron float glass; with intumescent interlayers; complying with 16 CFR 1201, Category II.

1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; Pyrobel fire-rated glass or comparable product by one of the following:

    a. AGC Glass.
    b. Pilkington North America

2.6 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

B. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

C. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

C. Perimeter Insulation for Fire-Resistance-Rated Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch- (3-mm-) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 FIRE-RESISTANCE-RATED GLAZING SCHEDULE

A. Glass Type: 90-minute fire-resistance-rated glazing complying with ASTM E119 or UL 263 in a tested assembly of glass and framing with 250 deg F (121 deg C) temperature-rise limitation; 450 deg F (250 deg C) temperature-rise limitation for door vision areas; fire-resistance-rated laminated glass with intumescent interlayers.

END OF SECTION 088813

SECTION 092216 – NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing systems.
2. Suspension systems.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Framing systems.
2. Suspension systems.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For high-strength steel studs and tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, the Steel Stud Manufacturers Association, or the Supreme Steel Framing System Association.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received prior to installation.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

C. Horizontal Deflection: For composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).

D. Design framing systems in accordance with AISI S220, "North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members," unless otherwise indicated.

E. Design Loads: As indicated on architectural Drawings or 5 lbf/sq. ft. (239 Pa) minimum as required by the IBC.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with AISI S220 and ASTM C645, Section 10 for conditions indicated.

1. Steel Sheet Components: Comply with AISI S220 and ASTM C645, Section 10 requirements for metal unless otherwise indicated
2. Protective Coating: Comply with AISI S220; ASTM A653/A653M, G40 (Z120); or coating with equivalent corrosion resistance. Galvannealed products are unacceptable.

a. Coating demonstrates equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.

B. Studs and Track: AISI S220 and ASTM C645, Section 10.

1. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
2. Depth: As indicated on Drawings.

C. High-Strength Steel Studs and Tracks: Roll-formed with surface deformations to stiffen the framing members.

1. Minimum Base-Steel Thickness: As required by horizontal deflection performance requirements.
2. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide the following:

1. Single Long-Leg Track System: Top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Steel Thickness: 0.0296 inch (0.752 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels:

1. Minimum Base-Steel Thickness: 0.0296 inch (0.752 mm).
2. Depth: As indicated on Drawings.

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped as indicated on drawings.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

C. Flat Hangers: Steel sheet, in size indicated on Drawings.

D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch (1.367-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Tracks:

    a. Minimum Base-Steel Thickness: 0.0329 inch (0.836 mm).
    b. Depth: As indicated on Drawings.

    c. Minimum Base-Steel Thickness: 0.0329 inch (0.836 mm).

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLATION OF FRAMING SYSTEMS

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 INSTALLATION OF SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
3. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

3.5 FIELD QUALITY CONTROL

A. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Section 079219 "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum wallboard.
2. Gypsum board, Type X.
3. Mold-resistant gypsum board.
4. Cementitious backer units.
5. Interior trim.
6. Aluminum trim.
7. Joint treatment materials.
8. Sound-attenuation blankets.

B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.3 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.4 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed; SAINT-GOBAIN.
b. Georgia-Pacific Gypsum LLC.
c. Gold Bond Building Products, LLC provided by National Gypsum Company.

d. USG Corporation.

2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed; SAINT-GOBAIN.
b. Georgia-Pacific Gypsum LLC.
c. Gold Bond Building Products, LLC provided by National Gypsum Company.
d. USG Corporation.

2. Thickness: 5/8 inch (15.9 mm).
3. Long Edges: Tapered.

C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed; SAINT-GOBAIN.
b. Georgia-Pacific Gypsum LLC.
c. Gold Bond Building Products, LLC provided by National Gypsum Company.
d. USG Corporation.

2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed; SAINT-GOBAIN.
b. Custom Building Products.
c. USG Corporation.

2. Thickness: 5/8 inch (15.9 mm).
3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Flannery, Inc.
   b. Fry Reglet Corporation.
   c. Pittcon Industries.
   d. Tamlyn.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221 (ASTM B221M), Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

   a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: Where required for fire-resistance-rated assembly.
3. Mold-Resistant Type: Painted surfaces in toilet rooms, and where indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLATION OF TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings, in accordance with ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated on Drawings.
4. U-Bead: Use where indicated on Drawings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING OF GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Where indicated on Drawings.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

5. Level 5: Where indicated on Drawings.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain floor tile.
2. Glazed wall tile.
3. Thresholds.
4. Waterproof membranes.
5. Setting material.
6. Grout materials.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of movement joints in tile surfaces.
2. Section 092900 "Gypsum Board" for tile backing panels.

1.2 DEFINITIONS

A. General: Definitions in ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Face Size: Actual tile size, excluding spacer lugs.

C. Large Format Tile: Tile with at least one edge 15 inches (381 mm) or longer.

D. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations, plans, and elevations, of each type of tile and tile pattern. Show widths, details, and locations of movement joints in tile substrates and finished tile surfaces. Show thresholds.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection or shade variation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of product, including product use classification.

C. Product Test Reports:

1. Tile-setting and -grouting products.
2. Certified porcelain tile.
3. Slip-resistance test reports from qualified independent testing agency.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard Grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 PORCELAIN FLOOR TILE

A. Porcelain Floor Tile: Unglazed.

1. Basis-of-Design Product FT-01: As indicated on Sheet A900.00 Finish Schedule, or approved equal.

2.4 GLAZED WALL TILE

A. Glazed Wall Tile:

1. Basis-of-Design Product WT-01: As indicated on Sheet A900.00 Finish Schedule, or approved equal.

2.5 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

B. Solid-Surface Thresholds:

1. Basis-of-Design Product FT-02: As indicated on Sheet A900.00 Finish Schedule, or approved equal.

2.6 WATERPROOF MEMBRANES

A. General: Manufacturer's standard product that complies with ANSI A118.10 and ANSI A118.12 and is recommended by manufacturer for application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Waterproof Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mapei Mapelastic AquaDefense, or approved equal.

2.7 SETTING MATERIALS

A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mapei Large-Format Floor & Wall Tile Mortar, or approved equal.
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.4.

2.8 GROUT MATERIALS

A. Organic Pre-Mixed Grout: ANSI A118.19.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mapei Flexcolor CQ, or approved equal.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting and adhesive materials for installations indicated.

B. Metal Edge Trim: Profile as indicated on drawings, height to match tile and setting-bed thickness, metallic, designed specifically for tile applications at walls and floors.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Schluter Systems.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors comply with surface finish requirements in ANSI A108.01 for installations indicated.

a. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting materials.

B. Fill cracks, holes, and depressions in concrete substrates for tile floors with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Substrate Flatness:

1. For tile shorter than 15 inches (381 mm), confirm that structure or substrate is limited to variation of 1/4 inch in 10 ft. (6.4 mm in 3 m) from the required plane, and no more than 1/16 inch in 12 inches (1.5 mm in 300 mm) when measured from tile surface high points.
2. For large format tile, tile with at least one edge 15 inches (381 mm) or longer, confirm that structure or substrate is limited to 1/8 inch in 10 ft. (3 mm in 3 m) from the required plane, and no more than 1/16 inch in 24 inches (1.5 mm in 609 mm) when measured from tile surface high points.

3.3 INSTALLATION OF CERAMIC TILE SYSTEM

A. Install tile backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

B. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

C. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

1. Add materials, water, and additives in accurate proportions.
2. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

D. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply

with parts of ANSI A108 series that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

    a. Tile floors in wet areas.
    b. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
    c. Tile floors consisting of rib-backed tiles.

2. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
3. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
4. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
5. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
6. Jointing Pattern: Lay tile in pattern indicated on drawings. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

    a. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
    b. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

7. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

E. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

F. Metal Wall Trim: Install at locations indicated on Drawings.

3.4 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile in accordance with tile and grout manufacturer's written instructions. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:

    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Sprinklers.
    f. Access panels.
    g. Perimeter moldings.

7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
8. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48).

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations for Ceiling System: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A in accordance with ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Product ACT-01: As indicated on Sheet A900.00 Finish Schedule, or approved equal.

B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Color: Matte Black

2.4 METAL SUSPENSION SYSTEM

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.

1. Structural Classification: Intermediate -duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel.
5. Cap Finish: Painted to match color of acoustical unit.

2.5 ACCESSORIES

A. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- (2.69-mm-) diameter wire.

B. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

C. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings to fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 079200 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF ACOUSTICAL PANEL CEILINGS

A. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

C. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

D. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. Arrange directionally patterned acoustical panels as follows:

    a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.
2. Vinyl molding accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

1.3 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. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. Basis-of-Design Product RB-01: As indicated on Sheet A900.00 Finish Schedule, or approved equal.

B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient floor coverings.

C. Thickness: 0.125 inch (3.2 mm).

D. Lengths: Coils in manufacturer's standard length.

E. Outside Corners: Job formed.

F. Inside Corners: Job formed.

2.2 VINYL MOLDING ACCESSORY

A. Description: Vinyl transition strips.

B. Profile and Dimensions: As indicated.

C. Locations: Provide vinyl molding accessories in areas indicated.

D. Colors and Patterns: Match Architect's sample.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

   a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

   a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.

    a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color, and pattern in locations directed by Architect.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 SOLID VINYL FLOOR TILE

A. Basis-of-Design Product LVT-01: As indicated on Sheet A900.00 Finish Schedule, or approved equal.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a relative humidity level measurement within manufacturer's allowable range.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Textile wall covering.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.

C. Samples for Verification: Full width by 36-inch- (914-mm-) long section of wall covering.

1. Sample from same print run or dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

C. Coordination Drawings: Elevations 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. Electrical outlets, switches, and thermostats.
2. Items penetrating or covered by stretched-fabric systems including the following:

a. Speakers.

3. Show operation of hinged components covered by or adjacent to stretched-fabric systems.

D. Qualification Data: For Installer.

E. Product Certificates: For each type of stretched-fabric system.

F. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 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. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

1.7 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: As follows, per ASTM E 84:

a. Flame-Spread Index: 25 or less.

2. Fire-Growth Contribution: Textile wall coverings complying with acceptance criteria of UBC Standard 8-2.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 WALL COVERINGS

A. General: Provide rolls of each type of wall covering from same print run or dye lot.

B. Source Limitations: Obtain stretched-fabric systems from single source from single manufacturer.

C. Approved equals must match Architect's sample for color, finish, and acoustic characteristics relating to aesthetic effects and sound absorption. Architect shall be the sole judge of acceptable matching materials.

2.2 TEXTILE WALL COVERING (FWC)

A. Wall-Covering Standard: Provide wall coverings that comply with ASTM F 793 for Category V, Type II, Commercial Serviceability products.

B. Test Responses:

1. Colorfastness to Wet and Dry Crocking: Passes AATCC 8, Grade 3, minimum.
2. Colorfastness to Light: Passes AATCC 16, Option 1 or 3, Grade 4, minimum, at 40 hours.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer.

1. Adhesive shall have VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Primer/Sealer: Mildew resistant, complying with requirements of wall-covering manufacturer for intended substrate.

C. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
2. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

G. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.3 INSTALLATION

A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.

B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

D. Install reversing every other strip.

E. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

F. Match pattern 72 inches (1830 mm) above the finish floor.

G. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 3 inches (75 mm) from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

I. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 098400 – ACOUSTIC WOOD PANEL CEILING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustic wood panel ceiling system.

1.2 DEFINITIONS

A. NRC: Noise Reduction Coefficient.

1.3 COORDINATION

A. Coordinate layout and installation of acoustic wood panel ceiling system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Take field dimension measurements prior to preparation of shop drawings. Measure applicable areas to confirm location of panel supports in accordance with installation instructions and delegated design requirements.
2. Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:

    a. Ceiling patterns and joints.
    b. Ceiling suspension members.
    c. Method of attaching hangers to building structure and locations of cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
    d. Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
    e. Ceiling perimeter and penetrations through ceiling; trim and moldings.

C. Samples: For each exposed product and for each color and finish specified, in manufacturer's or fabricator's standard size.

D. Delegated-Design Submittal: For acoustic wood panel ceiling system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For acoustic wood panel ceiling system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for acoustic wood panel ceiling system.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required for specified products, with minimum three years' experience in similar project work.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.

1. Build mockup of typical ceiling area, minimum 100 sq. ft.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Delegated Design Engineer: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install panels until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install panels until a permanent level of lighting is provided on surfaces to receive the panels.

C. Air-Quality Limitations: Protect panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify panel locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design supports and anchorages for the acoustic wood panel ceiling system.

B. Fire-Test-Response Characteristics: Panels shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

C. Acoustic Performance: Submitted products, if different from the Basis-of-Design Products listed below, must meet or exceed the acoustic performance of the Basis-of-Design Product and be approved by the Architect.

2.2 ACOUSTIC WOOD PANEL CEILING SYSTEM

A. Acoustic Wood Panel Ceiling System: Microperforated, with 0.5 mm holes in a 1 mm veneer layer that is adhered to a maximally-perforated MDF substrate.

1. Basis-of-Design Product WPC-01: As indicated on Sheet A900.00 Finish Schedule, or approved equal, including:

a. Armstong ACGI SS5 Hook on System, # SS5-4896-C
b. Topakustik Acoustic Wooden Panel Micro Type 3/3

B. Acoustic Performance: 0.80 NRC.

C. Construction:

1. Face Profile: 3/3/0.5.
2. Rear Perforation: M-hole perforation; standard perforation of MDF panel (single diameter through MDF).
3. Veneer: European Oak, WD-01, As indicated on Sheet A900.00 Finish Schedule.
4. Grain Cut: Plain Slice.
5. Matching Within Panel: Book.
6. Matching Between Panels: Random, with colors mixed for consistent appearance.
7. Finish: Natural lacquer with matte finish.
8. Edge Conditions: Edgebanding on all sides of panels.
9. Border: Perforations on panel face stop short of panel edge by 1-inch.
10. Backing: Black, nonwoven glass fiber matt, adhered to rear of panel.
11. Rear Balance: Perforated CPL layer on back of panel to act as balance for panel construction.
12. Acoustic Insulation: 1-inch thick 6 lb/cu. ft. density fiberglass.
13. Panel Cutouts: Factory completed with unfinished edges and microperforations not held back.

D. Suspension System: Full accessibility suspension grid system consisting of a primary U-profile grid member, and a secondary G-profile grid member that supports the weight of the panels. Panels are fitted with a custom edge profile to hang on the G-profile runner.

1. Provide attachment to structure in accordance with delegated design requirements and approved shop drawings.
2. Suspension system hardware includes but is not limited to U-profile main runner, G-profile secondary grid, connection brackets to the U-profile, transverse panel stiffening, screws to attach hardware to rear perforations, and any wall connection profiles.
3. Secure panels with wire rope as necessary for local codes and ordinances.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and with requirements for installation tolerances and other conditions affecting performance of acoustic wood panel ceiling system.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustic wood panel ceiling system.

1. Balance border widths at opposite edges of each ceiling.
2. Avoid using less-than-half-width units.

3.3 INSTALLATION

A. Install acoustic wood panel ceiling system and accessories in accordance with manufacturer's written instructions and to accommodate natural expansion and contraction of wood products resulting from fluctuations in humidity.

3.4 CLEANING

A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

B. Touch up any finish damage.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 098400

SECTION 098414 – ACOUSTIC FABRIC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes sound transparent fabric.

B. Related Section:

1. Section 274116 – Integrated Audiovisual Systems for speakers for SOUND TRANSPARENT FABRIC.
2. Section 097200 – Novawall system for WALL COVERING FABRIC

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. Samples for Verification: 6” X 6” swatches to match the existing in the field.

C. Mock-up

1. SOUND TRANSPARENT FABRIC:6” x 6” swatch with spray-paint to match existing in the field
2. WALL COVERING FABRIC: No mock-up required.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency & Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

C. Product Certificates: For each type of fabric.

D. Sample Warranty: For each type of fabric.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fabric to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: Per ASTM E 84: Flame-Spread Index: 25 or less.
2. Fire-Growth Contribution: Acceptance criteria of UBC Standard 8-2.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.

PART 2 - PRODUCTS

2.1 SOUND TRANSPARENT FABRIC MATERIAL

A. Sounds transparent fabric shall consist of l00% polyester, 2 ply yarn. Fabric construction shall be a non-directional weave of l6 x l7 (± 1) strands per square inch with a weight of no more than 16 (± 0.5) ounces per linear yard. Maximum width is 66”.Copy and re-edit "Alternate No. (Insert number)" Paragraph below for each alternate required for Project. See samples of alternate descriptions in the Evaluations. Revise below when additional clarification of base bid and alternate conditions will assist bidders and the Contractor in understanding scope of each. The specifier should ensure that Work of alternates is adequately covered in the individual specification Sections.

B. Physical performance shall be: tensile strength-minimum 150 lbs. (ASTM-D-5034), tear strength-minimum 30 lbs (ASTM D2262), moisture regain-maximum 0.5% (ASTM D2654),

colorfastness to light-minimum 40 hours (AATCC-16A). Flammability shall meet NFPA70l, ASTM-E84, Class l or A, state of California (CS-191-53), and NY-NJ Port Authority (FTMS191-5903)

2.2 SOUND TRANSPARENT FABRIC

A. General: Provide rolls of each type of wall covering from same print run or dye lot.

B. Original Product: Note: This has been discontinued.

1. Description: Speaker Grille Cloth
2. Series: Acoustone
3. Spray-paint: S-W Pro-Mar 200 Zero VOC Eggshell Enamel – SW 6035 Gauzy White
4. Pattern: FR7010
5. Content: Vinyl Coated Fiberglass
6. Notes 1: Spray-painted to match Xorel fabric wallcovering by Novasystems.
7. Notes 2: Painting must not compromise acoustical transparency
8. Notes 3: Painting must not block openness of weave.

C. Basis of Design: Product F-03: As indicated on Sheet A900.00 Finish Schedule, or approved equal.

1. MANUFACTURERS

a. Guilford, Model FR-701 from Guilford of Maine Textile Resources, Grand Rapids, MI, 1-800-544-0200 www.acousticalsurfaces.com/fabric_panel/fabricsel.htm
b. Acoustone Type 2P Fabric or FR Sound Flow Vinyl from New Castle Fabrics Corp., Brooklyn, NY 718-782-5560 www.newcastlefabrics.com/acoustone.htm
c. Or approved equal.

2.3 WALL COVERING FABRIC

A. General: Provide rolls of each type of wall covering from same print run or dye lot.

B. Basis of Design: Note: This has been discontinued.

1. Description: Paper-backed fabric wallcovering at rear Auditorium upper walls
2. Series: Xorel
3. Color: W403
4. Pattern: Nexus 6425
5. Content: 100% Xorel
6. Notes 1: Qualified for heavy duty contact use: no wear after 1,000,00 double rubs
7. Notes 2: Free of PVC, Chlorine, Plasticizer, Heavy Metals, & VOCs

C. Basis of Design: Product F-04: As indicated on Sheet A900.00 Finish Schedule, or approved equal.

1. MANUFACTURES

   a. Carnegie Fabrics, Model Xorel Nexus from Rockville Center, NY 1-800-727-6770

      1) Submit the following colors for field verification:

         a) Xorel Nexus 6425 919 - Nexus | Panels | Carnegie Fabrics
         b) Xorel Nexus 6425 920 - Nexus | Panels | Carnegie Fabrics
         c) Xorel Nexus 6425 903 - Nexus | Panels | Carnegie Fabrics

2. NovaWall panels must be serviced by their approved vendor. GC shall coordinate the work with Cavanaugh-Wall.

   1) Ron Brooks, Cavanaugh-Wall Solutions Inc, 580 Fifth Avenue, Suite 820, New York, NY 10036. 610-524-5353 x108, Ron@cavanaugh-wall.com

PART 3 - EXECUTION

3.1 EXAMINATION - SOUND TRANSPARENT FABRIC

A. Examine existing cover to determine if speaker cover is removable.

B. Proceed with procurement only if speaker cover cannot be removed without damaging fabric.

3.2 INSTALLATION - SOUND TRANSPARENT FABRIC

A. Remove existing fabric. Install new speaker as defined in Division 27.

B. Install fabric covering taught, plumb and aligned horizontally and vertically with no sags, gaps, bowing and flexing.

C. Examine fabric as it is installed for damage imperfections, poor color match or other deficiencies. Replace with acceptable material as directed by the Architect.

3.3 EXAMINATION - WALL COVERING FABRIC

A. Examine all locations for new penetrations with representative from Cavanaugh-Wall to determine all locations to be modified.

B. Cavanaugh-Wall will be responsible for removing all panels to be modified.

C. General contractor shall prepare all masonry and electrical work.

3.4 INSTALLATION – WALL COVERING FABRIC

A. General contractor shall complete all masonry and electrical work.

B. Cavanaugh-Wall will be responsible for reinstalling all modified panels.

END OF SECTION 098414

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.3 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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Previously Painted Surfaces: Clean surface of all foreign material. Abrade existing painted surfaces. Apply test area, allowing paint to dry one week before testing adhesion. If adhesion is poor, provide additional abrasion or remove previous coating down to substrate. Retest surface for adhesion, and perform additional surface preparation until adhesion testing is successful.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Gypsum Board Ceiling – Latex Flat Finish

1. Primer: 1 coat SW ProMar 200 Zero VOC Interior Latex Primer
2. Finish: 2 coats SW ProMar 200 Zero VOC Interior Latex Flat

B. Gypsum Board Ceiling – Latex Semi-Gloss Finish

1. Primer: 1 coat SW ProMar 200 Zero VOC Interior Latex Primer
2. Finish: 2 coats SW ProMar 200 Zero VOC Interior Latex Semi-Gloss

C. Gypsum Board Ceiling – Latex Eggshell Finish

1. Primer: 1 coat SW ProMar 200 Zero VOC Interior Latex Primer
2. Finish: 2 coats SW ProMar 200 Zero VOC Interior Latex Eg-Shel

D. Gypsum Board Walls – Latex Eggshell Finish

1. Primer: 1 coat SW ProMar 200 Zero VOC Interior Latex Primer
2. Finish: 2 coats SW ProMar 200 Zero VOC Interior Latex Eg-Shel

E. Gypsum Board Walls - Latex Semi-Gloss Finish

1. Primer: 1 coat SW ProMar 200 Zero VOC Interior Latex Primer
2. Finish: 2 coats SW ProMar 200 Zero VOC Interior Latex Semi-Gloss

F. Ferrous Metal – Semi-Gloss Acrylic

1. Primer: 1 coat SW Pro Industrial Pro-Cryl Universal Primer
2. Finish: 2 coats SW Pro Industrial Semi-Gloss Acrylic

G. Spraying of Exposed Construction at Ceilings

1. Surface Preparation: All surfaces must be smooth and clean
2. Finish: 2 coats SW Waterborne Acrylic Dryfall Flat Finish

END OF SECTION 099123

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dimensional characters.

a. Cutout dimensional characters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cutout Characters: Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. APCO Signs.
b. A.R.K. Ramos Architectural Signage Systems.
c. ASI Sign Systems.
d. Gemini Inc.

2. Character Material: Sheet or plate brass.
3. Character Height: As indicated on Drawings.
4. Thickness: 0.25 inch (6.35 mm).
5. Finishes:

a. Integral Metal Finish: As selected by Architect from full range of industry finishes.

6. Mounting: Projecting studs.

2.2 DIMENSIONAL CHARACTER MATERIALS

A. Brass Sheet (Yellow Brass): ASTM B36/B36M, alloy recommended by manufacturer and finisher for finish indicated.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. Sign Mounting Fasteners:

a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
3. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

2.6 LACQUER COATING FOR COPPER-ALLOY FINISHES

A. Lacquer Coating: Clear, organic, waterborne, air-drying, acrylic lacquer called "Incralac"; specially developed for coating copper-alloy products; consisting of a solution of acrylic resin, methyl methacrylate copolymer, leveling agent, and corrosion inhibitor benzotriazole.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Mounting Methods:

1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 102113.14 - STAINLESS STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel toilet compartments.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for blocking.
2. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Stainless steel toilet compartments.

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
4. Show locations of centerlines of toilet fixtures.
5. Show locations of floor drains.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available finishes for each type of toilet compartment.

1. Include Samples of hardware and accessories involving material and color selection.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

E. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: 10 fasteners of each size and type.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain stainless steel toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:

1. Panels are able to withstand a concentrated load on grab bar of at least 250 lbf (1112 N) applied at any direction and at any point, without deformation of panel.

C. Regulatory Requirements: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" for toilet compartments designated as accessible.

2.3 STAINLESS STEEL TOILET COMPARTMENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ASI Global Partitions; Standard Privacy-58, or comparable product by one of the following:

1. Bradley Corporation.
2. Hadrian Manufacturing Inc.
3. Metpar Corporation.

B. Toilet-Enclosure Style: Overhead braced.

C. Urinal-Screen Style: Wall hung flat panel.

D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) for doors and panels and 1-1/4 inches (32 mm) for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand specified structural performance requirements.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

E. Urinal-Screen Construction:

1. Flat-Panel Urinal Screen: Matching panel construction.

F. Facing Sheets and Closures: Stainless steel sheet of nominal thicknesses as follows:

1. Pilasters: Manufacturer's standard thickness, but not less than 22 gauge.
2. Panels: Manufacturer's standard thickness, but not less than 22 gauge.
3. Doors: Manufacturer's standard thickness, but not less than 22 gauge.
4. Flat-Panel Urinal Screens: Thickness matching panels.

G. Pilaster Shoes: Formed from stainless steel sheet, not less than 20 gauge nominal thickness and 3 inches (76 mm) high, finished to match hardware.

H. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

I. Stainless Steel Finish: Directional Satin Finish: ASTM A480/A480M, No. 4 on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.4 HARDWARE AND ACCESSORIES

A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories.

1. Hinges:

a. Manufacturer's continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.

1) Material, Continuous, Cam-Type Hinge: Stainless steel.

2. Latch and Keeper: Manufacturer's surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.

a. Material: Stainless steel.

3. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.

a. Material: Stainless steel.

4. Door Bumper: Manufacturer's rubber-tipped bumper at outswinging doors.

a. Material: Manufacturer's standard.

5. Door Pull: Manufacturer's unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.

a. Material: Stainless steel.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.5 MATERIALS

A. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

B. Stainless Steel Castings: ASTM A743/A743M.

2.6 FABRICATION

A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.

B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide inswinging doors for standard toilet enclosures and 36-inch- (914-mm-) wide outswinging doors with a minimum 32-inch- (813-mm-) wide clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels or Screens: 1/2 inch (13 mm).
b. Panels or Screens and Walls: 1 inch (25 mm).

2. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.

    a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 102113.14

SECTION 102653 – MISCELLANEOUS SAFETY SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Safety Padding.
2. Adhesively-applied non-skid strips.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type of product required, prepared on Samples of size indicated below.

1. Safety padding: corner section, minimum 12 inches, including striped finish.
2. Non-skid strips: Minimum 24 inch long piece of both striped and non-striped.
3. Exit sign: Full-size sample.

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. Safety Padding: Full-size covers of maximum length equal to 2 percent of each type of units installed, but no fewer than two full units.
2. Non-skid Strips: Full-size strips equal to 10 percent of each type, color, and texture of units installed, but no fewer than ten units.

B. Include mounting and accessory components.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain safety specialty units from single source from single manufacturer for each type of specialty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install safety units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

B. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 SAFETY PADDING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Boddingtons, a Fiberweb Brand.
b. Vestil Manufacturing.
c. Or Approved equal.

B. Materials: Flexible polyurethane foam.

1. Water-resistant skin surface.
2. Color: Yellow and black stripe.
3. Profiles: As required.

a. Thickness: Minimum 1/4 inch thick for corner protection profiles.

4. Mounting: Self-adhesive backing.

2.3 NON-SKID STRIPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Flex-Tred Anti-Slip Tape by Wooster Products, 1000 Spruce Street, Wooster, OH (800.321.4936) or comparable product.

B. Strips: Minimum 1 inch wide, self-adhesive tape.

1. Provide in lengths to cover the width of the surfaces indicated, or field cut rolls of tape to fit.
2. Tape shall bend repeatedly over sharp corners without fracture.
3. Resistant to solvents.
4. Color: Ultra Grip Black.

a. Provide Yellow Stripe Safety for all surface edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. For units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing safety system components.

3.3 INSTALLATION

A. Install all safety devices as recommended by the manufacturer.

3.4 CLEANING

A. Protect the finished work from damage by work of other Sections during the remainder of the construction period.

B. Finished units shall be without damage. Units damaged during shipping or construction shall be replaced by the Contractor.

END OF SECTION 102653

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Childcare accessories.

B. Related Requirements:

1. Section 088300 "Mirrors" for frameless mirrors.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Public-use washroom accessories.
2. Public-use shower room accessories.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

D. Delegated Design Submittals: For grab bars and shower seats.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
2. Shower Seats: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.

B. Basis-of-Design Products: As indicated on Sheet A201.00 & A900.00 Finish Schedule, or approved equals.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

A. Source Limitations: Obtain each type of public-use shower room accessory from single source from single manufacturer.

B. Basis-of-Design Products: As indicated on Sheet A201.00 & A900.00 Finish Schedule, or approved equals.

2.4 PUBLIC-USE DRESSSING ROOM ACCESSORIES

A. Source Limitations: Obtain each type of public-use dressing room accessory from single source from single manufacturer.

B. Basis-of-Design Products: As indicated on Sheet A201.00, A202.00 & A900.00 Finish Schedule, or approved equals.

2.5 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.

B. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.

C. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

E. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 102800

SECTION 116113 – NETWORKED LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes all labor, materials, equipment and services necessary to manufacture and deliver to job site, for installation by Electrical Contractor, a complete Lighting Control System, as shown on the drawings and/or specified herein, including but not limited to the following:

1. Type 1: Primarily ACN/Ethernet structure

a. Type 1 will be used for the Haft Auditorium

1) Mains-fed and feed-through relay panels, as indicated on drawings.
2) Ethernet control system equipment rack and contents, including:

a) Ethernet switches
b) DMX splitters with related cabling
c) Interfaces with other building systems as required, such as building automation, A/V controls, fire alarm control panel, and related input/output interfaces
d) Battery back-up

3) Signal distribution using Ethernet Taps and other fixed control devices.
4) Streaming ACN (sACN) compatible Lighting Control Console and associated equipment.
5) Architectural lighting control stations (house light stations), including button stations and network-compatible touchscreen stations.
6) Architectural lighting DMX distribution system including UL 924 emergency lighting control overrides (UL 1008 emergency lighting power transfer specified elsewhere).

b. Design intent - PARADIGM

1) Lighting Control System shall manage performance lighting for each “Type 1” space, independently from each other, with the following minimum capabilities:

a) Record presets based on live lighting levels generated by lighting control stations and/or Lighting Control Console(s).

b) Recall presets through user input, timeclock events, occupancy/vacancy sensors, daylight sensors, or external triggers as specified (May include: Building Automation System, Audiovisual System, Fire Alarm, Power Loss, Demand Response / Load Shedding).
c) Manipulate all features of individual architectural lighting fixtures (house lights) and stage lighting fixtures with lighting control station(s) and Lighting Control Console(s)(s).
d) Control equipment can be connected to the network at any Ethernet Tap.
e) Fixtures and devices may be added to the network at any Ethernet Tap. Signal adapters, such as DMX Gateways, may be required to connect fixtures and devices to network.
f) Allow simultaneous control of lighting fixtures by lighting control stations and Lighting Control Console(s), with Owner-defined priority levels for each. Control stations may be locked out during performance conditions.
g) Emergency override of DMX levels when triggered by Fire Alarm.
h) Loss of power phase sense device triggers emergency override of DMX levels.

1.3 MANUFACTURING STANDARDS

A. Manufacture all work in accordance with the latest editions of applicable publications and standards of the following organizations:

1. National Electric Code (NEC) and all prevailing local and state regulations including:

   a. ANSI/NFPA 70: National Electrical Code

2. Entertainment Services and Technology Association (ESTA) including:

   a. ANSI/ESTA E1.3-2001(R2021): Lighting Control Systems – 0-10V Analog Control Specification
   b. ANSI/ESTA E1.11-2008 (R2018): USITT DMX512-A
   c. ANSI/ESTA E1.17-2015 (R2020): Architecture for Control Networks (ACN)
   d. ANS/ESTA E1.20-2010: Remote Device Management over USITT DMX512
   e. ANSI/ESTA E1.27-1-2006 (R2021): Portable Control Cables for DMX512
   f. ANSI/ESTA E1.27-2-2009 (R2019): Permanently Installed Control Cables for DMX512
   g. ANSI/ESTA E1.31-2018: ACN transport of DMX512

3. Occupational Safety & Health Act (OSHA)

1.4 SUBMITTALS

A. Prepare and submit documents for review in accordance with the requirements of the Contract Documents.

B. Product Data Sheets

1. For Manufacturer standard panels, enclosures, modules, devices, and other equipment, with options and other variables clearly noted on data sheets.

C. Shop drawings shall be reviewed by the Architect before fabrication begins.

a. Such review does not relieve the Manufacturer of the responsibility of providing equipment in accordance with this Specification.

D. Shop drawings showing:

a. Optical or transformer isolation of all control data lines between dimmer racks, panels, and architectural lighting processor.
b. Materials, finishes, metal gauges, overall and detail dimensions, sizes, electrical and mechanical connections, fasteners, welds, provisions for the work of others, and similar information.
c. Complete details of equipment, including manufacturer's catalog numbers for components, including complete wiring diagrams.

2. Any deviation from this Specification shall be clouded and noted in letters a minimum 1/4 inches high.

a. In order for a deviation to be considered, it shall upgrade the quality of the equipment or respond to a field condition.

3. Incomplete shop drawing submittals will not be reviewed
4. Update reviewed shop drawings to show any changes made during manufacturing and assembly and send to the Architect before the equipment is delivered.

E. Installation instructions for all equipment

1. Including, but not limited to, connection diagrams, termination designations, etc.

F. Coordination Drawings

1. Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.

a. Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.
b. For networked controls, list network protocols and provide statements from manufacturers that input and output devices meet interoperability requirements of the network protocol.

G. Operations and Maintenance Manual

1. Not more than fourteen days after system checkout is complete, the Manufacturer shall provide the Owner with the following:

a. One O&M manual printed “hard” copy
b. Two flash drives of O&M manual documents
c. O&M Manuals to include, but not limited to:

1) Copies of all “record” shop drawings.
2) Catalog cuts of all equipment provided.
3) Recommendations for periodic maintenance.
4) Catalog numbers and manufacturer's names and addresses for perishable items such as pilot lamps and fuses.
5) Diagnostic procedures.
6) Internet address for online access to manuals, product literature and troubleshooting guides.
7) Emergency and normal repair telephone contact sheet for 7-day, 24-hour service.

H. Lighting Control Console Manual(s)

1. Provide to the Owner at time of system checkout, one printed “hard copy” of the User Instruction Manual for each Lighting Control Console type, in a 3-ring binder or similar.
2. Lighting Control Console(s) manual(s) may be requested by the Owner’s Representative at a date prior to the system checkout.

1.5 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 0-degrees to 40-degrees C (32-degrees to 104-degrees F)
2. Relative humidity: Maximum 90 percent, non-condensing.
3. Protect Lighting Control System from dust during installation.

1.6 COORDINATION

A. Coordinate lighting control components to form an integrated interconnection of compatible components.

1. Match components and interconnections for optimum performance of lighting control functions.
2. Coordinate lighting controls with BAS if applicable. Design display graphics showing building areas controlled; include the status of lighting controls in each area.
3. Coordinate lighting controls with Audiovisual system if applicable. Program appropriate preset triggers and supply necessary strings to AV contractor.
4. Coordinate lighting controls with Fire Alarm system if applicable.

5. Coordinate lighting controls with other Sections specifying distribution components that are monitored or controlled by power monitoring and control equipment.

B. Coordinate lighting control loads specified in this Section with components providing overcurrent protection as specified in Division 26 Section "Panelboards."

1.7 DELIVERY

A. If required by the Construction Manager or Electrical Contractor, deliver equipment in a minimum of three separate shipments that shall include:

1. Shipment #1: All items in which conduit is terminated which includes dimmer racks, panels, control station back boxes, etc.
2. Shipment #2: All items in which wiring is terminated including control station faceplates, etc.
3. Shipment #3: All items that are not required until system activation by the Manufacturer's field service representative. This includes dimmer modules, electronics modules, control consoles, gateways, monitors, cables, etc.

B. If, through no fault of the Owner, the timely completion of the work of this Section is imperiled, the Lighting Control System Manufacturer shall prevent or minimize any delay by shipping the required product to the job site by air freight, at no additional cost to the Owner.

C. Bid price shall include full freight and insurance charges for all items to the job site.

1.8 QUALITY ASSURANCE

A. Manufacturer’s Quality System: Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.

B. Source Limitations: Obtain lighting control and power distribution components through one source from a single manufacturer wherever possible. The Integrator shall furnish all network lighting control components as described in the contract document or as required for a complete system regardless of source.

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 47 CFR, Subparts A and B, for Class A digital devices.

E. Comply with NFPA 70.

1.9 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two (2) years.

1. Include 24-hour telephone support with guaranteed callback time of less than one hour.

B. Upgrade Service: Update software and firmware to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading of software shall include operating systems where applicable. Upgrade shall include new or revised licenses for use of the software.

1. Provide thirty-day notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment, if necessary.

1.10 MANUFACTURERS RESPONSIBILITIES

A. Study the contract drawings and specifications with regard to the work as shown and required under this section so as to insure its completeness.

B. Manufacture and deliver equipment complete in all respects and to provide any additional equipment required to fulfill the intent of these drawings and specifications regardless of whether such items are herein specified or indicated.

C. Prepare and submit complete shop drawings and other submittals according to the requirements set forth in the Contract Documents and this Specification.

D. Coordinate delivery of all equipment with the Construction Manager and/or Electrical Contractor.

E. Deliver all material to the job site suitably crated, packed, and protected, and bearing the manufacturer's identification label and the nomenclature of the product(s) found in each carton or crate.

1.11 INTEGRATOR’S RESPONSIBILITIES

A. Provide equipment listed herein or shown on the QT series drawings for installation by the Electrical Contractor.

B. Provide services as detailed in this specification.

C. Coordinate the work of this section with other contractors.

D. Verify, by field measurement on the job site, all dimensions affecting the work

1. Bring field dimensions which vary from those on the approved shop drawings to the attention of the Architect.
2. If required, obtain a directive from the Architect and Owner regarding corrective measures before the start of fabrication of items affected by the variance.

1.12 WARRANTY

A. Manufacturer agrees to make all repairs, including replacement of components and parts, made necessary due to defects in design, workmanship, and materials without additional cost to the Owner for a period of two years from the date of acceptance of the completed system.

B. In the event of a system failure during the warranty period, manufacturer agrees to send to the job the necessary field service technician(s) within twenty-four hours of notification.

1. Technician(s) shall remain on the job until all necessary repairs have been made and the system is operational to the satisfaction of the Owner.

PART 2 - PRODUCTS

2.1 LIGHTING CONTROL SYSTEM MANUFACTURERS

A. Approved manufacturers for the work of this section:

1. Electronic Theatre Controls
Burbank, CA
(323) 461-0216
https://www.etcconnect.com/

B. Equal Manufacturers:

1. Subject to Division 01 Specifications, other manufacturers may submit for consideration as equal to the design basis manufacturer products.

a. Submittals for consideration must show conformance to project Specifications and system design requirements.

2. Manufacturer: Minimum ten years' experience in manufacture of architectural and theatrical lighting controls.
3. Final determination of suitability shall be at the discretion of the Specifier

2.2 INTEGRATED LIGHTING CONTROL PANELBOARDS (Labeled LCP-01 and LCP-02)

A. General:

1. Up to forty-eight network-controlled motorized circuit breakers.

a. UL listed and labeled.

2. Circuit breakers

a. Configured for single or dual pole load control as scheduled.
b. Remotely operated by network communication link.

3. Capable of acting as a standalone lighting control system with the following capabilities:

    a. Internal Astronomical Time Clock for programmed events.
    b. Accepts input from external button stations for recall of presets.
    c. Signal arbitration to prioritize inputs by source (sACN, DMX, Preset Stations, Time Clock, etc).
    d. Configurable loss-of-signal behavior including ‘hold last look’ and ‘activate preset’.

4. UL 924 rated input

    a. For triggering emergency ‘panic’ preset.

5. USB port

    a. For upload of configuration files and firmware updates

B. Physical:

1. Cabinets and Enclosures

    a. NEMA 1 enclosure sized to accept required relays.
    b. Surface mounted cover as required with captive screws in a hinged, lockable configuration.

2. Interior

    a. Provided with all internal equipment installed and tested

3. Panel side-mount enclosure

    a. Provided with low voltage control interface between network and motorized breakers, compliant with partitioning requirements for separation of line and low voltage.

C. Electrical:

1. Mains-fed LCP Panelboards shall be equipped with a hydraulic/magnetic full-load-rated main circuit breaker, as noted on each panel’s associated Panelboard Schedule on QT series Drawings. AIC rating as specified by Electrical Engineer.
2. Power Supply

    a. Transformer assembly with internal overcurrent protection, automatic reset, and metal oxide varistor protection against power line spikes.

3. Circuit Breakers containing solenoid actuators

    a. To move poles between open and closed positions.
    b. Overcurrent conditions shall cause a closed contact to open into ‘tripped’ position for ready identification of state:

1) Coil:

a) Magnetically held, momentary coil activation (50 milliseconds)
b) 2.2 VA max per breaker to allow simultaneous or sequenced control of up to 10 breakers per control wire run.
c) Split coil – 1/2 for ON, 1/2 for OFF.

2) Power Contacts:

a) 20A or 30A tungsten and NEMA electronic ballast rated, as scheduled.
b) Rated for 50,000 ON/OFF cycles at full load.
c) Support #6 - #14 AWG solid or stranded wire.
d) 120V and 277V rated.
e) FCC approved for commercial use.

D. Control Electronics:

1. Network and user interface

a. Integral to the panel side enclosure
b. Interface for individual control of motorized circuit breakers in panelboard

2. Digital graphical display or network port

a. For configuration of network addressing
b. Status LEDs to indicate presence of Power and DMX signal.

3. DMX512 interfaces

a. Serves as primary integrating means between the rack electronics and the lighting control network, and shall also support remote configuration, file storage, playback, and monitoring capabilities from other devices on the network.
b. Include at least one optically isolated DMX512 input and one optically isolated DMX512 output per panel.

4. Ride-through power supply

a. To remain energized during short duration loss of power, such as during transfer to backup generator.

5. Furnish 0-10V control interface card where 0-10V loads are indicated on the associated panel schedule.

E. Basis of Design

1. Basis of Design for Integrated Lighting Control Panelboards:

a. SensorIQ, as manufactured by Electronic Theatre Controls

2.3 LIGHTING CONTROL RELAY PANELS (Labeled LRP-01)

A. General:

1. Up to twenty-four network-controlled relays.

   a. UL listed and labeled.
   b. Configured for single or dual pole load control as scheduled.
   c. Remotely operated by network communication link.

2. Up to thirty breaker slots available

   a. UL listed and labeled.
   b. Configured for single or dual pole load control as scheduled.

3. Capable of acting as a standalone lighting control system with the following capabilities:

   a. Internal Astronomical Time Clock for programmed events.
   b. Accepts input from external button stations for recall of presets.
   c. Signal arbitration to prioritize inputs by source (sACN, DMX, Preset Stations, Time Clock, etc).
   d. Configurable loss-of-signal behavior including ‘hold last look’ and ‘activate preset’.

4. UL924 rated input

   a. For triggering emergency ‘panic’ preset.

5. USB port

   a. For upload of configuration files and firmware updates.

B. Physical:

1. Cabinets and Enclosures

   a. NEMA 1 enclosure sized to accept required relays.
   b. Surface mounted cover as required with captive screws in a hinged, lockable configuration.

2. Interior

   a. Provided with all internal equipment installed and tested

3. Panel side-mount enclosure

   a. Provide low voltage control interface between network and relays, compliant with partitioning requirements for separation of line and low voltage.

C. Electrical:

1. Relays:

    a. Mechanically held latching relays, 20A or 30A tungsten and NEMA electronic ballast rated, as scheduled.
    b. Rated for 50,000 ON/OFF cycles at full load.
    c. Support #10 - #14 AWG solid or stranded wire.
    d. 120V and 277V rated.
    e. FCC approved for commercial use.

2. Breakers:

D. Control Electronics:

1. Network and user interface
2. Digital graphical display interface or by network port

    a. For configuration of network addressing

3. Status LEDs

    a. For indicating presence of Power and DMX signal.

4. System network interface

    a. The primary integrating means between the rack electronics and the lighting control network
    b. Supports remote configuration, file storage, playback, and monitoring capabilities from other devices on the network

5. DMX512 interface

    a. At least one optically isolated DMX512 input and one optically isolated DMX512 output per panel.

6. Status feedback for breaker state, relay state, current drawer circuit, phase voltage and energy usage per circuit.
7. Ride-through power

    a. To remain energized during short duration loss of power, such as during transfer to backup generator

8. 0-10v control interface card in each panel

E. Basis of Design

1. Basis of Design for Lighting Control Relay Panels shall be:

    a. Echo Mains Fed, as manufactured by Electronic Theatre Controls

2.4 LIGHTING CONTROL NETWORK AND INTERFACE

A. General:

1. Furnish and install a complete lighting control network system capable of supporting the following:

    a. Specified dimmer racks, panelboards, and relay panels
    b. Stage Lighting Control Console(s)s
    c. Architectural control stations
    d. Occupancy/Vacancy sensors
    e. Daylight sensors
    f. Time and calendar schedules
    g. Related network devices indicated on the drawings and in this Specification

2. Category 5e Ethernet distribution

    a. To communicate between Lighting Control Console(s)s, dimmer racks, panelboards, relay panels, gateways, sensors, computers, etc.

3. Manufacturer specified wiring and topology for communication with control stations, sensor devices and relay panels.

B. Network Components:

1. Control Processors:

    a. Furnish architectural processors as required to interface dimmer rack, lighting control relay panels, control stations, sensors, system I/O contacts, and any appurtenant devices or equipment required for system to function fully as intended.

        1) Provide necessary programming interface for setup and configuration of system and system components.

    b. Include one backup processor, which may be used as a replacement processor for any venue in the building.
    c. Include one backup station power module, which may be used as a replacement for any venue in the building.

2. Basis of Design for Auditorium: ETC –Paradigm

    a. Battery-backed real-time, astronomical, and lunar time clock.
    b. Supports sACN, KiNet, Pathport, Art-Net and digital video.

        1) Supports triggering from sACN and Artnet level input.

    c. Simple integration with other Mosaic devices for large systems
    d. Supports conditional logic and scripting for integration.
    e. Ethernet integration with Mosaic RIO modules, Button Stations, and other Mosaic Show Controllers.

f. DVI video (HDMI compatible) input for live video at up to 1080p30 with support for all major formats including H.264/ MPEG-4 AVC, MJPEG and QuickTime.
g. Triggering and show-control integration using Ethernet, RS232/485, DMX, MIDI, digital/analog inputs, and optional remote devices.
h. Local User Interface
i. Web User Interface

3. Ethernet switches and patch bays:

a. Ethernet Switches in port quantities as required for devices in system plus 25% spare for future expansion at each rack location.
b. Patch bays in port quantities as required for devices in system plus 25% spare for future expansion at each rack location.

4. DMX signal splitters:

a. ANSI/USITT E1.1-2008 compliant DMX512 opto-isolating splitters, in quantity and configuration of inputs and outputs as required for system.
b. All DMX signal cables terminating at the splitter location shall be outfitted with 5-pin XLR connectors or RJ45 connectors as necessary to permit user patching where required. This includes signals to Ethernet-to-DMX gateway node receptacles, dimmers, and relay panels.

5. Equipment Racks:

a. Wall or floor mounted 19-inch equipment racks with mounting rails, hinged locking door, and sized to accommodate all required processing equipment including that indicated above.

1) Furnish in quantities shown on drawings plus any additional required for complete system.

b. Minimum of one four-space contiguous blank section with cover plate for future equipment addition.
c. Each rack shall be furnished with a three-space pull out drawer for storage of manuals, patch cabling, and user notes.
d. Racks shall be Middle Atlantic SR series, EWR series or equal.
e. Racks shall be furnished with an uninterruptible power supply (UPS) battery backup.
f. Coordinate electrical power connections for rack contents.

6. Ethernet cabling:

a. Ethernet cabling used in theatrical lighting control network shall have the following properties:

1) Comply with NEMA WC-63.1 Category 5e, UL verified.
2) Comply with TIA 568.C.2.
3) Outer jacket shall be purple in color.

b. Furnish and install RJ45 Category 5e patch cables as necessary to fully patch between all network switch ports and patch bay ports in each rack location, plus 20% spares.
c. Furnish additional RJ45 Category 5e patch cables to allow connection of distributed Ethernet ports to portable Ethernet-to-DMX gateway devices in the performance spaces. Refer to Theatrical Lighting Fixtures and Accessories Schedule on QT series Drawings for lengths and quantities to be furnished.

7. DMX Network Cabling:

a. Furnish and install 5-pin XLR M/F DMX jumper patch cables as necessary to fully patch between all DMX splitter ports and DMX patch points, racks, or other DMX devices at equipment racks.
b. Furnish additional 5-pin XLR M/F DMX jumper cables to allow connection of DMX node devices to stage lighting fixtures and other DMX-controlled devices in the performance spaces. Refer to Theatrical Lighting Fixtures and Accessories Schedule on QT series Drawings for lengths and quantities to be furnished.

8. Ethernet Taps:

a. Location, mounting type, and qty as shown on drawings and schedules
b. RJ45 Ethernet connectors, each discretely fed from patch panel, unless otherwise noted.

9. Ethernet-to-DMX Gateways:

a. Mounting as shown on Drawings, furnish with necessary hardware.
b. Each node with one, two, or four each 5-pin XLR connectors configurable for DMX512 input or output, or for ESTA/ANSI E1.20 two-way communication. Each connector may be addressed to discrete universes.
c. Surface mount nodes shall have Ethernet wire feed from patch panel to device.
d. Portable nodes shall have one RJ45 Ethernet connection to permit patching into any Ethernet Tap shown on drawings. Each shall be outfitted with Light Source MAB mega clamp or equal aluminum pipe clamp.
e. Refer to drawings and schedules for quantity of each node type to be furnished.

10. Input/Output devices for communication with other systems:

a. Furnish minimum eight dry contact closures configurable as input or output signals, to connect with fire alarm system, effects controls, shading systems, and future interfaces.

2.5 LIGHTING CONTROL NETWORK HARDWARE

1. D.I.N. Enclosure containing the following:

a. DMX Scene Controller

1) Preset record based on live DMX levels (min. 32 presets)

2) Preset recall (min. 32 presets) with adjustable fade times

b. DMX splitters with related cabling
c. Time Clock
d. Interfaces with other building systems as required, such as building automation, A/V controls, fire alarm control panel, and related input/output interfaces.

1) Furnish minimum eight dry contact closures configurable as input or output signals

e. Battery backup

2.6 DMX IN/OUT PLATES

A. General

1. DMX connector plates in surface or recessed backboxes, provided by Manufacturer and installed by Electrical Contractor
2. Refer drawings for quantity, configuration, and placement.

B. Connectors

1. DMX-IN: 5-pin XLR connector(s), male
2. DMX-OUT: 5-pin XLR connector(s), female

C. Labeling

1. DMX devices shall have Control Device Number (i.e. ‘DMX-5’) clearly indicated on the faceplate.

a. Minimum 1/4-inch tall white on black characters
b. Center above control port(s).
c. Match faceplate labels to those on the QT series Drawings. Verify in Shop Drawings.

2. Furnish and install removable adhesive labels for each Theatrical Control Device back box and rear of faceplate, indicating the Control Device Number (i.e. ‘DMX-5’) and serial code to facilitate programming and commissioning.

2.7 STAGE LIGHTING CONTROL CONSOLES

A. General

1. For each console, furnish all power and interface devices, cabling, and accessories necessary for a fully functioning system.

B. Console

1. Basis of Design: ETC – Ion Xe 20

2. Performance Requirements:

   a. Min. 19-inch color multi-touch touchscreen
   b. Min. (20) Channel / Playback faders
   c. Min. Two (2) DMX/RDM port (1024 outputs)
   d. Min. Two (2) USB ports
   e. 25 GB onboard storage for show files

3. Accessories:

   a. (1) standalone LED gooseneck task light
   b. (1) Dust Cover
   c. (1) 15-foot DMX 5-pin XLR patch cable
   d. (1) Case

4. Deliver console to control room in the auditorium.

2.8 ARCHITECTURAL LIGHTING CONTROL STATIONS (HOUSE LIGHT STATIONS)

A. General

1. Stations shall serve as user interface to recall and manipulate common room lighting presets via the lighting control network. Stations shall occur in the following styles:

   a. Fixed Touchscreen stations

      1) Station programming shall support discrete screen shots configurable for preset recall, virtual faders, clock and time scheduling functions, dynamic color wheel for LED fixture color selection.
      2) Station shall be configured with general lighting on/off and code lockout for additional features on home page.
      3) Design display graphics showing stage areas controlled; include the status of lighting controls in each area.

   b. Portable Touchscreen stations

      1) Handheld portable P.O.E. touchscreen with equivalent capabilities to Fixed Touchscreen stations.
      2) Device shall connect to any Ethernet port for control of the Lighting Network.

2.9 ARCHITECTURAL LIGHTING DMX DISTRIBUTION SYSTEM

A. Provide bi-directional DMX repeater(s) as required with sufficient DMX outputs for control of DMX enabled architectural lighting fixtures.

B. Provide emergency DMX bypass device(s) as noted on drawings, for lighting control override during loss of power or emergency evacuations. Bypass device(s) shall receive the following feeds:

1. Panic signal from Fire Alarm Control Panel
2. Loss of power signal from Emergency Bypass Detection Kit with power sense feed

PART 3 - EXECUTION

3.1 SYSTEM INTEGRATOR

A. Approved Integrators for the Work of this Section include:

1. 4 Wall Entertainment
   Moonachie, NJ
   (201) 329-9878
   https://www.4wall.com/
2. Clearwing Systems Integration
   Milwaukee, WI
   (414) 258-6333
   https://www.clearwing.com/
3. LVH Entertainment Systems
   Duarte, CA
   (805) 278-4584
   http://www.lvhent.com/
4. Musson Theatrical
   Santa Clara, CA
   1 (800) 843-2837
   https://www.musson.com/
5. Electronic Theatre Controls
   New York, NY
   (212) 397-8080
   https://www.etcconnect.com/

B. Equal Integrators:

1. Minimum five years' experience with supply, installation, commissioning, and integration of theatrical and architectural lighting control systems
2. At least ten recent projects of similar scope and characteristics to those specified herein

C. System Integrator shall be responsible for scope outlined in this Specification and for the following related Specification sections:

1. 116116 – Theatrical Wiring Devices
2. 116119 – Theatrical Lighting Fixtures and Accessories

D. System integrator shall be responsible for providing factory authorized personnel for system startup, programming, commissioning, and Owner training.

3.2 EXECUTION

A. Verify that surfaces are ready to receive work. Beginning of installation means installer accepts existing conditions.

B. Verify field dimensions and coordinate physical size of all equipment with the architectural requirements of the spaces into which they are to be installed. Allow space for adequate ventilation and circulation of air.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Install in accordance with manufacturer's instructions and approved shop drawings.

E. All wiring shall be installed in conduit.

F. Live test all branch load circuits before connecting the loads to the lighting control panels

3.3 SUPPORT SERVICES BY FACTORY-AUTHORIZED TECHNICIAN

A. System Startup

1. Upon completion of installation, Contractor shall notify the Manufacturer that the system is ready for formal checkout and programming.

    a. The Lighting Control System stays powerless unless specifically authorized by written instructions from the manufacturer.

2. Provide Factory-Authorized Technician to confirm proper installation and operation of all system components

B. Testing by Factory-Authorized Technician

1. Perform complete functional test of the system, including the following:

    a. Test all loads live for continuity and freedom from defects
    b. Test all control wiring for continuity and connections
    c. All continuity tests and repairs must be completed prior to energizing the system components.

C. Repairs

1. Contractor shall be responsible for correction of any improper wiring or component installation as identified by the Factory-Authorized Technician during testing.
2. Contractor shall be responsible for any return visits by Factory-Authorized Technician resulting from lack of system readiness for checkout or from any incomplete or incorrect wiring or installation.

D. Initial Programming by Factory-Authorized Technician

1. Programming of initial button assignments, touch screen page layouts, normal and emergency presets, control priorities, sensor settings, time clock events, etc.
2. All final decisions regarding programming shall be at the direction of the Owner.

3.4 COMMISSIONING AND OWNER TRAINING

A. General

1. Factory-Authorized Technician shall perform Owner Training.
2. Class size is limited to twelve participants
3. Schedule instruction with the Owner's designated representatives.
4. Provide all O&M materials, as designated in this Specification, at the time of training.
5. Instruction shall be independent of the system check-out and activation. Length of engineering check-out and activation shall not affect the length of instruction time.
6. At Owner’s discretion, instruction may occur in multiple time blocks.
7. Provide the Owner with written documentation upon completion of training.

   a. Form to include:

      1) The date, time, and location of training.
      2) Name, title, company and signature of trainer.
      3) Name, title, and signature of all participants.
      4) Topics covered at training.

   b. If training is non-continuous, provide one form for each training segment.

B. Provide up to 12 hours of Owner training to include the following:

1. Minimum of three separate training sessions with Owner, as follows:

   a. First session shall occur at conclusion of startup and system commissioning and shall include four hours training time with Owner representatives. Include the following general subjects, but tailor to the Owner’s preference at time of training:

      1) General system overview.
      2) Routine care and maintenance.
      3) Lighting Control Station operation and configuration, including review of initial programming of presets.
      4) Lighting Control Console introduction and basic programming
      5) Review of warranty and software updates

   b. Second session shall occur no less than two weeks following substantial completion, but within one month of initial training. This session shall include up to an additional four hours training time with Owner representatives. Include the following general subjects, but tailor to the Owner’s preference at time of training:

      1) In-depth Lighting Control Console operation and programming appropriate to the level of the users.

2) Lighting Control Station preset review and adjustment to reflect operational needs.
3) Other review as requested by Owner.
4) Introduction to online training resources.

c. Third session shall occur no less that one month after the second session, but within the first year.

1) More advanced Lighting Control Console operation and programming appropriate to the level of the users.
2) Lighting Control Station preset review and adjustment to reflect operational needs.
3) Other review as requested by Owner.
4) Review of online training resources.

2. Set specific agenda for each session in advance.
3. Training may be video and audio recorded by the Owner at the Owner's expense.

END OF SECTION 116113

SECTION 116116 – THEATRICAL WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK OF THIS SECTION

A. This Section includes all labor, materials, equipment and services necessary to manufacture and deliver to job site, for installation by Electrical Contractor, theatrical wiring devices, including back boxes, as shown on the QT drawings and/or specified herein, including but not limited to the following:

1. **Flush mount receptacle boxes**
2. **Surface mount receptacle boxes**
3. **Pipe mount connector strips**
4. **Pipe batten mount connector strips with cable management**

B. Installation of equipment shall be by Electrical Contractor

1.3 SUBSTITUTIONS

A. Substitutions are allowed when the substitution improves the quality, decrease installation time, or reduce cost.

1. Submit a proposal that clearly outlines construction features of the product so that true and accurate comparisons may be made.

a. Samples of the proposed substation item/s may be requested by the Architect and/or Owner for evaluation.

B. No product bid which deviates from the details of the Construction Documents will be considered unless such deviation has been approved in advance by the Architect

1.4 SUBMITTALS

A. Prepare and submit complete shop drawings according to requirements set forth in the Contract Documents.

B. Show bussing for each outlet box and shall utilize the exact circuit numbering method detailed in the shop drawings

C. Furnish catalog cuts, drawings, and/or descriptive material of catalog items as requested by the Architect.

D. Furnish all of the above for review by the Architect prior to commencing any work.

1. Such review does not relieve the Manufacturer of the responsibility of providing equipment in accordance with this Specification.

E. Any deviation from this Specification is to be clouded and noted in letters a minimum 1/4 inches high.

1. In order for a deviation to be considered it shall upgrade the quality of the equipment or respond to a field condition.

1.5 MANUFACTURING STANDARDS

A. All work shall be manufactured in accordance with the latest editions of applicable publications and standards of the following organizations:

1. National Electric Code (NEC) and all prevailing local and state regulations
2. National Electrical Manufacturers Association (NEMA)
3. Occupational Safety & Health Act (OSHA)

B. All applicable products shall bear label of Underwriters Laboratories (UL).

C. All receptacle, back box, junction box, face plate, and connector construction:

1. Minimum 18-gauge steel
2. Color: Powder coated black, unless otherwise noted in the device schedule.

1.6 MANUFACTURER’S RESPONSIBILITIES

A. Study the contract drawings and specifications with regard to the work as shown and required under this section so as to insure its completeness.

B. Manufacture and deliver equipment complete in all respects and to provide any additional equipment required to fulfill the intent of these drawings and specifications regardless of whether or not such items are herein specified or indicated.

C. Test all equipment thoroughly in shop prior to shipment to ensure mechanical and electrical integrity

1.7 LABELING

A. Permanently identify all theatrical wiring devices with means and methods as noted on the drawings and elsewhere in this specification.

B. Each faceplate and back box shall be tagged with a removable label identifying the WD box "number”

1.8 DELIVERY

A. Delivery per the Construction Documents.

B. The Manufacturer shall coordinate delivery of all equipment with the General Contractor, Construction Manager and Electrical Contractor.

C. Manufacturer shall, if requested by the Construction Manager, General Contractor and/or Electrical Contractor, deliver theatrical wiring devices items in the following two (2) separate shipments:

1. Shipment #1: Back boxes for all theatrical wiring device items so that the Electrical Contractor may terminate all conduit.
2. Shipment #2: Faceplates for all theatrical wiring device items.
3. Theatrical Wiring Device Manufacturer shall notify the Construction Manager and/or Electrical Contractor 24 hours prior to delivery of equipment.

D. Deliver all material to the job site suitably crated, packed, and protected.

1. Crate/Cartons clearly marked on the outside with the Manufacturer's identification label and the nomenclature of the product contained within.

1.9 WARRANTY

A. The Manufacturer shall assure that all equipment is provided free of defects in materials and workmanship and shall provide a warranty under this contract for a period of two years from the date of final acceptance.

B. During the warranty period, repair or replacement of defective materials and/or repair of faulty workmanship shall be provided, at no cost to the Owner, within ten days written notice of the defect(s).

PART 2 - PRODUCTS

2.1 THEATRICAL WIRING DEVICE MANUFACTURERS

A. Manufacturers for work of this section include:

1. Altman Lighting
   Denver, CO
   1-303-500-7072
   https://www.altmanlighting.com/
2. Electronic Theatre Controls (ETC)

New York, NY
(212) 397-8080
https://www.etcconnect.com/

3. Lex Products
   Trumbull, CT
   (203) 717-4845
   https://lexproducts.com/
4. SSRC
   Duncan, SC
   (864) 848-9770
   https://www.ssrconline.com/
5. Stagecraft Industries Inc.
   Seattle, WA
   (206) 763-8800
   https://www.stagecraftindustries.com

B. Equal Manufacturers:

1. Subject to Division 01 Specifications, other manufacturers may submit for consideration as equal to the design basis manufacturer products.

   a. Submittals for consideration must show conformance to project Specifications

2. Manufacturer: Minimum ten years' experience in manufacture of theatrical wiring devices.
3. Final determination of suitability shall be at the discretion of the Specifier

2.2 FLUSH AND SURFACE MOUNT RECEPTACLE BOXES

A. Provide recessed and surface mount receptacle boxes and RJ45 ports as listed herein and shown on the drawings.

B. Face Plates:

1. Steel
2. Mounting holes on face plate.
3. Color as scheduled
4. Circuit numbers engraved directly into a black lamicoid or plastic laminate label plate attached with non-corroding screw fasteners or rivets.

   a. Text Height: 1/4 inch
   b. Color: White on black
   c. Verify circuit numbers in shop drawings

C. Buss bars, for each receptacle plate:

1. Solid Copper
2. Adjacent neutral pairs for each circuit
3. Adjacent hot leg pairs for each circuit

4. Grounds for each receptacle plate

D. Prewire boxes with 125-Celsius high temperature wire to molded barrier terminal blocks.

E. Connectors:

1. Standard Edison parallel blade U ground connectors and 20A L5-20 three-pin twist lock connectors as shown on the drawings.
2. Mount at spacing listed herein or as shown on the drawings

F. Mounting:

1. Mount back box per code requirements

2.3 PIPE MOUNT CONNECTOR STRIPS

A. Provide pipe mount continuous connector strips with flush mounted receptacles and RJ45 ports as listed herein and as shown on the drawings.

1. For each connector strip, provide mounting brackets (hangers) and associated hardware that are designed to mount the connector strip to an 1-1/2-inch NPS steel pipe railing.

B. Face Plates:

1. Steel
2. Mounting holes on face plate.
3. Color as scheduled
4. Circuit numbers engraved directly into a black lamicoid or plastic laminate label plate attached with non-corroding screw fasteners or rivets.

a. Text Height: 1/4 inch
b. Color: White on black
c. Verify circuit numbers in shop drawings

C. Connectors:

1. Standard Edison parallel blade U ground connectors and 20A L5-20 three-pin twist lock connectors as shown on the drawings.
2. Mount at spacing listed herein or as shown on the drawings

D. Buss bars, for each receptacle plate:

1. Solid copper
2. Adjacent neutral pairs for each circuit
3. Adjacent hot leg pairs for each circuit
4. Grounds for each receptacle plate

E. Pre-wire connector strip with 125-Celsius high temperature wire to double sided, numbered molded barrier terminal strips at end of each connector strip.

1. Terminate all circuit wiring on one side of the terminal strip.
2. Other side is reserved for load wiring termination by Electrical Contractor.

F. Ship connector strips in segments folded over one another with the internal wiring intact when strips are too long.

1. Grind inside edges smooth to prevent damage to internal wiring
2. Provide splice hardware as required

2.4 PIPE BATTEN MOUNT CONNECTOR STRIPS WITH CABLE MANAGEMENT

A. Provide pipe batten mount continuous connector strips with flush mounted receptacles and RJ45 ports as listed herein and as shown on the drawings.

1. For each connector strip, provide mounting brackets and associated hardware as required to hang the connector strip on a stage rigging system 1-1/2-inch NPS steel pipe batten.
2. Provide pantograph cable management devices in locations as shown on drawings.

B. Face Plates:

1. Steel
2. Mounting holes on face plate.
3. Color as scheduled
4. Circuit numbers engraved directly into a black lamicoid or plastic laminate label plate attached with non-corroding screw fasteners or rivets.

a. Text Height: 2 inches maximum
b. Color: White on black
c. Verify circuit numbers in shop drawings

C. Connector strip construction:

1. Stated (1.5 D) steel or min. 1/8-inch aluminum.

D. Connectors:

1. Standard Edison parallel blade U ground connectors and 20A L5-20 three-pin twist lock connectors as shown on the drawings.
2. Mount at spacing listed herein or as shown on the drawings

E. Pre-wire connector strip with 125-Celsius high temperature wire to double sided, numbered molded barrier terminal strips at end of each connector strip.

1. Terminate all circuit wiring on one side of the terminal strip.
2. Other side is reserved for load wiring termination by Electrical Contractor.

F. Pantograph:

1. Located between batten rigging pick-up cables.

2. Include a horizontal stabilization track and flat multi-cable to provide permanent electrical connection for the stage lighting dimming circuits.
3. Circuit quantities as scheduled
4. Network cable as scheduled
5. Coordinate pantograph gridiron junction box location with Electrical Contractor.

G. Ship connector strips in segments folded over one another with the internal wiring intact when strips are too long.

1. Grind inside edges smooth to prevent damage to internal wiring
2. Provide splice hardware as required

H. Theatrical Wiring Device Manufacturer may propose alternative cable management system subject to review by Architect and Theatre Consultant.

2.5 PIPE MOUNT CONNECTOR STRIPS WITH PIG TAILS

A. Provide pipe mount continuous connector strips and RJ45 ports as listed herein and as shown on the drawings.

1. For each connector strip, provide mounting brackets (hangers) and associated hardware which are designed to mount the connector strip to upper and load pipes of an 1-1/2-inch NPS steel pipe grid.

B. Face Plates:

1. Steel
2. Color as scheduled
3. Circuit numbers engraved directly into a black lamicoid or plastic laminate label plate attached with non-corroding screw fasteners or rivets.

a. Text Height: 2 inches maximum
b. Color: White on black
c. Verify circuit numbers in shop drawings

C. Connector strip construction:

1. Stated (1.5 D) steel or min. 1/8-inch aluminum.

D. Connectors:

1. Edison parallel blade U ground receptacles on 18” long SO cable pigtails
2. [**20A theatrical 2 pin and ground receptacles**] [**20A L5-20 three-pin twist lock receptacles**] [**Edison parallel blade U ground receptacles**] panel mounted as shown on device detail drawings.
3. Mount at spacing listed herein or as shown on the drawings

E. Pre-wire connector strip with 125-Celsius high temperature wire to double sided, numbered molded barrier terminal strips at end of each connector strip.

1. Terminate all circuit wiring on one side of the terminal strip.
2. Other side is reserved for load wiring termination by Electrical Contractor

F. Ship connector strips in segments folded over one another with the internal wiring intact when strips are too long.

1. Grind inside edges smooth to prevent damage to internal wiring
2. Provide splice hardware as required

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that equipment is properly wired, terminated, and ready for electrical connection and energization.

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. verify location, size, and type of devices. Coordinate details of equipment connections with supplier and Professional.

3.3 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment where appropriate

3.4 MANUALS

A. Provide the Owner with one printed “hard” copy Operations and Maintenance manual as well as the O&M manual in electronic format on two flash drives. Operations and Maintenance Manuals include, but not be limited to the following:

1. Contact name, phone number and e-mail address
2. Record shop drawings
3. Catalogue cuts and complete parts list of equipment installed
4. Recommended maintenance procedures
5. Information identifying fabric manufacturer, type number, color number, weight, width and manufacture date

3.5 PROTECTION AND CLEANING

A. The Supplier is solely and exclusively responsible for the following:

1. Satisfactory installation

2. Furnishing and storing all equipment and tools during the period of installation.
3. Collecting and removing from the job site all packing materials, trash, scrap materials, etc. from these stage lighting fixtures
4. Protection of equipment and/or finished materials provided by other contractors

END OF SECTION 116116

SECTION 116119 – STAGE LIGHTING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK OF THIS SECTION

A. All labor, materials, equipment, and services necessary to furnish, for installation by others, the Stage Lighting Fixture package specified herein, including but not limited to, the following:

1. Stage lighting fixtures and accessories.
2. Hardware and jumper cables.
3. Miscellaneous items.
4. Equipment installation.

1.3 SUBSTITUTIONS

A. Substitutions are allowed when the substitution improves the quality, decreases installation time, or reduce cost.

1. Submit a proposal that clearly outlines construction features of the product so that true and accurate comparisons may be made.

a. Samples of the proposed substation item/s may be requested by the Architect and/or Owner for evaluation.

B. No product bid which deviates from the details of the Construction Documents will be considered unless such deviation has been approved in advance by the Architect.

1.4 SUBMITTALS WITH BID

A. A list of all items with manufacturer's catalog numbers for each item

B. A unit price for each item listed per schedule

1. Unit pricing may be used by the Owner to determine the value of any additions to or deletions from the equipment list
2. Failure to provide unit pricing may result in the disqualification of the bid

C. Time estimates:

1. Length of time required to supply all equipment
2. Length of time required to install all equipment

1.5 SUBMITTALS

A. Supplier shall submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Shop drawings shall include catalogue cuts of all items listed in the Stage Lighting Fixture & Accessories Schedule for review.

C. Provide unit pricing for all items listed in the Stage Lighting Fixture & Accessories Schedule

1.6 STAGE LIGHTING FIXTURE INSTRUCTION

A. Stage Lighting Fixture Supplier shall provide Owner’s designated representative(s) with up to eight hours of instruction in the configuration, programming, and operation of the LED stage lighting fixtures

1.7 DELIVERY

A. Delivery per the Construction Documents

B. Include full freight and insurance charges for delivery of all of the equipment to the job site in the bid price.

C. Supplier shall confirm the delivery dates with the Construction Manager and/or Owner a minimum of thirty days in advance of scheduled delivery

D. Deliver all material to the job site suitably crated, packed, and protected

1. Crates/Cartons clearly marked on the outside with the manufacturer's identification labels and the nomenclature of the product contained within

1.8 WARRANTY

A. Assure that this equipment is provided free of defects in materials and workmanship and provide a warranty under this contract agreeing to make all applicable repairs, including replacement of materials, at no cost to the Owner for a period of one year from the date of final acceptance.

1. If, through no fault on the part of the Owner, the Supplier is unable to meet the required delivery dates established at the time of the signing of an agreement, Supplier agrees to furnish substitute equipment of the same quantity and of comparable type and quality to the job site.

B. This equipment will be extended to the Owner at no additional cost until the delivery of the presentation area lighting fixture list has been completed.

PART 2 - PRODUCTS

2.1 STAGE LIGHTING FIXTURE SUPPLIERS

A. Stage lighting fixture supplies for work of the section include the following:

1. Barbizon Lighting
   New York, NY
   (212) 586-1620
   https://www.barbizon.com/
2. PRG – Secaucus
   Secaucus, NJ
   (201) 758-4000
   https://www.prg.com
3. 4Wall
   Moonachie, NJ
   (201) 329-9878
   https://www.4wall.com
4. Norcostco
   Fairfield, NJ
   (973) 575-3503
   https://www.norcostco.com

2.2 STAGE LIGHTING FIXTURES

A. LED stage lighting fixtures supplied with all standard equipment, including the following:

1. Edison parallel blade U ground connector installed on with minimum 3-foot length, three wire PowerCon lead.
2. Center pivot type "C" clamp and yoke
3. One safety cable
4. Each Cyclorama fixture shall also include 6-foot long minimum DMX signal extension cables and DMX terminators

B. Lamp designations listed with each fixture type in the Stage Lighting Fixture & Equipment Schedule to identify the type of lamp used for each fixture.

C. The manufacturer(s) for each fixture is included in “QT Vendor General Contact Info”. No substitutions will be allowed and each item furnished shall conform in all respects to the product description found on the data sheets.

2.3 JUMPER CABLES

A. All 20A jumpers shall be made of black type "SO" (extra hard usage), three conductor, #12 cable with specified colored tape at each end and installed 20A **Edison parallel blade U ground** connector(s)

1. All jumpers shall be made with strict observance of polarity.

B. All PowerCON to PowerCON fixture to fixture Power Thru jumper cables shall be made of black type "SJ" (junior hard service), three conductor, #12 cable with installed standard Neutrik PowerCON connectors.

C. All TrueOne to TrueOne fixture to fixture Power Thru jumper cables shall be made of black type "SJ" (junior hard service), three conductor, #12 cable with installed standard Neutrik TrueOne connectors.

2.4 DISTRIBUTED DIMMING PACKS

A. LED stage lighting fixtures supplied with all standard equipment, including the following:

1. 3-Foot minimum length Edison parallel blade U ground male connector to Nema L5-20 “Twistlock” female connector
2. Yoke hanging hardware

PART 3 - EXECUTION

3.1 INSTRUMENT PREPARATION

A. After delivery and prior to installation, prepare the stage lighting fixtures with the following:

1. Unpack from carton
2. Install C-clamp and all associated hardware, including safety cable
3. Install lamp
4. Initial bench-focus

3.2 INSTALLATION

A. Install stage lighting instruments in locations as shown on the Light Plot or as directed by Owner’s Representative.

B. Connect stage lighting instruments to nearest stage lighting outlet using jumper cables, two-fers, etc. as required or as directed by Owner’s Representative.

C. Focus all stage lighting instruments shown on the Light Plot as directed by Owner’s Representative.

3.3 INSTALLATION SUPERINTENDENT

A. Installation of the stage lighting fixtures shall be supervised by the Stage Lighting Fixture Supplier's own experienced superintendent, having extensive experience in installing instruments of this kind.

B. Superintendent represents the Supplier, and all responsibilities are as binding as if given to the Supplier.

C. The same individual shall remain in charge of the work throughout the installation of the stage lighting fixtures until work is completed excepting only the intervention of circumstances completely beyond the control of the Supplier.

3.4 INSTALLATION LABOR BY SUPPLIER

A. The Supplier shall carry out the installation of the stage lighting fixtures using experiences professional stage rigging technicians

1. Do not employ any person to do work of a particular craft unless that person is qualified in that craft

3.5 PROTECTION AND CLEANING

A. The Supplier is solely and exclusively responsible for the following:

1. Satisfactory installation, plugging and focusing of these stage lighting fixtures
2. Furnishing and storing all equipment and tools during the period of installation.
3. Collecting and removing from the job site all packing materials, trash, scrap materials, etc. from these stage lighting fixtures
4. Protection of equipment and/or finished materials provided by other contractors

3.6 FIELD QUALITY CONTROL AND WORK

A. Prior to the completion of the installation, the Supplier shall notify the Architect and Owner’s Representative to arrange on a date for inspection of the installation.

1. At the time of the inspection, the Supplier shall furnish sufficient personnel to operate equipment and to perform adjustments and tests as may be required by the Owner's representatives.
2. Repair or replace any equipment that fails to meet Specifications with new equipment

   a. Re-inspect under the same conditions listed previously

3. Final approval will be withheld until all fixtures and equipment have been thoroughly tested and found to be in first class operating condition in every circumstance.

END OF SECTION 116119

SECTION 116133 – MOTORIZED RIGGING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK OF THIS SECTION

A. This Section includes all labor, materials, equipment, and services necessary to furnish and install the Stage Rigging System as shown on the QT drawings and/or specified herein, including but not limited to the following:

1. Two motorized speaker cluster hoists, rigging and control.

B. Related work in other sections:

1. 116136 – Counterweight Rigging & Pin Rails
2. 116116 – Wiring Devices
3. 116113 – Networked Lighting Control

1.3 SUBSITITUTIONS

A. Substitutions are allowed when the substitution improves the quality, decrease installation time, or reduce cost.

1. Submit a proposal that clearly outlines construction features of the product so that true and accurate comparisons may be made.

a. Samples of the proposed substation item/s may be requested by the Architect and/or Owner for evaluation

B. No product bid which deviates from the details of the Construction Documents will be considered unless such deviation has been approved in advance by the Architect

1.4 PROJECT CONDITIONS

A. Provide all new equipment of the latest design

B. No extras will be allowed due to the Contractor's misunderstanding of the work involved or its lack of knowledge of any field conditions due to failure to make accurate field measurements or a thorough investigation of the job site.

1.5 SUBMITTALS

A. Stage Rigging Contractor shall prepare and submit complete shop drawings according to the requirements set forth in the Contract Documents.

B. Submit shop drawings for review by the Architect before fabrication can begin. Such review does not relieve the Contractor of the responsibility of providing equipment in accordance with this Specification.

C. Shop Drawings:

1. Show dimensions, sizes, gauges, thicknesses, finishes, joining, attachments and relationship of work to adjoining construction.
2. Clearly show power, wire, and conduit requirements for all work to be provided by the Contractor.
3. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from drawings.
4. Where other materials must be set to exact locations to receive rigging, furnish assistance and directions necessary to permit other trades to locate their work.
5. Where welded connections, concrete or masonry inserts are required to receive work, show exact locations required and all such drawings shall be furnished to the trades responsible for installing the connectors or inserts.
6. Show locations of all lubrication points.
7. Include engineering and load calculations as well as stamp and seal of a registered professional engineer.
8. Catalog work sheets showing illustrated cuts of items may be submitted for standard manufactured items.
9. Include a copy of the installation superintendent’s ETCP Certified Rigger - Theatre certification. A copy of the installation superintendent’s ETCP certification shall be available on the job site for the length of the installation.

D. Any deviation from this Specification shall be clouded and noted in letters a minimum 1/4-inch high.

1. In order for a deviation to be considered, it must upgrade the quality of the equipment or respond to a field condition.

E. Provide Operation and Maintenance manuals upon completion of installation

1. One O&M manual shall be a printed “hard” copy.
2. O&M manual shall also be provided in electronic format on two flash drives
3. Manuals to include, but not limited to:

a. Copies of all "record" shop drawings
b. Parts lists
c. Operational instruction,
d. Service/maintenance recommendations
e. Component working load limits

F. Rigging System Log Book:

1. At Owner training, furnish a system log book, configured to permit Owner tracking of inspections, system issues and maintenance history. Provide overview of observations and actions that should be documented for appropriate record keeping and compliance with industry standards for safety. Log book shall include:

    a. Schedule and ID of all installed rigging sets (manual and motorized).
    b. Identification of design parameters for each set, including high and low trim limits, set live loading capacity, hoist configuration settings, etc.
    c. Log sheet for periodic system-wide inspections, including commissioning date of system as first entry.
    d. Journal fields for each set to document date, status, observations, actions taken, and resolution.

1.6 CONTRACTOR RESPONSIBILITIES

A. Prepare and submit complete shop drawings according to the requirements set forth in the Contract Documents

B. Verify, by field measurement on the job site, all dimensions affecting the work.

1. Bring field dimensions which vary from those on the approved shop drawings to the attention of the Architect.

    a. If required, obtain a directive from the Architect and Owner regarding corrective measures before the start of fabrication of items affected by the variance.

C. Install equipment complete in all respects and provide any additional equipment required to fulfill the intent of the drawings and specifications regardless of whether or not such items are herein specified or indicated.

D. If requested by the Owner or Architect, provide satisfactory evidence as to the kind and quality of materials he proposes to furnish by submission of exact samples of hardware to be used in this contract.

1. The samples shall be retained by the Owner until such time that this contract has been completed and accepted

1.7 WARRANTY

A. The Contractor shall assure that the rigging is properly installed, free of defects in materials and workmanship and shall provide a warranty on all equipment and workmanship provided under this contract for a period of two years from the date of the final acceptance.

B. During the warranty period, repair or replacement of defective materials and faulty workmanship shall be provided, at no cost to the Owner, within ten days of written notification of defects(s).

C. Post Installation Safety Inspection:

1. One year after the date of final acceptance by the Owner, the Stage Rigging Contractor Supervisor shall return to the job site to conduct a thorough inspection of the rigging installation.

    a. Check all bolts and tighten as required, inspect all cable connections and cables
    b. Give all items a thorough safety inspection in compliance with ANSI E1.47, Entertainment Technology – Recommended Guidelines for Entertainment Rigging System Inspections.
    c. Repair or replace all damaged items
    d. If the original supervisor is unavailable either because the supervisor no longer works for the contractor or due to issues fully beyond the control of the contractor, then an alternate rigger superintendent shall perform the inspection, under the following conditions:

        1) The alternate superintendent shall be ETCP-RT certified.
        2) The alternate superintendent shall have experience supervising installation on projects of similar scope and scale.

2. The Contractor is responsible for all materials, superintendent labor, transportation and living expenses for this work at no additional cost to the Owner.

    a. Conduct inspection and repair work during normal working hours at a time mutually agreed upon by the Owner and the Contractor.

3. Provide the Owner and Architect with a written report stating the findings of the inspection within two weeks of completion of the inspection

PART 2 - PRODUCTS

2.1 STAGE RIGGING MANUFACTURERS

A. Pre-approved Stage Rigging Manufacturers for work of this section shall include:

1. Electronic Theatre Controls
   Middleton, WI
   (608) 831-4116
   New York, NY
   (212) 397-8080
   Orlando, FL
   (407) 843-7770
   Burbank, CA
   (323) 461-0216
   Mazomanie, WI
   (608) 824-5656
   Austin, TX
   (512) 836-2242
   https://www.etcconnect.com/
2. J.R. Clancy Inc.

Syracuse, NY
(315)451-3440

3. I. Weiss Inc.
   Fairview, NJ
   (201) 402-6500
   https://www.iweiss.com/
4. Texas Scenic Co.
   Bronx, NY
   (718) 402-2677
   https://www.texasscenic.com/

2.2 STAGE RIGGING CONTRACTORS

A. The Contractor shall have been continuously engaged in the production of theatrical stage rigging equipment for at least fifteen years.

B. The Contractor shall have installed a total of not less than five installations of equal or greater scope to system specified herein, which have been in service for a minimum of one year and a maximum of ten years.

   1. Each of the listed stage rigging installations shall be in service in fully professional commercial theatres being operated by professional technicians.

C. Stage Rigging Contractors for work of this section shall include:

   1. Beck Studios
      Milford, OH
      (513) 831-6650
      https://www.beckstudios.net/
   2. Chicago Flyhouse
      Chicago, IL
      (773) 533-1590
      https://www.flyhouse.com/
   3. I. Weiss Inc.
      Fairview, NJ
      (201) 402-6500
      https://www.iweiss.com/
   4. J.R. Clancy Inc.
      Syracuse, NY
      (315)451-3440
      https://www.jrclancy.com/
   5. Scenic Solutions
      West Carrollton, OH
      (888) 866-5062
      https://scenicsolutions.com/
   6. Stage Rigging Services
      Greensboro, NC
      (336) 370-1900
      http://www.srsrigging.us/

7. Texas Scenic Co.
   Bronx, NY
   (718) 402-2677
   https://www.texasscenic.com/
8. Tiffin Scenic Studios
   Tiffin, OH
   (419) 477-1546
   http://www.tiffinscenic.com/
9. High Output Inc.
   Boston, MA
   Providence, RI
   Portland, ME
   Charleston, SC
   Savannah, GA
   (781) 364-1800
   https://www.highoutput.com/

D. The Contractor for this section shall be the same Contractor that furnishes and installs the following related Division 11 theatrical systems specified on this project:

1. 116136 – Counterweight Rigging & Pin Rails
2. 116139 – Fire Safety Curtain

2.3 MATERIALS

A. Ferrous materials and accessories shall conform to the following ASTM and ANSI standard specifications:

1. Standard structural steel shapes and plates:

   a. ASTM A-36.

2. Miscellaneous steel items:

   a. ASTM A-283, grade optional.

3. Steel pipe:

   a. ASTM A-53

4. Gray iron castings:

   a. ASTM A-48, Class 30 unless otherwise specified.

5. Malleable iron castings:

   a. ASTM A-47

6. Bolts and nuts:

a. B18.2.1&2

7. Welding electrodes shall be as permitted by AWS Code D1.0.

B. Wire Rope and Fittings

1. Wire rope shall be 7x19 construction, utility cable, sized as required, that meets Federal Specification RR-W-410E.

a. Damaged or deformed cables shall not be used.

2. Use Nicopress copper sleeves or forged steel clips and conform to wire rope manufacturer's recommendations as to size, number and method of installation.

C. Aluminum Materials and Accessories

1. Thicknesses, gauges and tempers of aluminum products to meet structural standards.
2. Aluminum Castings: 214 or 356 alloy as per strength requirements.
3. Fasteners: Include bolts, nuts, washers, screws, nails, rivets and other fastenings necessary for proper erection and/or assembly of aluminum work.
4. Fabrication shall be by AWS certified welders.

D. Finishes for Items Without Factory Finish

1. Welds, burrs and rough surfaces on all interior ferrous metals shall be ground smooth and the completed assembly cleaned, and all metal surfaces shall be given a minimum one coat of finish paint.
2. No painted finish shall be required on aluminum finishes.
3. Match all exposed fastenings to color and finish of adjacent material.

2.4 SAFETY STANDARDS

A. In order to establish minimum standards of safety, the following factors shall be used:

1. Cables and fittings: 8:1 Safety Factor
2. Terminating hardware: 5:1, or not exceeding WLL, whichever is more restrictive.
3. Trim chain assembly: 5:1, or not exceeding WLL, whichever is more restrictive.
4. Batten clamps: 5:1, or not exceeding WLL, whichever is more restrictive.
5. Motors: 1.0 Service factor
6. Gearboxes: 1.25 Mechanical Strength Service Factor
7. Cable bending ratio: Sheave diameter is 30 times diameter of cable
8. Tread pressures: 500# for cast iron, 900# for Nylatron ,1000# for steel
9. Maximum fleet angle: 1-1/2 degrees
10. Steel: 1/5 of yield
11. Bearings: L10 life of 2000 hours at two times required load at full speed
12. Bolts: Grade 5 or better, plated

2.5 SIGNAGE

A. Provide and install signs with white background and 3/8 inches high red letters to be mounted on the wall on the stage level, fly gallery level, and loading bridge level at a position that is conspicuous to workers performing rigging work.

1. The signs shall read as shown on the drawings.
2. “Date of Last Inspection” and “Date of Next Required Inspection” information shall be in erasable marker.

2.6 SPEAKER CLUSTER RIGGING AND MOTORIZED HOISTS

A. Provide motorized drum hoists for raising and lowering speaker clusters as shown on the drawings.

B. Mount to a steel frame attached to the proscenium wall.

1. Provide additional mounting steel as required.

C. Speaker Cluster and Motorized Hoist Set to include:

1. Speaker cluster frame
2. Pick-up utility cable
3. Loft Blocks
4. Mule Bocks
5. Hoist
6. Drum
7. Motor
8. Brakes
9. Limit Switches
10. Control Panel

D. Pick-up Cables:

1. Six
2. 1/4-inch diameter 7x19 utility cable
3. Use thimbles, wire rope clips or Nicopress sleeves and rated jaw and eye domestically manufactured turnbuckles.

E. Loft Blocks:

1. Twelve loft blocks
2. Underhung
3. Diameter: minimum 8 inches
4. Groove for one 1/4-inch diameter cable.
5. Components meet the same requirements as the loft blocks listed in the counterweight section of this Specification
6. Provide mounting steel as required.

F. Mule Blocks:

1. Two
2. Diameter: minimum 8 inches
3. Groove for one 1/4-inch diameter cable.
4. Components meet the same requirements as the loft blocks listed in the counterweight section of this Specification
5. Provide mounting steel as required.

G. Hoist Assembly

1. Mount on a heavy channel base
2. Hoist shall consist of two grooved winding drums, direct coupled to a worm gear, oil bath drive.

    a. Flange-mount the motor and brake directly to the gearbox.

3. Lifting Capacity:

    a. Side cluster hoist: minimum 1800#
    b. Central Cluster hoist: minimum 800#

4. Moves at a rate of 20-25 feet per minute, and capable of winding Two or four (see drawings) 1/4" diameter cables with 20’ of travel, plus three dead wraps.

H. Drum Construction:

1. Grooved to accept a single layer of cable and shall have a minimum pitch diameter of 28 times the cable diameter.
2. Welded
3. Drill holes at the root of the cable groove through the tubing wall for cable to enter

    a. These holes shall have a radial line drawn from the shaft to the center of the hole.

4.
5. Support outboard end by a self-aligning flange type or pillow block type bearing.
6. Combination helical/worm reducer with an integral motor and brake.

    a. Cast iron gear case for protection against shock damage and protect shafts with double lip oil seals to prevent leaks.
    b. Double reduction gear train with the helical gearing before the worm gears for higher torque transmission
    c. AGMA service

7. Driving shall be through direct mounting and keying to the output shaft of the reducer.

I. Motor:

1. 208 volt

a. verify on electrical drawings

2. AGMA service factor: minimum 1.0 for continuous operation
3. Gearing service factor: minimum 1.0
4. Mechanical strength factor: 1.3.
5. Verify voltage prior to submitting shop drawings.

J. Brake:

1. Direct acting AC, DC, electro-magnetic
2. Contains a manual release
3. Minimum retarding torque equal to 200% of motor full load torque.
4. Release the brake by energizing the DC coil simultaneously with the motor winding to provide fail safe braking in the event of power failure.

K. Limit Switches:

1. Minimum of four

a. Two over travel

2. Mechanical assembly
3. Independently adjustable switch/cam sets
4. Mount to the hoist base in a manner that allows for easy adjustment of the switch settings.
5. Fully guarded input shaft and drive chain
6. Pin sprockets to the shafts to prevent erroneous feedback and size to allow maximum usable rotation of the limit switch cam.
7. Rigging System Contractor may propose alternative hoist types/configurations subject to review by Architect.

L. Speaker Cluster Control Panel:

1. Controlled via the speaker cluster motorized rigging control panel, when connected to the control panel inlet box, for the accurate individual raising and lowering of each of the speaker clusters from stage level

a. Panel will have a steel panel box containing devices for the remote-control operation of the speaker cluster hoist.
b. Provide a control panel inlet box with screw sleeve connector matching the connector on the control panel flexible control cable.

1) Inlet box to be labeled "SPEAKER CLUSTER CONTROL PANEL INLET" and surface mounted stage left.

c. Provide control panel with a 25’ flexible control cable with screw sleeve connector.
d. Key operated ON/OFF switch in the control panel, with "power on" indicator light.
e. Provide individual "UP" and "DOWN" control pushbuttons

1) Momentary contact type, requiring continuous pressure for operating
2) Provide each with a green indicator light or LED that is illuminating only when the hoist is actually operating.

f. Provide one mushroom head emergency stop button which, when activated, removes all control voltage from the hoist.
g. Label control panel "SPEAKER CLUSTER HOIST CONTROL"
h. Provide a complete wiring diagram for control panel, junction box, and hoist.

1) Indicate primary wiring, number, type and sizes of wires from control panel to junction box, junction box to hoists, hoists to power panel, etc.

2.7 SIGNAGE

A. Provide and install signs with white background and 3/8-inch-high red letters to be mounted on the wall adjacent to the tee bar battery on the stage level, fly gallery level, and loading bridge level.

1. The signs shall read as shown on the drawings.
2. “Date of Last Inspection” and “Date of Next Required Inspection” information shall be in erasable marker.

B. Provide numbered labels to identify each line set at loading bridge level, either on the face of the kickplate, on the head block beam or suspended below the head block beam.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine all conditions under which all presentation area rigging items shall be installed and notify the Construction Manager and/or General Contractor in writing of any condition detrimental to the proper and timely completion of the work.

B. Contractor is solely and exclusively responsible for the satisfactory completion of this rigging system

1. Supply all tools required for the successful installation of the equipment herein.
2. Storage of all equipment and tools during the period of installation and for collecting and removing from the job site all packing materials, trash, scrap materials, etc.

C. The Contractor shall be responsible for the protection of equipment and/or finished materials provided by other Contractors.

D. Prior to the completion of the installation, the Contractor shall notify the Construction Manager and/or General Contractor and Architect to schedule an inspection of the system.

1. At the time of the inspection, the Contractor shall furnish sufficient personnel to operate all equipment and to perform adjustments and tests as may be required by the Architect and/or the Owner's representatives.
2. Repair or replace equipment that does not meet specifications with new equipment

    a. Reschedule inspection under the same conditions listed previously

3. Remove all temporary to permit full operation and access to all equipment.
4. Final review will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every circumstance.

3.2 INSTALLATION SUPERVISION

A. Installation of the rigging systems shall be supervised by the Contractor's own experienced superintendent having extensive experience in installing work of this kind.

1. Superintendent shall be an Entertainment Technician Certification Program (ETCP) Certified Rigger - Theatre.

    a. Rigging System Contractor shall provide the Architect with a copy of the superintendent’s ETCP certification and shall make a copy of this certification available on the job site for the length of the installation.

2. An ETCP Certified Rigger - Theatre shall be present at all times during the rigging system installation.

B. The same individual shall remain in charge of the work throughout the installation of the rigging system until work is completed excepting only the intervention of circumstances completely beyond the control of the Contractor.

C. The superintendent shall represent the Contractor and all directions given to him shall be binding as if given to the Contractor.

1. The Contractor may require the Owner to confirm such directions in writing.

3.3 FIELD QUALITY CONTROL

A. Install rigging system in accordance with OSHA Safety and Health Standards and all local codes. All welding shall be in full compliance with the most recent edition of the Structural Welding Code (ANSI / AWS D1.1).

B. Install all equipment in locations shown on Construction Drawings

1. Install plumb, straight and true and function as designed.

C. Install all components to prevent abrasion of moving items against any part of the building structure or other equipment.

1. Align sheaves as to provide fleet angles of the cables not exceeding two (2) degrees.
2. Provide mule blocks, cable rollers and guides as required to provide proper alignment and movement around obstructions.

D. Form cable termination eyes over thimbles of correct size

E. The Contractor shall perform all drilling and fitting required in the setting of materials and all cutting and fitting required in the fitting of materials to the adjoining work of other Contractors.

3.4 OWNER TRAINING

A. Contractor’s installation superintendent shall perform owner training

B. Schedule instruction with the Owner's designated representatives.

C. Provide all O&M materials, as designated in this Specification, at the time of training

D. Instruction shall be independent of the system check-out and activation. Length of engineering check-out and activation shall not affect the length of instruction time.

1. Instruction shall not necessarily follow immediately after the system check-out and activation

E. Provide up to four hours of owner training to include the following:

1. Up to two hours of instruction shall cover the safe and proper operation of the equipment, including limit switch placement and adjustment, use of the control panel, etc., to the Owner's designated representative.
2. An additional two hours of training shall be dedicated to walking up to six users through an ANSI inspection of one lineset of each type.

a. ANSI inspection training shall cover what to look and listen for, how to identify common problems in each rigging system, and when a problem needs to be addressed immediately by a professional rigger.

F. Instruction, at Owner’s digression, may occur in multiple time blocks.

1. If training is non-continuous, provide one form for each training segment.

G. Provide written documentation of Owner training to the Owner upon completion.

1. Form to include:

a. The date, time, and location of training.
b. Name, title, company and signature of trainer.
c. Name, title, and signature of all participants.
d. Topics covered at training.

H. Training may be video and audio recorded by the owner at the owner’s expense.

END OF SECTION 116133

SECTION 116136 – COUNTERWEIGHT RIGGING & PIN RAILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK OF THIS SECTION

A. This Section includes all labor, materials, equipment, and services necessary to furnish and install the Stage Rigging System as shown on the QT drawings and/or specified herein, including but not limited to the following:

1. One fully rigged, four line, single purchase counterweight line sets and associated equipment (line set 3)

    a. Repair existing arbor, replace all other line set components

2. One fully rigged, straight lift, lattice track counterweight house emergency fire curtain set and associated equipment.
3. Replacement of all lift lines (wire rope) for the existing manual rigging systems.
4. Replacement of all twenty-nine 42’-0” battens and batten extensions.
5. Installation of steel roller systems or non-abrading diverter devices to protect steel lift lines from structural steel elements.
6. Installation of rigging signage and system markings to comply with current standards and theatrical best practice.
7. Installation of proper spreader plates in all counterweight arbors.
8. Miscellaneous equipment listed herein and on schedules, for installation by others.
9. Mule blocks, idler sheaves, cable rollers or guides as required assuring proper alignment and operation of the rigging system.
10. Index strip lights
11. Sag bars
12. Rigging of stage lighting system multicables
13. Miscellaneous equipment listed herein, for installation by others

B. Related work in other sections:

1. 116133 – Motorized Rigging
2. 116116 – Wiring Devices
3. 116113 – Networked Lighting Control

1.3 SUBSITITUTIONS

A. Substitutions are allowed when the substitution improves the quality, decrease installation time, or reduce cost.

1. Submit a proposal that clearly outlines construction features of the product so that true and accurate comparisons may be made.

a. Samples of the proposed substation item/s may be requested by the Architect and/or Owner for evaluation

B. No product bid which deviates from the details of the Construction Documents will be considered unless such deviation has been approved in advance by the Architect.

1.4 PROJECT CONDITIONS

A. Provide all new equipment of the latest design

B. No extras will be allowed due to the Contractor's misunderstanding of the work involved or its lack of knowledge of any field conditions due to failure to make accurate field measurements or a thorough investigation of the job site

1.5 SUBMITTALS

A. Stage Rigging Contractor shall prepare and submit complete shop drawings according to the requirements set forth in the Contract Documents

B. Submit shop drawings for review by the Architect before fabrication can begin. Such review does not relieve the Contractor of the responsibility of providing equipment in accordance with this Specification.

C. Shop Drawings:

1. Show dimensions, sizes, gauges, thicknesses, finishes, joining, attachments and relationship of work to adjoining construction.
2. Clearly show power, wire, and conduit requirements for all work to be provided by the Contractor.
3. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from drawings.
4. Where other materials must be set to exact locations to receive rigging, furnish assistance and directions necessary to permit other trades to locate their work.
5. Where welded connections, concrete or masonry inserts are required to receive work, show exact locations required and all such drawings shall be furnished to the trades responsible for installing the connectors or inserts.
6. Show locations of all lubrication points.
7. Include engineering and load calculations as well as stamp and seal of a registered professional engineer.

8. Catalog work sheets showing illustrated cuts of items may be submitted for standard manufactured items.
9. Include a copy of the installation superintendent's ETCP Certified Rigger - Theatre certification. A copy of the installation superintendent's ETCP certification shall be available on the job site for the length of the installation.

D. Any deviation from this Specification shall be clouded and noted in letters a minimum 1/4-inch high.

1. In order for a deviation to be considered, it must upgrade the quality of the equipment or respond to a field condition.

E. Provide Operation and Maintenance manuals upon completion of installation

1. One O&M manual shall be a printed "hard" copy.
2. O&M manual shall also be provided in electronic format on two flash drives
3. Manuals to include, but not limited to:

a. Copies of all "record" shop drawings
b. Parts lists
c. Operational instruction,
d. Service/maintenance recommendations
e. Component working load limits

1.6 CONTRACTOR RESPONSIBILITIES

A. Prepare and submit complete shop drawings according to the requirements set forth in the Contract Documents

B. Verify, by field measurement on the job site, all dimensions affecting the work.

1. Bring field dimensions which vary from those on the approved shop drawings to the attention of the Architect.

a. If required, obtain a directive from the Architect and Owner regarding corrective measures before the start of fabrication of items affected by the variance.

C. Install equipment complete in all respects and provide any additional equipment required to fulfill the intent of the drawings and specifications regardless of whether or not such items are herein specified or indicated.

D. If requested by the Owner or Architect, provide satisfactory evidence as to the kind and quality of materials he proposes to furnish by submission of exact samples of hardware to be used in this contract.

1. The samples shall be retained by the Owner until such time that this contract has been completed and accepted

1.7 WARRANTY

A. The Contractor shall assure that the rigging is properly installed, free of defects in materials and workmanship and shall provide a warranty on all equipment and workmanship provided under this contract for a period of two years from the date of the final acceptance.

B. During the warranty period, repair or replacement of defective materials and faulty workmanship shall be provided, at no cost to the Owner, within ten days of written notification of defects(s).

C. Post Installation Safety Inspection:

1. One year after the date of final acceptance by the Owner, the Stage Rigging Contractor Supervisor shall return to the job site to conduct a thorough inspection of the rigging installation.

a. All bolts shall be checked and tightened as required, cables and all cable connections inspected and all items given a thorough safety inspection in compliance with ANSI E1.47, Entertainment Technology – Recommended Guidelines for Entertainment Rigging System Inspections.
b. All damage not caused by negligence on the part of the Owner shall be repaired and/or replaced.
c. If the original supervisor is unavailable either because the supervisor no longer works for the contractor or due to issues fully beyond the control of the contractor, then an alternate rigger superintendent shall perform the inspection, under the following conditions:

1) The alternate superintendent shall be ETCP-RT certified.
2) The alternate superintendent shall have experience supervising installation on projects of similar scope and scale.

2. All materials, superintendent labor, transportation and living expenses for this work shall be furnished by the Stage Rigging Contractor at no additional cost to the Owner.

a. The inspection and repair work shall be conducted during normal working hours at a time mutually agreed upon by the Owner and the Stage Rigging Contractor.

3. Within two weeks of the completion of the inspection, the Stage Rigging Contractor shall provide the Owner and Architect with a written report stating the findings of the inspection.

PART 2 - PRODUCTS

2.1 STAGE RIGGING MANUFACTURERS

A. Pre-approved Stage Rigging Manufacturers for work of this section shall include:

1. I. Weiss Inc.

Fairview, NJ
(201) 402-6500
https://www.iweiss.com/

2. J.R. Clancy Inc.
Syracuse, NY
(315)451-3440
https://www.jrclancy.com/

3. Texas Scenic Co.
San Antonio, TX
(210) 684-0091
Bronx, NY
(718) 402-2677
https://www.texasscenic.com/

4. Tiffin Scenic Studios
Tiffin, OH
(419) 477-1546
http://www.tiffinscenic.com/

2.2 STAGE RIGGING CONTRACTORS

A. The Stage Rigging Contractor shall have been continuously engaged in the production of theatrical stage rigging equipment for at least fifteen years.

B. The Stage Rigging Contractor shall have installed a total of not less than five installations of equal or greater scope to system specified herein, which have been in service for a minimum of one year and a maximum of ten years.

1. Each of the listed stage rigging installations shall be in service in fully professional commercial theatres being operated by professional technicians.

C. Pre-approved Stage Rigging Contractors for work of this section shall include:

1. Beck Studios Inc.
Milford, OH
(513) 831-6650
https://www.beckstudios.net/

2. Chicago Flyhouse
Chicago, IL
(773) 533-1590
https://www.flyhouse.com/

3. I. Weiss
Fairview, NJ
(201) 402-6500
https://www.iweiss.com/

4. J.R. Clancy Inc.
Syracuse, NY
(315)451-3440
https://www.jrclancy.com/

5. Scenic Solutions

West Carrollton, OH
(888) 866-5062
https://scenicsolutions.com/

6. Stage Rigging Services
Greensboro, NC
(336) 370-1900
http://www.srsrigging.us/

7. Texas Scenic
San Antonio, TX
(210) 684-0091
Bronx, NY
(718) 402-2677
https://www.texasscenic.com/

8. Tiffin Scenic Studios
Tiffin, OH
(419) 477-1546
http://www.tiffinscenic.com/

D. The Contractor for this section shall be the same Contractor that furnishes and installs the following related Division 11 theatrical systems specified on this project:

1. 116133 – Motorized Rigging
2. 116139 - Fire Safety Curtain

2.3 MATERIALS

A. Ferrous materials and accessories shall conform to the following ASTM and ANSI standard specifications:

1. Standard structural steel shapes and plates:

a. ASTM A-36.

2. Miscellaneous steel items:

a. ASTM A-283, grade optional.

3. Steel pipe:

a. ASTM A-120

4. Gray iron castings:

a. ASTM A-48, Class 30 unless otherwise specified.

5. Malleable iron castings:

a. ASTM A-47

6. Bolts and nuts:

   a. B18.2.1&2

7. Welding electrodes shall be as permitted by AWS Code D1.0.

B. Wire Rope and Fittings

1. Wire rope shall be 7x19 construction, utility cable, sized as required, that meets Federal Specification RR-W-410E.

   a. Damaged or deformed cables shall not be used.

2. Use Nicopress copper sleeves or forged steel clips and conform to wire rope manufacturer's recommendations as to size, number and method of installation.

C. Aluminum Materials and Accessories

1. Thicknesses, gauges and tempers of aluminum products to meet structural standards.
2. Aluminum Castings: 214 or 356 alloy as per strength requirements.
3. Fasteners: Include bolts, nuts, washers, screws, nails, rivets and other fastenings necessary for proper erection and/or assembly of aluminum work.
4. Fabrication shall be by AWS certified welders.

D. Finishes for Items Without Factory Finish

1. Welds, burrs and rough surfaces on all interior ferrous metals shall be ground smooth and the completed assembly cleaned and all metal surfaces shall be given a minimum one coat of finish paint.
2. No painted finish shall be required on aluminum finishes.
3. Match all exposed fastenings to color and finish of adjacent material.

2.4 SAFETY STANDARDS

A. In order to establish minimum standards of safety, the following factors shall be used:

1. Cables and fittings: 8:1 Safety Factor
2. Terminating hardware: 5:1, or not exceeding WLL, whichever is more restrictive.
3. Purchase lines: Min. tensile strength of 4,860# when new.
4. Trim chain assembly: 5:1, or not exceeding WLL, whichever is more restrictive.
5. Batten clamps: 5:1, or not exceeding WLL, whichever is more restrictive.
6. Fiber rope lifting lines: 10:1, min. 5/8” diameter.
7. Motors: 1.0 Service factor
8. Gearboxes: 1.25 Mechanical Strength Service Factor
9. Cable bending ratio: Sheave diameter is 30 times diameter of cable
10. Tread pressures: 500# for cast iron, 900# for Nylatron ,1000# for steel
11. Maximum fleet angle: 1-1/2 degrees
12. Steel: 1/5 of yield
13. Bearings: L10 life of 2000 hours at two times required load at full speed

14. Bolts: Grade 5 or better, plated

2.5 GENERAL PURPOSE SINGLE-PURCHASE COUNTERWEIGHT RIGGING

A. The stage rigging system repairs will encompass new blocks for lineset 3 and arbor repairs for line sets 7 and 23.

B. All aircraft cable lift lines on all line sets shall be replaced.

C. The following items encompass the existing counterweight rigging system.

1. One 12-inch diameter upright head block, with sheave grooved for four cables and one rope.
2. Four 8-inch underhung/upright loft blocks, each grooved for one cable.
3. One counterweight arbor with 750 lbs. load capacity.
4. Two safety rope locks. One at stage level and one at fly gallery level.
5. One 3/4-inch Multiline II or SureGrip synthetic rope purchase line.
6. One tension block.
7. Four 1/4-inch 7 x 19 galvanized aircraft cables, fitted with trim chains, screw-pin shackles, safety bolt, wire rope thimbles, and Nicopress sleeves.
8. One 42’ pipe battens as noted, of 1-1/2-inch NPS, schedule 40 steel pipe with internal splices, line set numbers and provisions for telescoping batten extensions at each end.

2.6 SINGLE PURCHASE COUNTERWEIGHT RIGGING ITEMS DEFINED

A. Head blocks:

1. Upright
2. Equip at least six pipe spacers, through bolted to the side plates, to prevent cables escaping from the sheave grooves.
3. Sheave:

    a. 12-inch diameter
    b. Grooved to conform to rope and cable manufacturer's recommendations.
    c. Single cast or nylon sheave shall be
    d. Machined, faced, lathe turned and grooved for the respective number of 1/4-inch cables and one 3/4-inch rope.

4. Bearing:

    a. At least 1-inch diameter hub
    b. Tapered roller bearings with felt seals press fitted in the head block bore.

5. Shaft:

    a. Keyed to one side plate or otherwise restrained to prevent rotation.
    b. Proper adjustment of the bearings to be accomplished by "Flexloc" self-locking nut on the opposite side of the shaft.

6. Side plates:

    a. At least 10-gauge steel
    b. Weld each side plate to the base angle

7. Mounting Angle Iron:

    a. Two support angles for each head block for mounting to building structure

        1) Sized to support the specified loads

    b. Minimum of two bolts per base angle or mounting clips of sufficient size.

8. Aligned so that each groove, its center and sides, remain in the same vertical axis when the sheave is rotated.
9. Provide additional support steel to elevate the head block as required.

B. Loft blocks:

1. Upright
2. Sheave:

    a. 8-inch diameter
    b. Single cast or nylon
    c. Grooved to conform to rope and cable manufacturer's recommendations
    d. Machined, faced and bored for shaft and bearings

3. Bearing:

    a. At least 2-inch diameter hub
    b. Two tapered roller bearings in place operating on a 1/2-inch diameter steel shaft or sealed precision ball bearings on a 5/8-inch diameter steel shaft

4. Shaft:

    a. Keyed to one side plate to prevent the shaft from rotating
    b. Thread the opposite end of the shaft and equip with "Flexloc" self-locking nut

5. Side Plates:

    a. Minimum of 11-gauge steel

6. Install loft blocks at spacing as shown on drawings

C. Mule blocks:

1. Meets the same specifications as the head blocks, except that sheave shall be 10 inches in diameter, provided with suitable universal joint swivel bases and mounting stands or bracket to meet the job conditions.

D. Idler blocks:

1. Consists of one or more sheaves contained within an assembly to provide only vertical support of the lift lines
2. Mount to loft blocks or from building structure

E. Tension blocks:

1. Sheave:

   a. Cast iron or nylon
   b. 10-inch diameter
   c. Grooved for 3/4-inch rope
   d. Machined, faced and bored for shaft and bearings.
   e. Housing: one-piece gray iron casting

2. Bearing:

   a. 1/2-inch diameter steel shaft threaded
   b. Two precision ball bearing or tapered roller bearing assemblies
   c. Held with a hex head nut

3. Weight: at least 30 pounds
4. Rides in tee bar by means of UHMW guide assembles with 1/4-inch steel back plates.

   a. Secure each guide assembly to the block housing by two 3/8-inch bolts, nuts and lock washers

F. Single-Purchase Counterweight Arbors:

1. Existing arbors to be repaired if at all possible

   a. Line set

2. Verify existing loading capacity.

   a. Leave an additional 10-inch clear space above a full load of weights for easy loading.

3. Connect lead cable from battens to shackles with thimbles and Nico-Press sleeves or two wire rope clips

   a. Dress tail of cable with tape

4. Spreader plates:

   a. Minimum three per arbor
   b. 1/8-inch x 2-inch flat bar steel
   c. Affix signs to the arbor back plate that reads:

5. At the top and bottom of each arbor, provide 1/2 inches high line set ID numbers. Adhesive "stick-on" number labels may be used

G. Pipe Battens:

1. 1-1/2-inch NPS, schedule 40 steel pipe
2. Splices:

    a. Sleeve splice all joints
    b. 18-inch long, 9 inches extending into each pipe.
    c. Bolt through the sleeve with two 3/8 inches x 1-inch hex head, grade 5 bolts.

        1) Drill holes in pipes and sleeves so that all pipe sections are interchangeable

3. Color: Black (painted)

    a. Paint the last 12 inches at each end of the truss and pipe batten white or provide yellow plastic end caps.
    b. Mark centerline with a 1/2-inch painted yellow line around the circumference of the bottom pipe
    c. Paint 1/2-inch-wide white lines at 1-foot increments marked around the circumference of the batten, starting at center and working out to the ends

4. At each pick-up point, provide a red tape mark on each side of the trim chain for the full circumference of the top pipe.
5. Line Set Numbers:

    a. Mark each batten with its line set number
    b. Color: white
    c. 1-inch-high numerals
    d. Mark on the top and bottom of each batten 18 inches from each end, and 12 inches stage left of the centerline mark

6. Use trim chains for pickup cable batten connections

H. Pipe Batten Extensions:

1. Ten pipe extensions.
2. Length: 6 feet
3. 1-inch NPS schedule 80 steel pipe
4. Must sleeve within the 1-1/2" I.D. pipe batten.
5. Terminate extensions in a pipe collar welded in place and ground smooth to act as an end stop
6. Paint extensions white from end – 4 feet

    a. Paint the last 2 feet bright red

7. Install extensions on line sets designated by the Owner’s representative

I. Pickup Cables:

1. Use 1/4-inch 7 x 19 utility cable
2. Breaking Strength: 7,000 lbs.

3. free of oil
4. Certification required.

J. Trim Chains:

1. Use either J.R. Clancy Grade 63 *AlphaChain* or SECOA *STC* chain

   a. 3,250 pounds working load
   b. Must meet OSHA 1910.184(e)(5) – Sling use,
   c. Length: 36 inches
   d. Use at the batten end of the pickup cables.

2. One end of the trim chain shall connect to pickup cable with thimbles and Nico-press sleeves.
3. Fit the other end with a 1/4-inch screw-pin shackle

K. Alternative batten clamp Trim Chains:

1. Assemble trim chain with 1/4-inch screw-pin shackle, steel batten clamp and either J.R. Clancy Grade 63 *AlphaChain* or SECOA *STC* chain,
2. 3,250 pounds working load
3. Must meet OSHA 1910.184(e)(5) – Sling use.

L. Purchase Lines:

1. 3/4-inch diameter rope
2. Multiline II synthetic rope free from slivers and foreign materials and in one continuous length.
3. No splices will be accepted

M. Counterweights:

1. Standard "U" slotted type flame cut steel,
2. Width: 6 inches
3. Grind all edges smooth
4. Cut two opposite corners at 45-degree angle to allow for ease of removal with alternately stacked counterweights.
5. Insert sufficient weight in each arbor to balance the empty pipe and paint the exposed edges of these weights "safety yellow".

N. Arbor Guide Tracks:

1. Use 1-1/2 inches x 1-1/2 inches x 3/16 inches tee-steel or J-bar aluminum extending from the stage level to the underside of the head block beams.
2. Space tracks as shown on centers.

O. Stop Bumpers:

1. Use 1-3/4 inches x 1-3/4 inches x 3/16 inches angle irons bolted to the tee tracks.
2. Bolt 2-inch x 2-inch hardwood to the angle iron.

3. On the arbor contact surface of the hardwood, mount 1/2-inch neoprene rubber to cushion the arbor impact.

P. Tee Bar Connections:

1. All connections of wall knees, wall battens, stop battens, and tee guides shall have 3/4-inch slotted holes to permit perfect vertical alignment.
2. Use 5/16-inch x 7/8-inch machine bolts for all tee connections.

    a. For all other connections, use 3/8-inch x 1-1/4-inch bolts

3. Use a flat washer and a lock nut at all slotted connections

    a. Use lock washers at all other connections

Q. Locking Rails:

1. Location: at the stage floor level and at the fly gallery level
2. Construction:

    a. Drill to receive rope locks 8 inches on center
    b. Use 3 inches x 4 inches x 1/4-inch steel angle for the rope lock

        1) Supported 2-foot 6-inches above the stage floor by C4 x 7.24 steel channel legs with diagonal bracing.

    c. Base plates on each leg for floor mounting and gussets for rigidity.

3. Bolt leg base plates through the floor slab or weld to structural steel for maximum uplift of 400 pounds per linear foot on the purchase lines through the rope locks.
4. The locking rails shall have the rope lock channel drilled with 9/16-inch holes, 1-foot on center.

    a. To be used by the stagehands to insert eye nuts, etc.
    b. Provide six eye nuts and corresponding bolts, Crosby #G-400, size 3A or equivalent.

5. On each locking rail, provide cards and mountings for further identification of line sets
6. Provide permanent line set number labels on the locking rail above the ID card slots

    a. Do not place these lineset number labels in the line set identification cards

R. Rope Locks:

1. Construction:

    a. Housings made out of a material having ductile properties that will deform plastically without fracturing
    b. Provide an adjustment mechanism on the rope lock for adjustment of the clamping members for worm ropes or ropes of differing diameters

c. Encapsulate handle in plastic
d. 50 pounds capacity
e. Contains an integral mechanism designed to prevent accidental release

2. Operation:

a. Holds locked position until manually released

3. Position Rope Locks to impose minimal wear on the operating line as it passes through the system.

2.7 FIRE CURTAIN RIGGING

A. Provide house curtain lattice track as shown on the drawings

B. Operate from stage left at the stage floor level

C. Refer to Section “SINGLE PURCHASE COUNTERWEIGHT RIGGING ITEMS DEFINED” for type of quality of individual rigging component

1. Refer to rigging drawings for additional information

D. Use 2-inch NPS, schedule 80 steel pipe

E. Provide one 16-inch diameter **upright** head block, with sheave grooved for four 1/4-inch cables and one 1-inch diameter cotton purchase line.

1. Component parts of head block shall meet the same requirements as the head block listed in the counterweight section of this Specification.
2. Place head block as required for lattice track and operating purchase line to be in the proper location on the floor at stage left/right, as shown on the drawings.
3. Provide and install additional steel, as necessary, to elevate and/or support the head block.

F. Provide four 12-inch diameter upright loft blocks, with sheave grooved for one 1/4-inch cable

1. Component parts of loft blocks shall meet the same requirements as the loft blocks listed in the counterweight section of this Specification

G. Provide one floor block with a 12-inch diameter tension sheave grooved for a 1-inch diameter purchase line.

1. Bolt floor block through stage floor

H. Pickup cables:

1. 1/4-inch 7 x 19 galvanized carbon aircraft cable
2. Breaking Strength: 7,000 lbs.
3. Free of oil

I. Use trim chains as listed in Section “SINGLE PURCHASE COUNTERWEIGHT RIGGING ITEMS DEFINED”

J. Provide one 1-inch diameter Multiline II synthetic rope purchase line.

K. Provide a 1800# capacity counterweight arbor in a lattice type guide track with brass or nylon guide shoes.

1. Long enough to accommodate the counterweight arbor plus the travel of the curtain
2. Terminate wire ropes at the top of the arbor with jaw and eye turnbuckles

    a. Provide thimbles to accommodate the cable and fit through the turnbuckle's eye

3. Cable shall be secured with proper size and number of wire rope clips or Nicopress sleeves
4. Provide turnbuckles rated for a safety factor of not less than 5

    a. Long enough to allow 6 inches of adjustment after installation
    b. Use jam nuts or "mouse" with wire to prevent rotation

5. Attach the lattice track to the wall along its length every 4-feet minimum, using 1/4-inch x 2-inch formed brackets

    a. Provide all materials required to extend the lattice track out from any uneven proscenium wall conditions as required

6. Size arbor to properly counterbalance weight

    a. Provide two locking stop collars and a minimum of three steel flat bar spacer plates on the arbor

7. Provide counterweight in various thicknesses to properly counterbalance the fire curtain plus
8. Provide spring stop bumpers at the bottom of the lattice track
9. At the top and bottom of the arbor provide a minimum 1/2-inch drop forged eye equal to Chicago Hardware No. C-181-A capable of accepting a block and tackle or capstan winch hook.

L. Provide all materials required to extend the lattice track out from any uneven proscenium wall conditions as required.

1. Rigging System Contractor shall inspect this area to determine existing condition.

M. Provide enough steel counterweight for rigging of fire curtain systems. Refer to

N. Install 1/4-inch 7x19 aircraft cables at each side to guide the edges of the curtain.

O. The completed installation shall provide a fully operational house curtain rig, exclusive of the curtain, and shall provide full travel of the batten as noted on the drawings.

2.8 INDEX STRIPLIGHTS

A. Provide one set of two circuit LED index striplights in lengths shown on the drawings and suspended on chains above the stage level locking rail

1. Provide sufficient chain to allow potential lowering of each striplight 2 feet.
2. Wire lamps on two circuits,

   a. One for a blue-wash
   b. One for a white-wash.

3. Provide LED lamps, in blue and warm-white.

2.9 SIGNAGE

A. Provide and install signs with white background and 3/8-inch-high red letters to be mounted on the wall adjacent to the tee bar battery on the stage level, fly gallery level, and loading bridge level.

1. The signs shall read as shown on the drawings.
2. "Date of Last Inspection" and "Date of Next Required Inspection" information shall be in erasable marker.

B. Provide numbered labels to identify each line set at loading bridge level, either on the face of the kickplate, on the head block beam or suspended below the head block beam.

2.10 RIGGING OF ELECTRICAL MULTICABLES

A. Rig a total of four stage lighting circuit multicable extensions from dimming system connector strips mounted on stage pipe battens.

B. Refer both rigging drawings and "QT" series lighting drawings for specific details regarding cable lengths and locations

C. Provide the following:

1. Loft blocks, 8-inch diameter, identical to those listed in "SINGLE PURCHASE COUNTERWEIGHT RIGGING ITEMS DEFINED"

   a. Note that each multicable spot line may require multiple loft blocks.
   b. Loft blocks used for rigging of electrical multicables are not included in "MISCELLANEOUS EQUIPMENT"

2. Cable cradles for each multicable or combination of multicables.
3. 5/8-inch Multiline II or SureGrip synthetic rope as required to rig all the multicables.
4. Rig pick-up lines to avoid fouling working battens and tie off spot lines to the pin rails.

2.11 MISCELLANEOUS EQUIPMENT

A. Provide the following equipment, stored at grid iron level:

1. Two 12-inch diameter upright head blocks

a. Meet the same requirements as the head blocks listed in “SINGLE PURCHASE COUNTERWEIGHT RIGGING ITEMS DEFINED” except for having two sheaves, each grooved for one 5/8-inch diameter rope line.

2. Eight 8-inch diameter upright loft blocks

a. meet the same requirements as the loft blocks listed in “SINGLE PURCHASE COUNTERWEIGHT RIGGING ITEMS DEFINED” except for being grooved for one 5/8-inch diameter rope line

B. Provide the following equipment, stored at the fly gallery level:

1. One 1200 foot coils of first quality 5/8-inch diameter Multiline II synthetic rope
2. Four 30-inch-long lengths of 1-1/2-inch NPS schedule 40 steel pipe to weight the spot lines onstage.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine all conditions under which all presentation area rigging items shall be installed and notify the Construction Manager and/or General Contractor in writing of any condition detrimental to the proper and timely completion of the work.

B. Contractor is solely and exclusively responsible for the satisfactory completion of this rigging system

1. Supply all tools required for the successful installation of the equipment herein.
2. Storage of all equipment and tools during the period of installation and for collecting and removing from the job site all packing materials, trash, scrap materials, etc.

C. The Stage Rigging Contractor shall be responsible for the protection of equipment and/or finished materials provided by other Contractors.

D. Prior to the completion of the installation, the Contractor shall notify the Construction Manager and/or General Contractor and Architect to schedule an inspection of the system.

1. At the time of the inspection, the Stage Rigging Contractor shall furnish sufficient personnel to operate all equipment and to perform adjustments and tests as may be required by the Architect and/or the Owner's representatives.
2. Repair or replace equipment that does not meet specifications with new equipment

a. Reschedule inspection under the same conditions listed previously

3. Remove all temporary to permit full operation and access to all equipment.
4. All temporary equipment shall be removed to permit full operation and access to all equipment.
5. Final review will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every circumstance.

3.2 INSTALLATION SUPERVISION

A. Installation of the rigging systems shall be supervised by the Contractor's own experienced superintendent having extensive experience in installing work of this kind.

1. Superintendent shall be an Entertainment Technician Certification Program (ETCP) Certified Rigger - Theatre.

a. Contractor shall provide the Architect with a copy of the superintendent’s ETCP certification and shall make a copy of this certification available on the job site for the length of the installation.

2. An ETCP Certified Rigger - Theatre shall be present at all times during the rigging system installation.

B. The same individual shall remain in charge of the work throughout the installation of the rigging system until work is completed excepting only the intervention of circumstances completely beyond the control of the Stage Rigging Contractor.

C. The superintendent shall represent the Rigging System Contractor and all directions given to him shall be binding as if given to the Rigging System Contractor.

1. The Rigging System Contractor may require the Owner to confirm such directions in writing.

3.3 FIELD QUALITY CONTROL

A. Rigging System shall be installed in accordance with OSHA Safety and Health Standards and all local codes. All welding shall be in full compliance with the most recent edition of the Structural Welding Code (ANSI / AWS D1.1).

B. All equipment shall be installed in locations shown on Construction Drawings and shall be installed plumb, straight and true and shall function as designed.

C. All components shall be installed to prevent abrasion of moving items against any part of the building structure or other equipment.

1. Sheaves shall be so aligned as to provide fleet angles of the cables not exceeding 2 degrees.

2. Provide mule blocks, cable rollers and guides as required to provide proper alignment and movement around obstructions.

D. Eyes at cable terminations shall be formed over thimbles of correct size.

E. The Stage Rigging Contractor shall perform all drilling and fitting required in the setting of materials and all cutting and fitting required in the fitting of materials to the adjoining work of other Contractors.

3.4 OWNER TRAINING

A. Contractor’s installation superintendent shall perform owner training

B. Schedule instruction with the Owner's designated representatives.

C. Provide all O&M materials, as designated in this Specification, at the time of training

D. Instruction shall be independent of the system check-out and activation. Length of engineering check-out and activation shall not affect the length of instruction time.

1. Instruction shall not necessarily follow immediately after the system check-out and activation

E. Provide up to twelve hours of owner training to include the following:

1. Up to eight hours of instruction shall cover the safe and proper operation of the equipment, including limit switch placement and adjustment, use of the control panel, etc., to the Owner's designated representative.
2. An additional four hours of training shall be dedicated to walking up to six users through an ANSI inspection of one lineset of each type.

a. ANSI inspection training shall cover what to look and listen for, how to identify common problems in each rigging system, and when a problem needs to be addressed immediately by a professional rigger.

F. Instruction, at Owner’s digression, may occur in multiple time blocks.

1. If training is non-continuous, provide one form for each training segment.

G. Provide written documentation of Owner training to the Owner upon completion.

1. Form to include:

a. The date, time, and location of training.
b. Name, title, company and signature of trainer.
c. Name, title, and signature of all participants.
d. Topics covered at training.

H. Training may be video and audio recorded by the owner at the owner’s expense.

END OF SECTION 116136

SECTION 116139 – FIRE SAFETY CURTIAN

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK OF THIS SECTION

A. This Section includes all labor, materials, equipment, and services necessary to furnish and install the Fire Curtain System as shown on the QT drawings and/or specified herein, including but not limited to the following:

1. A motorized, straight lift, automatically closing fire curtain
2. associated rigging and release line as indicated on the drawings and
3. Meet all requirements applicable codes including NFPA and IBC.

B. Related work in other Sections:

1. 116136 – Counterweight Rigging & Pin Rails
2. 116133 – Motorized Rigging
3. 116116 – Wiring Devices
4. 116113 – Networked Lighting Control

1.3 SUBSTITUTIONS

A. Substitutions are allowed when the substitution improves the quality, decrease installation time, or reduce cost.

1. Submit a proposal that clearly outlines construction features of the product so that true and accurate comparisons may be made.

a. Samples of the proposed substation item/s may be requested by the Architect and/or Owner for evaluation

B. No product bid which deviates from the details of the Construction Documents will be considered unless such deviation has been approved in advance by the Architect.

1.4 PROJECT CONDITIONS

A. Provide all new equipment of the latest design

B. No extras will be allowed due to the Contractor's misunderstanding of the work involved or its lack of knowledge of any field conditions due to failure to make accurate field measurements or a thorough investigation of the job site

1.5 SUBMITTALS

A. Submit shop drawings for review by the Architect before fabrication can begin. Such review does not relieve the Contractor of the responsibility of providing equipment in accordance with this Specification.

B. Shop Drawings:

1. Show dimensions, sizes, gauges, thicknesses, finishes, joining, attachments and relationship of work to adjoining construction.
2. Clearly show power, wire, and conduit requirements for all work to be provided by the Contractor.
3. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from drawings.
4. Where other materials must be set to exact locations to receive rigging, furnish assistance and directions necessary to permit other trades to locate their work.
5. Where welded connections, concrete or masonry inserts are required to receive work, show exact locations required and all such drawings shall be furnished to the trades responsible for installing the connectors or inserts.
6. Show locations of all lubrication points.
7. Include engineering and load calculations as well as stamp and seal of a registered professional engineer.
8. Catalog work sheets showing illustrated cuts of items may be submitted for standard manufactured items.
9. Include a copy of the installation superintendent’s ETCP Certified Rigger - Theatre certification. A copy of the installation superintendent’s ETCP certification shall be available on the job site for the length of the installation.

C. Any deviation from this Specification shall be clouded and noted in letters a minimum 1/4-inch high.

1. In order for a deviation to be considered, it must upgrade the quality of the equipment or respond to a field condition.

D. The Stage Rigging Contractor shall, if requested by the Owner or Architect, furnish satisfactory evidence as to the kind and quality of materials he proposes to furnish by submission of exact samples of hardware to be used in this contract.

1. Owner retains the samples until such time that this contract has been completed and accepted.

E. Upon completion of installation, Contractor shall provide Operation and Maintenance (O&M) manuals that shall include "record" shop drawings, parts lists, operational instruction, service/maintenance recommendations, component working load limits, etc.

1. One printed “hard” copy of the O&M manual
2. Two flash drive electronic versions of the O&M manual

1.6 WARRANTY

A. Assure that the rigging is properly installed, free of defects in materials and workmanship and shall provide a warranty on all equipment and workmanship provided under this contract for a period of two years from the date of the final acceptance.

B. During the warranty period, repair or replacement of defective materials and faulty workmanship shall be provided, at no cost to the Owner, within ten days of written notification of defects(s).

C. Post Installation Safety Inspection:

1. One year after the date of final acceptance by the Owner, the installation superintendent shall return to the job site to conduct a thorough inspection of the rigging installation.

    a. Check all bolts and tighten as required, inspect all cable connections and give all items a thorough safety inspection in compliance with ANSI E1.47, Entertainment Technology – Recommended Guidelines for Entertainment Rigging System Inspections.
    b. Repair or replace all damaged items
    c. If the original superintendent is unavailable either because the superintendent no longer works for the contractor or due to issues fully beyond the control of the contractor, then an alternate rigger superintendent shall perform the inspection, under the following conditions:

        1) Be ETCP-RT certified
        2) Have experience supervising installation on projects of similar scope and scale

2. The Contractor is responsible for all materials, superintendent labor, transportation and living expenses for this work at no additional cost to the Owner.

    a. Conduct inspection and repair work during normal working hours at a time mutually agreed upon by the Owner and the Contractor.

3. Provide the Owner and Architect with a written report stating the findings of the inspection within two weeks of completion of the inspection.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers for work in this section:

1. I. Weiss Inc.
   Fairview, NJ
   (201) 402-6500
   https://www.iweiss.com/
2. J.R. Clancy Inc.
   Syracuse, NY
   (315)451-3440
   https://www.jrclancy.com/
3. Texas Scenic Co.
   San Antonio, TX
   (210) 684-0091
   Bronx, NY
   (718) 402-2677
   https://www.texasscenic.com/
4. Tiffin Scenic Studios
   Tiffin, OH
   (419) 477-1546
   http://www.tiffinscenic.com/

B. The Contractor shall have been continuously engaged in the production of theatrical stage rigging equipment for at least fifteen years.

C. The Contractor shall have installed a total of not less than five installations of equal or greater scope to system specified herein, which have been in service for a minimum of one year and a maximum of ten years.

   1. Each of the listed stage rigging installations shall be in service in fully professional commercial theatres being operated by professional technicians.

D. The Contractor for this section shall be the same Contractor that furnishes and installs the following related Division 11 theatrical systems specified on this project:

   1. 116133 – Motorized Rigging
   2. 116136 – Counterweight Rigging & Pin Rails

2.2 GENERAL

A. Curtain sized as shown on the drawings and operate from stage left.

   1. Verify dimensions in the field

B. Operate curtain within smoke pockets

C. Provide an approved curtain of non-combustible material designed and installed to protect against the passage of flame, smoke, and hot gases in the proscenium opening

D. The curtain shall be operated by an automatic heat activated device to descend instantly and safely and to completely close the proscenium opening, and, by an auxiliary operating device, to permit prompt and immediate manual closing of the proscenium opening.

1. Duration and speed of the automatic closing function of the fire curtain shall meet all applicable codes and standards, including NFPA, IBC, and ANSI E1.22.
2. Provide electric fusible links or electronic release mechanism that, upon receiving signal from fire alarm system, lowers the fire curtain.

E. Provide all items not intentionally omitted to make the fire curtain installation complete in all respects to conform with applicable NFPA and Building Codes and Regulations.

2.3 MATERIALS

A. Ferrous materials and accessories shall conform to the following ASTM and ANSI standard specifications:

1. Standard structural steel shapes and plates:

   a. ASTM A-36.

2. Miscellaneous steel items:

   a. ASTM A-283, grade optional.

3. Steel pipe:

   a. ASTM A-53

4. Gray iron castings:

   a. ASTM A-48, Class 30 unless otherwise specified.

5. Malleable iron castings:

   a. ASTM A-47

6. Bolts and nuts:

   a. B18.2.1&2

7. Welding electrodes shall be as permitted by AWS Code D1.0.

B. Wire Rope and Fittings

1. Wire rope shall be 7x19 construction, utility cable, sized as required, that meets Federal Specification RR-W-410E.

   a. Damaged or deformed cables shall not be used.

2. Cable fittings shall be Nicopress copper sleeves or forged steel clips and conform to wire rope manufacturer's recommendations as to size, number and method of installation.

C. Aluminum Materials and Accessories

1. Thicknesses, gauges and tempers of aluminum products shall be as required for proper forming operations and to meet structural standards.
2. Aluminum Castings: 214 or 356 alloy as per strength requirements.
3. Fasteners: Include bolts, nuts, washers, screws, nails, rivets and other fastenings necessary for proper erection and/or assembly of aluminum work.
4. Fabrication shall be by AWS certified welders.

D. Finishes for Items Without Factory Finish

1. Welds, burrs and rough surfaces on all interior ferrous metals shall be ground smooth and the completed assembly cleaned and all metal surfaces shall be given a minimum one coat of finish paint.
2. No painted finish shall be required on aluminum finishes.
3. All exposed fastenings shall match color and finish of adjacent material.

E. Pipes

1. Provide a 2-inch NPS, schedule 40 steel pipe batten placed in the pocket at the top of the curtain
2. Provide a 2-inch NPS schedule 40 steel pipe batten in the bottom pocket of the curtain.

2.4 SAFETY STANDARDS

A. In order to establish minimum standards of safety, the following factors shall be used:

1. Cables and fittings: 8:1 Safety Factor
2. Terminating hardware: 5:1, or not exceeding WLL, whichever is more restrictive.
3. Trim chain assembly: 5:1, or not exceeding WLL, whichever is more restrictive.
4. Batten clamps: 5:1, or not exceeding WLL, whichever is more restrictive.
5. Motors: 1.0 Service factor
6. Gearboxes: 1.25 Mechanical Strength Service Factor
7. Cable bending ratio: Sheave diameter is 30 times diameter of cable
8. Tread pressures: 500# for cast iron, 900# for Nylatron ,1000# for steel
9. Maximum fleet angle: 1-1/2 degrees
10. Steel: 1/5 of yield
11. Bearings: L10 life of 2000 hours at two times required load at full speed
12. Bolts: Grade 5 or better, plated

2.5 STRAIGHT LIFT FIRE CURTAIN

A. Construction:

1. Non-combustible, non-asbestos, non-carcinogenic, silica-based cloth of sufficient weight and composition

   a. Meets or exceeds the requirements set forth in all applicable codes and standards, including NFPA, IBC, and ANSI E1.22
   b. Continuous length of fabric running vertically

1) No horizontal seams

c. Minimum 1” overlap with double rows of stitching on seams.
d. Sew with flame retardant thread that has the same or greater thickness than the yarns in the cloth

B. Provide minimum 6-inch pockets of double thickness at the top and bottom of the curtain for the pipe battens.

1. On the back of the bottom pocket provide openings at each end, at center line, and 21 feet left and right of center line making installation of bottom pipe easier.

C. At the bottom of the curtain, provide a 3-inch-thick yielding pad of non-combustible material to form a seal when the fire curtain is in the closed position.

1. The yielding pad shall be covered with a double thickness of cloth.

D. Roller Guides

1. At each side of the fire curtain provide double-thick vertical side edge hems each a minimum of 1/2 inch wider than the length of the metal hem reinforcing pieces.
2. Reinforce the vertical side edge hems with one-piece 16-gauge galvanized sheet metal on each side of the hem on each side of the curtain for its full vertical height so that both faces are covered 5-1/2 inches deep.

a. Fasten reinforcement to the side edge hems with pairs of minimum 3/16-inch plated tubular or solid steel rivets or bolts with lock washers, spaced not more than 6 inches on center vertically.

3. Use a roller guide and metal track side edge guide system, using guides with two or four roller or ball bearing steel wheels each, and 14-gauge galvanized steel tracks installed rigidly in place.

a. Mount side edge guide system inside the smoke pockets.
b. Attach each roller guide to the curtain metal stiffened edges by three or more minimum 3/16-inch plated tubular or solid steel rivets, or bolts with lock washers, through a plated steel strap assembly.
c. Place guides on maximum 18-inch vertical centers.

E. Above the proscenium opening, provide a smoke seal between the fire curtain and the wall.

1. This seal shall be of sufficient width to bear on the curtain when the curtain is in the closed position.
2. Attach smoke seal to the upstage side of the proscenium wall

2.6 EMERGENCY CONTROL LINE SYSTEM

A. Furnish and install a complete fire or emergency control line system, consisting of the following:

1. Minimum 3/32-inch 7x19 utility cable
2. Install one line on each side of the proscenium opening

B. Extend line system up both sides and above the proscenium opening.

C. Use a mechanical quick-release device that can be easily reset for any attachment to the emergency control line

2.7 MANUAL EMERGENCY DEPLOYMENT

A. Activate of one of two mechanical quick-release assemblies

1. one on each side of the proscenium opening.

B. Activation:

1. Pull a minimum 1-1/2-inch diameter red ring, attached to a quick-release pin that is pinned through two steel plates housing a minimum 1-inch diameter ring that is securely attached to the emergency release line.

C. Quick release mechanisms shall be such that they can quickly and easily be reset in the event of erroneous activation.

D. Other similar activation assemblies that are positive in nature and meet the basic criteria of the quick release system detailed above may be used.

2.8 ELECTRONIC EMERGENCY DEPLOYMENT

A. Provide one electronic mechanism which will release the fire line automatically upon signal from alarm system.

1. Mechanism shall allow for test release of the Fire Curtain fire line. If electric fusible links are provided, provide five additional links.
2. If an electrically held mechanism is provided, provide a battery and “trickle” charger to supply power to the mechanism to prevent release of fire curtain in the event of a power failure.

2.9 SIGNAGE

A. Display appropriate signs in English near each emergency control line release mechanism.

1. For the release system listed above, the sign shall read:

“IN CASE OF FIRE, PULL RED RING TO LOWER FIRE CURTAIN AUTOMATICALLY!” with an arrow pointing to the location of the ring.

B. Provide and install signs with white background and 3/8-inch-high red letters to be mounted on the wall on the stage level, fly gallery level, and loading bridge level at a position that is conspicuous to workers performing rigging work.

1. The signs shall read as shown on the drawings.
2. Use erasable marker for “Date of Last Inspection” and “Date of Next Required Inspection” information

2.10 SMOKE POCKETS

A. Construction:

1. 18 inches deep
2. Minimum 1/4-inch-thick structural steel shapes and plates with a bolted construction using minimum 3/8-inch Grade 5 bolts on minimum 4-foot centers to attach plates to the steel shapes for the entire height of the smoke pocket.
3. Begin at 6 inches off stage from the proscenium opening as shown on the drawings
4. Color: black

B. Vertically extend smoke pockets from the stage floor to the underside of the grid iron

1. Securely fasten to the upstage side of the proscenium wall with minimum 1/2-inch diameter Grade 5 bolts in anchors on minimum 4-foot centers.

2.11 RIGGING

A. Head Block

1. Head Block Construction:

a. Sheave:

1) 16-inch diameter
2) Grooved to conform to rope and cable manufacturer's recommendations
3) Machined, faced, lathe turned and grooved for the respective number of 1/4-inch cables and one 3/4-inch rope
4) Equip with at least six pipe spacers, through bolted to the side plates, to prevent cables escaping from the sheave grooves

b. Bearing:

1) At least 1-inch diameter hub
2) Tapered roller bearings with felt seals press fitted in the head block bore

c. Shaft:

1) Keyed to one side plate to prevent the shaft from rotating

2) Thread the opposite end of the shaft and equip with "Flexloc" self-locking nut

d. Side Plates:

1) 10-gauge steel
2) Weld to the base angle

e. Mounting Angle Iron:

1) Two support angle irons for mounting to building structure

a) Sized for the specific load

2) Minimum of two bolts per base angle or mounting clips of sufficient size

2. Component parts of head blocks shall meet the same requirements as head blocks listed in 116136 – Counterweight Rigging & Pin Rails
3. Install head block in location as shown on drawings
4. Align head blocks so that each groove, its center and sides, remains in the same vertical axis when the sheave is rotated.
5. Provide additional support steel to elevate the head block as required.

B. Loft Blocks

1. Loft Block Construction:

a. Upright
b. Nylon
c. Sheave:

1) 12-inch diameter
2) Grooved to conform to rope and cable manufacturer's recommendations
3) Machined, faced, and bored for shaft and bearings

d. Bearing:

1) At least 2-inch diameter hub
2) Two tapered roller bearings in place operating on a 1/2-inch diameter steel shaft or sealed precision ball bearings on a 5/8-inch diameter steel shaft

e. Shaft:

1) Keyed to one side plate to prevent the shaft from rotating
2) Thread the opposite end of the shaft and equip with "Flexloc" self-locking nut

f. Side Plates:

1) Minimum 11-gauge steel

g. Mounting Angle Iron:

1) Two support angle irons for mounting to building structure

a) Sized for the specific load

2) Minimum of two bolts per base angle or mounting clips of sufficent size

h. Cables:

1) 1/4-inch 7x19 steel pick-up cables
2) Attach cables to the counterweight carriage using turnbuckles, cable thimbles and wire rope clips or Nicopress sleeves

2. Component parts of loft blocks shall meet the same requirements as loft blocks listed in 116136 – Counterweight Rigging & Pin Rails and 116133 – Motorized Rigging.
3. Install loft blocks at spacing as shown on drawings

C. Guide Tracks:

1. Roller Guide Track

a. Provide a roller guide track side edge guide system inside the smoke pocket

1) Extend the full length of the smoke pocket
2) Rigidly installed
3) Use at least two roller or ball bearing steel wheels on each guide
4) Place on maximum 18-inch vertical centers
5) Attach guides to curtain on the metal stiffened edges by plated tubular or solid steel rivets or bolts through a plated steel strap assembly

D. Safety Chain

1. Provide 1/4-inch proof coil safety chains leading from the top batten to custom mounting steel as required.

a. Adjust chains so that they support the curtain when it is lowered, and the bottom batten is resting on the yield pad supported by the floor

PART 3 - EXECUTION

3.1 GENERAL

A. Examine all conditions under which all presentation area rigging items shall be installed and notify the Construction Manager and/or General Contractor in writing of any condition detrimental to the proper and timely completion of the work.

B. Contractor is solely and exclusively responsible for the satisfactory completion of this rigging system

1. Supply all tools required for the successful installation of the equipment herein.
2. Storage of all equipment and tools during the period of installation and for collecting and removing from the job site all packing materials, trash, scrap materials, etc.

C. The Stage Rigging Contractor shall be responsible for the protection of equipment and/or finished materials provided by other Contractors.

D. Prior to the completion of the installation, the Contractor shall notify the Construction Manager and/or General Contractor and Architect to schedule an inspection of the system.

1. At the time of the inspection, the Contractor shall furnish sufficient personnel to operate all equipment and to perform adjustments and tests as may be required by the Architect and/or the Owner's representatives.
2. Repair or replace equipment that does not meet specifications with new equipment

a. Reschedule inspection under the same conditions listed previously

3. Remove all temporary to permit full operation and access to all equipment.
4. Final review will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every circumstance.

3.2 INSTALLATION SUPERVISION

A. Installation of the rigging systems shall be supervised by the Rigging System Contractor's own experienced superintendent having extensive experience in installing work of this kind.

1. Superintendent shall be an Entertainment Technician Certification Program (ETCP) Certified Rigger - Theatre.

a. Rigging System Contractor shall provide the Architect with a copy of the superintendent’s ETCP certification and shall make a copy of this certification available on the job site for the length of the installation.

2. An ETCP Certified Rigger - Theatre shall be present at all times during the rigging system installation.

B. The same individual shall remain in charge of the work throughout the installation of the rigging system until work is completed excepting only the intervention of circumstances completely beyond the control of the Contractor.

C. The superintendent shall represent the Contractor and all directions given to him shall be binding as if given to the Contractor.

1. The Contractor may require the Owner to confirm such directions in writing.

3.3 FIELD QUALITY CONTROL

A. Install rigging system in accordance with OSHA Safety and Health Standards and all local codes. All welding shall be in full compliance with the most recent edition of the Structural Welding Code (ANSI / AWS D1.1).

B. Install all equipment in locations shown on Construction Drawings

1. Install plumb, straight and true and function as designed.

C. Install all components to prevent abrasion of moving items against any part of the building structure or other equipment.

1. Align sheaves as to provide fleet angles of the cables not exceeding two degrees.
2. Provide mule blocks, cable rollers and guides as required to provide proper alignment and movement around obstructions.

D. Form cable termination eyes over thimbles of correct size

E. The Contractor shall perform all drilling and fitting required in the setting of materials and all cutting and fitting required in the fitting of materials to the adjoining work of other Contractors.

3.4 OWNER TRAINING

A. Contractor’s installation superintendent shall perform owner training

B. Schedule instruction with the Owner's designated representatives.

C. Provide all O&M materials, as designated in this Specification, at the time of training

D. Instruction shall be independent of the system check-out and activation. Length of engineering check-out and activation shall not affect the length of instruction time.

1. Instruction shall not necessarily follow immediately after the system check-out and activation

E. Provide up to four hours of owner training to include the following:

1. Up to two hours of instruction shall cover the safe and proper operation of the equipment, including limit switch placement and adjustment, use of the control panel, etc., to the Owner's designated representative.
2. An additional two hours of training shall be dedicated to walking up to 6 users through an ANSI inspection of one lineset of each type.

a. ANSI inspection training shall cover what to look and listen for, how to identify common problems in each rigging system, and when a problem needs to be addressed immediately by a professional rigger.

F. Instruction, at Owner’s digression, may occur in multiple time blocks.

1. If training is non-continuous, provide one form for each training segment.

G. Provide written documentation of Owner training to the Owner upon completion.

1. Form to include:

a. The date, time, and location of training.
b. Name, title, company and signature of trainer.
c. Name, title, and signature of all participants.
d. Topics covered at training.

H. Training may be video and audio recorded by the owner at the owner's expense.

END OF SECTION 116139

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad countertops.
2. Accessories.

1.2 ACTION SUBMITTALS

A. Shop Drawings:

1. Plans, sections, details, edge and backsplash profiles, and attachments to other work.
2. Locations and details of joints.
3. Locations and sizes of cutouts and holes for items installed in countertop.
4. Apply AWI's Quality Certification Program label to Shop Drawings.

B. Samples for Initial Selection: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Indicate locations and sizes of cutouts and holes for items installed in countertop and backsplashes.

B. Product Certificates: For the following:

1. Composite wood products.
2. High-pressure decorative laminate.

C. Qualification Statements: For Installer and fabricator.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.

B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.6 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Plastic-Laminate-Clad Countertop Type:

B. Quality Standard: Unless otherwise indicated, comply with ANSI/AWI 1236 for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

C. High-Pressure Decorative Laminate: ISO 4586-3, Grade HGS.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Basis-of-Design Product PL-01: As indicated on Sheet A900.00 Finish Schedule.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: Veneer-core plywood.

G. Core Material at Sinks: Veneer-core plywood made with Type II adhesive.

H. Core Thickness: 3/4 inch (19 mm).

1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

I. Backer Sheet: Provide plastic-laminate backer sheet, ISO 4586-3, grade to match exposed surface, on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Composite Panel Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.

1. Veneer-Core Hardwood Plywood: ANSI/HPVA HP-1.

2.3 MISCELLANEOUS MATERIALS

A. Installation Adhesive: Manufacturer's standard product that is recommended for application indicated.

2.4 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of dates and times countertop fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.3 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where indicated on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten in accordance with manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Countertop Installation:

1. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

3. Anchor wall cleating necessary for proper setting for countertops not supported by casework.
4. Install countertops level and true in line. Use concealed shims as required to maintain not more than 1/8-inch-in-96-inch (3-mm-in-2400-mm) variation from a straight, level plane.
5. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
6. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where impossible to repair, replace countertops. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces.

C. Protection: Provide kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION 123623.13

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material apron fronts.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Initial Selection: For each type of material exposed to view.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.

1. Basis-of-Design Product SSM-01: As indicated on Sheet A900.00 Finish Schedule, or approved equal.
2. Type: Provide Standard type unless Special Purpose type is indicated.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Premium.

B. Configuration:

1. Front: Straight, slightly eased at top.
2. Backsplash: Straight, slightly eased at corner.
3. End Splash: Matching backsplash.

C. Countertops:

1. 3/4-inch- (19-mm-) thick, solid surface material with front edge built up with same material.

D. Backsplashes: 3/4-inch- (19-mm-) thick, solid surface material.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.

F. Joints:

1. Fabricate countertops without joints.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

   a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.

2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
3. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop,

form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

F. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Supports and anchorages.
11. Coordination drawings.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Escutcheons.
2. Supports and anchorages.
3. Piping materials

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

D. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to 1/4-inch scale or larger, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Domestic water piping.
2. HVAC hydronic piping.
3. All equipment.
4. HVAC ductwork.
5. Electrical equipment and conduit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Underground Piping NPS 1-1/2 (DN 40) and Smaller: Manufactured fitting or coupling.
2. Underground Piping NPS 2 (DN 50) and Larger: AWWA C219, metal sleeve-type coupling.
3. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.(security set screw)

1. Finish: Polished chrome-plated.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Contract Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
c. Insulated or Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
d. Insulated or Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast-brass type with polished chrome-plated finish.
e. Insulated or Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
f. Insulated or Bare Piping in Equipment Rooms: One-piece, cast-brass type.

2. Existing Piping: Use the following:

a. All Piping: Split-casting, cast-brass type with chrome-plated finish.

M. Sleeves are not required for core-drilled holes.

N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

   a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
   b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
   c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

      1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. PVC Nonpressure Piping: Join according to ASTM D 2855.
4. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

K. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

L. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.7 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.8 COORDINATION DRAWINGS

A. For piping in equipment rooms and other congested areas, drawn to 1/4-inch scale or larger, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Domestic water piping.
2. HVAC hydronic piping.
3. All equipment.
4. HVAC ductwork.
5. Electrical equipment and conduit

END OF SECTION 220500

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING – “LEAD FREE”

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Ductile-iron, single-flange butterfly valves.
3. Ductile-iron, grooved-end butterfly valves.
4. Bronze lift check valves.
5. Bronze swing check valves.
6. Iron swing check valves.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. PTFE: Polytetrafluoroethylene plastic.

H. SWP: Steam working pressure.

I. Lead Free: Refers to the wetted surface of pipe, fittings, valves and fixtures in potable water systems that have a weighted average lead content ≤ 0.25% per California Health & Safety Code (116875).

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.9 for building services piping valves.
3. ASME B16.18 for solder joint.
4. ASME B1.20.1 for threads for threaded end valves.

C. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified to comply with California lead free law, California Health & Safety Code 116875 (CA AB 1953).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Bronze valves shall be made with Lead Free silicon bronze copper alloy that is a corrosion-resistant material and can be brazed. Bronze valves made with copper alloy containing more than 22 percent zinc are not permitted.

C. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.

D. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.

E. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.

H. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material that meets UL 2043 approved for inside air plenum, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.

   a. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Nib-seal handle extension or comparable product by one of the following:

      1) Conbraco Industries, Inc.; Apollo Div

3. Butterfly Valves: With extended neck.

I. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

K. Manufacturers:

1. Subject to compliance with requirements, provide products by one of the following:

a. NIBCO INC.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Crane Valves.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & or with Nib-Seal Handle (-NS):

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-585-66-LF (-NS) or T-585-66-LF (-NS) or a comparable product.
2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig (4140 kPa).
c. Body Design: Two piece bronze with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.
d. Body Material: Lead Free silicon bronze copper alloy.
e. Ends: Threaded or soldered.
f. Seats: PTFE or TFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Full.

2.3 DUCTILE IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model LD-2000-3/5 & LD-1000-5 or a comparable product.
2. Description:

a. Standard: MSS SP-67, Type I.
b. NPS 12 (DN 300) and Smaller CWP Rating: 200 psig (1380 kPa).
c. NPS 14 (DN 350) and Larger CWP Rating: 150 psig (1034 kPa).
d. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
e. Body Material: ASTM A 536, ductile iron.
f. Seat: EPDM.
g. Stem: One- or two-piece stainless steel.
h. Disc: Lead Free Aluminum bronze.

2.4 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-480-Y-LF or T-480-Y-LF or a comparable product.
2. Description:

   a. Standard: MSS SP-80, Type 1 or MSS SP-139.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Vertical flow.
   d. Body Material: Lead Free silicon bronze copper alloy.
   e. Ends: Threaded or Soldered.
   f. Disc: TFE.

2.5 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Nonmetallic TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-413-Y-LF or T-413-Y-LF or a comparable product.
2. Description:

   a. Standard: MSS SP-80, Type 3 or MSS SP-139.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Horizontal flow.
   d. Body Material: Lead Free silicon bronze copper alloy.
   e. Ends: Threaded or Soldered.
   f. Disc: PTFE or TFE .

B. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-433-Y-LF or T-433-Y-LF or a comparable product.
2. Description:

   a. Standard: MSS SP-80, Type 4 or MSS SP-139.
   b. CWP Rating: 300 psig (2070 kPa).
   c. Body Design: Horizontal flow.
   d. Body Material: Lead Free silicon bronze copper alloy.
   e. Ends: Threaded or Soldered.
   f. Disc: PTFE or TFE.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model F-918-33, or a comparable product.
2. Description:

   a. Standard: MSS SP-71, Type I or MSS SP-136 Type 1.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Clear or full waterway.
   d. Body Material: ASTM A 126, gray iron with bolted bonnet.
   e. Ends: Flanged.
   f. Trim: Lead Free silicon bronze copper alloy or stainless steel.
   g. Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, or butterfly valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: Ball valves.
4. Pump-Discharge Check Valves:

   a. NPS 2 (DN 50) and Smaller: Bronze swing check or spring-loaded lift valves with nonmetallic disc.
   b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring or iron, center-guided metal-seat check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 4 (DN 100) and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
3. Bronze Swing Check Valves: Class 125, nonmetallic TFE disc.
4. Bronze Lift Check Valves: Class 125, nonmetallic TFE disc.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment support.
2. Division 21 Section "Wet Pipe Sprinkler Systems" for pipe hangers for fire-suppression piping.
3. Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
4. Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment, and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.
4. Pipe positioning systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." and AWS D1.4, "Structural Welding Code--Reinforcing Steel."

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.
15. Holdrite

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.

c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

   a. Horizontal (MSS Type 54): Mounted horizontally.
   b. Vertical (MSS Type 55): Mounted vertically.
   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

N. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
3. Secure piping to trapeze hangers with upper pipe clamps.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

O. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Thermal-hanger shield inserts shall be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Thermal-hanger shield inserts shall be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Warning signs and labels.
2. Pipe labels.
3. Valve tags.
4. Warning tags

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch; Stainless steel, 0.025-inch; Aluminum, 0.032-inch; or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.4 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting High-Performance Coatings."

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:

a. Background Color: Blue
b. Letter Color: White.

2. Sanitary Waste and Storm Drainage Piping:

a. Background Color: Black
b. Letter Color: White

3.3 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches round
b. Hot Water: 1-1/2 inches round

2. Valve-Tag Color:

a. Cold Water: Natural
b. Hot Water: Natural

3. Letter Color:

a. Cold Water: White
b. Hot Water: White

3.4 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

1. Division 22 Section "Domestic Water Piping"
2. Division 22 Section "Sanitary Waste and Vent Piping"
3. Division 22 Section "Facility Storm Drainage Piping"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Fibrex Insulations Inc.; Coreplus 1200.
   b. Johns Manville; Micro-Lok.
   c. Knauf Insulation; 1000-Degree Pipe Insulation.
   d. Manson Insulation Inc.; Alley-K.
   e. Owens Corning; Fiberglas Pipe Insulation.
   f. Or approved equal

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket with factory-applied ASJ with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. Type II, 1200 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, without factory-applied jacket with factory-applied ASJ with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
   b. Eagle Bridges - Marathon Industries; 225.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
   d. Mon-Eco Industries, Inc.; 22-25.
   e. Or approved equal

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Or approved equal

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Or approved equal

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. PVDC Jacket for Indoor Applications: 4-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

2.5 FIELD-APPLIED JACKETS

1. PVC Jacket: High-impact-resistant, PVC complying with ASTM D 1784, Class 16354-C with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
2. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto PVC Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

3. Adhesive: As recommended by jacket material manufacturer.
4. Color: White

5. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.6 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABI, Ideal Tape Division; 428 AWF ASJ.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
    c. Compac Corporation; 104 and 105.
    d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
    e. Or approved equal

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABI, Ideal Tape Division; 370 White PVC tape.
    b. Compac Corporation; 130.
    c. Venture Tape; 1506 CW NS.
    d. Or approved equal

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.7 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ITW Insulation Systems; Gerrard Strapping and Seals.
   b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
   c. Or approved equal

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, and securely in position indicated when self-locking washer is in place.

   a. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
      2) GEMCO; Perforated Base.
      3) Midwest Fasteners, Inc.; Spindle.
      4) Or approved equal

   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low carbon steel Aluminum Stainless steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.8 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches 4 inches o.c.

   a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Vertical stormwater and overflow piping concealed behind finishes
3. Underground piping.
4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Concealed Domestic Cold, Hot and Recirculated Hot Water:

1. NPS 2 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch

2. NPS 2-1/2 and Larger: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

B. Exposed Domestic Cold, Hot and Recirculated Hot Water above 8’-0” A.F.F.:

1. NPS 2 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch

2. NPS 2-1/2 and Larger: Insulation shall be one of the following:

   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

C. Exposed Domestic Cold, Hot and Recirculated Hot Water below 8’-0”A.F.F., and Domestic Cold, Hot and Recirculated Hot Water exposed in Mechanical rooms:

1. NPS 2 and Smaller: Insulation shall be one of the following:

   a. Mineral-Fiber, Preformed Pipe Insulation, Type I with PVC jacket: 1 inch

2. NPS 2-1/2 and Larger: Insulation shall be one of the following:

   a. Mineral-Fiber, Preformed Pipe Insulation, Type I with PVC jacket: 1-1/2 inch thick.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. Refer to plumbing fixture specification section.

END OF SECTION 220700

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
2. Encasement for piping.
3. Transition Fittings
4. Dielectric Fittings
5. Escutcheons
6. Sleeves
7. Sleeve Seals
8. Wall Penetration Systems

B. Related Requirements:

1. Division 22 Section "Identification for Plumbing Piping Systems"
2. Division 22 Section "Plumbing Insulation"
3. Division 22 Section "Domestic Water Piping Specialties"
4. Division 22 Section "General-Duty Valves for Plumbing Systems"
5. Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment"

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. Storm water piping
3. HVAC hydronic piping.

4. HVAC duct systems
5. Electrical and Low-Voltage system cable trays and major conduits

C. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect Owner no fewer than seven days in advance of proposed interruption of water service.
2. Do not interrupt water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings
2. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings
3. Copper Unions:

a. MSS SP-123.
b. Cast-copper-alloy, hexagonal-stock body.
c. Ball-and-socket, metal-to-metal seating surfaces.
d. Solder-joint or threaded ends.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

1. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings
2. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings
3. Copper Unions:

a. MSS SP-123.
b. Cast-copper-alloy, hexagonal-stock body.
c. Ball-and-socket, metal-to-metal seating surfaces.
d. Solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105/A21.5.

B. Form: Sheet or tube.

C. Color: Black or Natural

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Piping Specialties Products.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc.; a Sensus company.

g. Viking Johnson.
h. Or approved equal

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Charlotte Pipe and Foundry Company.
b. Harvel Plastics, Inc.
c. Spears Manufacturing Company.
d. Or approved equal

2. Description:

a. PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
b. One end with threaded brass insert and one solvent-cement-socket or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Colonial Engineering, Inc.
b. NIBCO Inc.
c. Spears Manufacturing Company.
d. Or approved equal

2. Description:

a. CPVC or PVC four-part union.
b. Brass or stainless-steel threaded end.
c. Solvent-cement-joint or threaded plastic end.
d. Rubber O-ring.
e. Union nut.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering

products that may be incorporated into the Work include, but are not limited to, the following:

a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Jomar International.
e. Matco-Norca.
f. McDonald, A. Y. Mfg. Co.
g. Watts; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.
i. Or approved equal

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F 150 psig 250 psig.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
b. Central Plastics Company.
c. Matco-Norca.
d. Watts; a division of Watts Water Technologies, Inc.
e. Wilkins; a Zurn company.
f. Or approved equal

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 175 psig.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
e. Or approved equal

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Elster Perfection Corporation.
   b. Grinnell Mechanical Products; Tyco Fire Products LP.
   c. Matco-Norca.
   d. Precision Plumbing Products, Inc.
   e. Victaulic Company.
   f. Or approved equal

2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

2.7 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated or rough-brass finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew.

E. Split Casting, Cast Brass: Polished, chrome-plated or rough-brass finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.8 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

D. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

E. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

F. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

G. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.9 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.
5. Or approved equal.

B. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.10 WALL PENETRATION SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. SIGMA.
2. Or approved equal.

B. Description: Wall-sleeve assembly, consisting of housing and gland, gaskets, and pipe sleeve.

1. Carrier-Pipe Deflection: Up to 5 percent without leakage.
2. Housing: Ductile-iron casting with hub, waterstop, anchor ring, and locking devices. Include gland, bolts, and nuts.
3. Retain "EPDM rubber" option in first two subparagraphs below unless NBR gasket material is required because hydrocarbons are present in the soil.
4. Housing-to-Sleeve Gasket: EPDM rubber.
5. Housing-to-Carrier-Pipe Gasket: AWWA C111, EPDM rubber.
6. Pipe Sleeve: AWWA C151, ductile-iron pipe

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Division 22 Section "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Division 22 Section "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Division 22 Section "Domestic Water Piping Specialties."

G. Install domestic water piping level with 0.25 percent slope downward toward drain without pitch and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Division 22 Section "Meters and Gages for Plumbing Piping."

S. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Division 22 Section "Domestic Water Pumps."

T. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Division 22 Section "Meters and Gages for Plumbing Piping."

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Common Work Results for Plumbing."

V. Install sleeve seals for piping penetrations of concrete walls and slabs.

W. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.4 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code. Comply with requirements for connection sizes in Division 22 plumbing fixture Sections.
3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece or split casting, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.8 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Stack sleeve fittings.

a. Extend sleeves 2 inches above finished floor level.
b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

a. Steel pipe sleeves for pipes smaller than NPS 6.
b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
5. Sleeves for Piping Passing through Exterior Concrete Walls:

a. Steel pipe sleeves for pipes smaller than NPS 6.
b. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
c. Do not use sleeves when wall penetration systems are used.

6. Sleeves for Piping Passing through Interior Concrete Walls:

a. Steel pipe sleeves for pipes smaller than NPS 6.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.

3.9 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.10 WALL PENETRATION SYSTEM INSTALLATION

A. Install wall penetration systems in new, exterior concrete walls.

B. Assemble wall penetration system components with sleeve pipe. Install so that end of sleeve pipe and face of housing are flush with wall. Adjust locking devices to secure sleeve pipe in housing.

3.11 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Division 22 Section "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.12 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
3) Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

c. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.13 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.14 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
        3) Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

    c. Repeat procedures if biological examination shows contamination.
    d. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.15 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

E. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.

F. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.

3.16 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply See Section 220523 for lead-free valve specifications:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Strainers.
6. Water hammer arresters.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa) unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

D. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

E. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of **Division 11**. Provide submittal information for products third-party certified by an approved laboratory as complying with **Division 11**.

1.5 QUALITY ASSURANCE

A. 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.

B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ames Co.
   b. Cash Acme.
   c. Conbraco Industries, Inc.
   d. FEBCO; SPX Valves & Controls.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Arrowhead Brass Products, Inc.
   b. Cash Acme.

c. Conbraco Industries, Inc.
d. MIFAB, Inc.
e. Watts Industries, Inc.; Water Products Div.
f. Woodford Manufacturing Company.
g. Zurn Plumbing Products Group.

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Flomatic Corporation.
e. Watts Industries, Inc.; Water Products Div.

2. Zurn Plumbing Products Group; Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.
5. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.
b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.
b. Watts Industries, Inc.; Water Products Div.
c. Woodford Manufacturing Company.
d. Or approved equal.

2. Standard: ASSE 1052.
3. Operation: Up to 10-foot head of water (30-kPa) back pressure.
4. Inlet Size: NPS 1/2 or NPS 3/4 (DN 15 or DN 20).
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm (0.19-L/s) flow.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Cash Acme.
   b. Conbraco Industries, Inc.
   c. Honeywell Water Controls.
   d. Watts Industries, Inc.; Water Products Div.
   e. Zurn Plumbing Products Group;.

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).

2.4 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Conbraco Industries, Inc.
   b. Crane Co.; Crane Valve Group.
   c. Hammond Valve.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
   f. Red-White Valve Corp.

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
4. Size: NPS 2 (DN 50) or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.5 THERMOSTATIC MIXING VALVES

A. High-Low, Thermostatic, Water Mixing Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bradley Corporation.

b. Lawler Manufacturing Company, Inc.
c. Leonard Valve Company.
d. Powers; a Watts Industries Co.
e. Symmons Industries, Inc.

2. Standard: ASSE 1017 and ASSE 1070 or CSA B125.3.
3. Pressure Rating: 125 psig (860 kPa).
4. Liquid-filled thermal motor
5. Type: Exposed, high-low, thermostatically controlled water mixing valve.
6. Material: Bronze body with corrosion-resistant interior components.
7. Connections: Threaded union inlets and outlet.
8. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable temperature-control handle.
9. Valve Finish: Bronze finish.
10. Piping Finish: None.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

a. Strainers NPS 2 (DN 50) and Smaller: 0.033.
b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045.

6. Drain: Factory-installed, hose-end drain valve.

2.7 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Josam Company.
c. MIFAB, Inc.
d. PPP Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

g. Tyler Pipe; Wade Div.
h. Watts Drainage Products Inc.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Select balancing valve based on flow requirements rather than pipe size.

F. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve, and pump.

G. Install water hammer arresters in water piping according to PDI-WH 201.

H. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

I. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 Section "Grounding and Bonding”.

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

B. Related Sections:

1. Division 22 Section "Identification for Plumbing Piping Systems"
2. Division 22 Section "Plumbing Piping Insulation"
3. Division 22 Section "Domestic Water Piping Specialties"
4. Division 22 Section "General-Duty Valves for Plumbing – Lead Free"
5. Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment"
6. Division 22 Section "Sanitary Waste Piping Specialties"

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Waste, Force-Main Piping: 50 psig.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For solvent drainage system. Include plans, elevations, sections, and details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. Storm water piping
3. HVAC hydronic piping.
4. HVAC duct systems
5. Electrical and Low-Voltage system cable trays and major conduits

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than seven days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Extra Heavy class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. Fernco Inc.
d. Matco-Norca, Inc.
e. MIFAB, Inc.
f. Mission Rubber Company; a division of MCP Industries, Inc.
g. Stant.
h. Tyler Pipe.
i. Or approved equal

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

~~**D. Heavy-Duty, Hubless-Piping Couplings:**~~

~~**1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:**~~

~~**a. ANACO-Husky.**~~
~~**b. Clamp-All Corp.**~~
~~**c. Dallas Specialty & Mfg. Co.**~~
~~**d. MIFAB, Inc.**~~
~~**e. Mission Rubber Company; a division of MCP Industries, Inc.**~~
~~**f. Stant.**~~
~~**g. Tyler Pipe.**~~
~~**h. Or approved equal**~~

~~**2. Standards: ASTM C 1277 and ASTM C 1540.**~~
~~**3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.**~~

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight or Schedule 40 class. Include ends matching joining method.

B. Galvanized Drainage Fittings: ASME B16.12, threaded.

C. Steel Pipe Pressure Fittings:

1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

D. Cast-Iron Flanges: ASME B16.1, Class 125.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.5 DUCTILE-IRON PIPE AND FITTINGS

A. Ductile-Iron, Mechanical-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

~~**2.6 *COPPER TUBE AND FITTINGS**~~

~~**A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.**~~

~~**1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.**~~

~~**B. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.**~~

~~**1. Copper Pressure Fittings:**~~

~~**a. Copper Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper, solder-joint fittings. Furnish wrought copper fittings if indicated.**~~
~~**b. Copper Unions: MSS SP-123, copper alloy, hexagonal stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends**~~

~~**C. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.**~~

~~**1. Copper Pressure Fittings:**~~

~~**a. Copper Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper, solder joint fittings. Furnish wrought copper fittings if indicated.**~~

~~**D. Solder: ASTM B 32, lead free with ASTM B 813, water flushable flux.**~~

2.7 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      1) Dallas Specialty & Mfg. Co.
      2) Fernco Inc.
      3) Mission Rubber Company; a division of MCP Industries, Inc.
      4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
      5) Or approved equal

   b. Standard: ASTM C 1173.
   c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   d. Sleeve Materials:

      1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      1) Cascade Waterworks Mfg. Co.
      2) Mission Rubber Company; a division of MCP Industries, Inc.
      3) Or approved equal

   b. Standard: ASTM C 1460.

c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

5. Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cascade Waterworks Mfg. Co.
2) Dresser, Inc.
3) EBAA Iron, Inc.
4) JCM Industries, Inc.
5) Romac Industries, Inc.
6) Smith-Blair, Inc.; a Sensus company.
7) The Ford Meter Box Company, Inc.
8) Viking Johnson.
9) Or approved equal

b. Standard: AWWA C219.
c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
d. Center-Sleeve Material: Carbon steel Stainless.
e. Gasket Material: Natural or synthetic rubber.
f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Hart Industries International, Inc.
4) Jomar International Ltd.
5) Matco-Norca, Inc.
6) McDonald, A. Y. Mfg. Co.
7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
8) Wilkins; a Zurn company.
9) Or approved equal

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 125 psig minimum at 180 deg F 150 psig 250 psig.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Matco-Norca, Inc.
4) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
5) Wilkins; a Zurn company.
6) Or approved equal

b. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 125 psig minimum at 180 deg F
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Advance Products & Systems, Inc.
2) Calpico, Inc.
3) Central Plastics Company.
4) Pipeline Seal and Insulator, Inc.
5) Or approved equal

b. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Elster Perfection.
2) Grinnell Mechanical Products.
3) Matco-Norca, Inc.
4) Precision Plumbing Products, Inc.
5) Victaulic Company.
6) Or approved equal

b. Description:

1) Standard: IAPMO PS 66
2) Electroplated steel nipple.
3) Pressure Rating: 300 psig at 225 deg F
4) End Connections: Male threaded or grooved.
5) Lining: Inert and noncorrosive, propylene.

~~**2.8 ENCASEMENT FOR UNDERGROUND METAL PIPING**~~

~~**A. Standard: ASTM A 674 or AWWA C105/A 21.5.**~~

~~**B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.**~~

~~**C. Form: Sheet or tube.**~~

~~**D. Color: Black or natural**~~

PART 3 - EXECUTION

~~**3.1 EARTH MOVING**~~

~~**A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earthwork."**~~

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for storm, soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

M. Install storm, soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

O. Install steel piping according to applicable plumbing code.

P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

Q. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

R. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

S. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

T. Install force mains at elevations indicated.

U. Install Rainwater Harvesting drainage piping at minimum 2 percent downward in direction of flow. Connect to rainwater storage tank and route inside gabion wall to downspout nozzle (lambs tongue). Pipe size to be 3 inch. Refer to specification section 221319 for downspout nozzle.

V. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping. Comply with requirements for backwater valves specified in Division 22 Section "Sanitary Waste Piping Specialties."
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."
3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."

W. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

X. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

Y. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

Z. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Join stainless-steel pipe and fittings with gaskets according to ASME A112.3.1.

E. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

F. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Unshielded Shielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:

a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
b. NPS 2 and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Comply with requirements for backwater valve specified in Division 22 Section "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. Install individual, straight, horizontal piping runs:

   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

I. Install supports for vertical steel piping every 15 feet.

J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.

K. Install supports for vertical copper tubing every 10 feet.

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with floor.
6. Comply with requirements for backwater valves cleanouts and drains specified in Division 22 Section "Sanitary Waste Piping Specialties."
7. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main.
2. Sewage Pump: To sewage pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings and sovent stack fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.

3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.

~~**C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:**~~

~~**1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.**~~
~~**2. Hubless, cast-iron soil pipe and fittings and sovent stack fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.**~~
~~**3. Galvanized-steel pipe, drainage fittings, and threaded joints.**~~
~~**4. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.**~~

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.

~~**E. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:**~~

~~**1. Extra Heavy Service class, cast-iron soil piping; gaskets; and gasketed joints.**~~
~~**2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty cast-iron hubless-piping couplings; and coupled joints.**~~
~~**3. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.**~~

~~**F. Underground, soil and waste piping NPS 5 and larger shall be any of the following:**~~

~~**1. Extra Heavy Service class, cast-iron soil piping; gaskets; and gasketed joints.**~~
~~**2. Hubless, cast-iron soil pipe and fittings; CISPI heavy-duty cast-iron hubless-piping couplings; coupled joints.**~~
~~**3. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.**~~

~~**G. Aboveground sanitary-sewage force mains NPS 2-1/2 to NPS 6 shall be any of the following:**~~

~~**1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.**~~
~~**2. Galvanized-steel pipe, pressure fittings, and threaded joints.**~~

~~**H. Underground sanitary-sewage force mains NPS 4 and smaller shall be any of the following:**~~

~~**1. Hard Soft copper tube, Type L; wrought-copper pressure fittings; and soldered joints.**~~
~~**2. Ductile-iron, mechanical-joint piping and mechanical joints.**~~

~~**3. Ductile-iron, push-on-joint piping and push-on joints.**~~
~~**4. Ductile-iron, grooved-joint piping and grooved joints.**~~
~~**5. Fitting-type transition coupling for piping smaller than NPS 1-1/2 and pressure transition coupling for NPS 1-1/2 and larger if dissimilar pipe materials.**~~

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. HDPE: High-density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PP: Polypropylene plastic.

E. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Cleanouts.
2. Floor drains.

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

1. Wiring Diagrams: Power, signal, and control wiring.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. 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.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of roof penetrations prior to installation.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. All cleanouts in inmate areas to be provided with vandal-proof screws.

B. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company; Josam Div.
2. MIFAB, Inc.
3. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.
7. Josam Company; Blucher-Josam Div.

C. Floor Cleanouts FCO.

1. Standard: ASME A112.36.2M cleanout.
2. Size: Same as connected branch.
3. Closure: Brass plug with straight threads and gasket or Brass plug with tapered threads.
4. Adjustable Housing Material: Cast iron.
5. Frame and Cover Material and Finish: Carpeted Floors: Provide carpet flange. Uncarpeted Floors; Provide polished bronze top.
6. Frame and Cover Shape: Round.
7. Top Loading Classification: Medium duty.
8. Provide pins for all floor cleanouts.

D. Wall Cleanouts WCO:

1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: as required to match connected piping.
4. Closure: Brass plug.
5. Wall Access: Round, flat, chrome-plated brass cover plate with screw.

2.2 FLOOR DRAINS

A. All floor drains and floor sinks in inmate accessible areas to be provided with vandal proof screws.

B. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company; Josam Div.
2. MIFAB, Inc.
3. Prier Products, Inc.
4. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
5. Tyler Pipe; Wade Div.
6. Watts Drainage Products Inc.
7. Zurn Plumbing Products Group; Specification Drainage Operation.

C. Floor Drains Type FD:

1. Standard: ASME A112.6.3
2. Pattern Floor drain.
3. Body Material Cast Iron.
4. Seepage Flange: Required.
5. Anchor Flange: Required.
6. Clamping Device Required.
7. Outlet: Bottom.
8. Top or Strainer Material: Nickel bronze.
9. Top of Body and Strainer Finish: Nickel bronze.
10. Top Shape: Round.
11. Dimensions of Top or Strainer: 6-inch.
12. Top Loading Classification: Medium duty.
13. Trap Material: Cast iron.
14. Trap Pattern: Standard P-trap.
15. Trap Features: Trap-seal primer valve drain connection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 135 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install wood-blocking reinforcement for wall-mounting-type specialties.

G. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.
4. Supports.

1.3 DEFINITIONS

A. Effective Flush Volume: Average of two reduced flushes and one full flush per fixture.

B. Remote Water Closet: Located more than 30 feet from other drain line connections or fixture and where less than 1.5 drainage fixture units are upstream of the drain line connection.

1.4 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 water closets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of per fixture. Kits shall be marked with the associated fixture and room number.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED WATER CLOSETS

A. Water Closets WC-2: Wall mounted, top spud, ADA accessible.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Kohler Co.
c. TOTO USA, INC.
d. Or approved equal

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Standard.
f. Rim Contour: Elongated.
g. Water Consumption: 1.28 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.

3. Flushometer Valve.
4. Toilet Seat.
5. Support: Water closet carrier.
6. Water-Closet Mounting Height: Handicapped/elderly according to ICC/ANSI A117.1.

2.2 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Gerber Plumbing Fixtures LLC.

b. Sloan Valve Company.
c. Zurn Industries, LLC.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed.
9. Consumption: 1.28 gal. per flush.
10. Minimum Inlet: NPS 1.
11. Minimum Outlet: NPS 1-1/4.

2.3 TOILET SEATS

A. Toilet Seats:

1. Standard: IAPMO/ANSI Z124.5.
2. Material: Plastic.
3. Type: Commercial (Heavy duty).
4. Shape: Elongated rim, open front.
5. Hinge: Self-sustaining, check.
6. Hinge Material: Noncorroding metal.
7. Seat Cover: Not required.
8. Color: White.

2.4 SUPPORTS

A. Water Closet Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.
3. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.
5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 224216.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.
3. Supply fittings.
4. Waste fittings.
5. Supports.

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 lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

a. Servicing and adjustments of automatic faucets.

1.6 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. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory L-1: Vitreous china, wall mounted, with back.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Gerber Plumbing Fixtures LLC.
c. Kohler Co.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.
c. Nominal Size: Oval, 19 by 16 inches, 22 by 22 inches.
d. Faucet-Hole Punching: Three holes, 4-inch centers.
e. Faucet-Hole Location: Top.
f. Color: White.
g. Mounting Material: Chair carrier.

3. Faucet:
4. Support: Type II, concealed-arm lavatory carrier with escutcheons. Include rectangular, steel uprights.
5. Lavatory Mounting Height: Handicapped/elderly according to ICC A117.1.

2.2 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF 372 for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Manual-type, single-control mixing, commercial general-duty, solid-brass valve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Chicago Faucets; Geberit Company.
   b. Moen Incorporated.
   c. Or approved equal

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Type: Centerset.
5. Body Material: Commercial, solid brass.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm.
8. Maximum Flow: 0.25 gal. per metering cycle.
9. Mounting Type: Deck, exposed.
10. Valve Handle(s): Push button.
11. Spout: Rigid type.
12. Spout Outlet: spray.
13. Operation: Compression, manual.
14. Drain: Not part of faucet.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

   1. NPS 1/2.
   2. ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material: Chrome-plated, one-piece, cast-brass trap with swivel 0.029-inch-thick tubular brass wall bend; and chrome-plated, brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

2.5 SUPPORTS

A. Type II Lavatory Carrier:

1. Standard: ASME A112.6.1M.

B. Type III Lavatory Carrier:

1. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories.

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

   a. Constant-volume air systems.
   b. Variable-air-volume systems.
   c. Smoke control systems.

2. Balancing Hydronic Piping Systems:

   a. Constant-flow hydronic systems.
   b. Variable-flow hydronic systems.

3. Balancing Domestic Piping Systems:

   a. Constant-flow domestic hot water circulation systems.

4. Flow meter verification

   a. Variable flow hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB or TABB as a TAB technician.

B. TAB Conference: Meet with Architect on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts and Nonmetal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

   a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

3.6 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.

4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

E. Measure and record the following data for each hydronic flow meter:

1. Actual flow rate vs indicated flow rate.

3.8 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 5 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.

B. Set domestic hot water recirculation system water flow rates to maintain measurable water flow through each branch.

3.9 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.10 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.

2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Terminal units.
5. Balancing stations.
6. Position of balancing devices.

E. Apparatus-Coil Test Reports:

1. Coil Data:

    a. System identification.

b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch (mm) o.c.
f. Make and model number.
g. Face area in sq. ft. (sq. m).
h. Tube size in NPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Air pressure drop in inches wg (Pa).
d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Water flow rate in gpm (L/s).
i. Water pressure differential in feet of head or psig (kPa).
j. Entering-water temperature in deg F (deg C).
k. Leaving-water temperature in deg F (deg C).
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig (kPa).
n. Refrigerant suction temperature in deg F (deg C).
o. Inlet steam pressure in psig (kPa).

F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft. (sq. m).
g. Indicated air flow rate in cfm (L/s).
h. Indicated velocity in fpm (m/s).
i. Actual air flow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

G. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.

b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Preliminary air flow rate as needed in cfm (L/s).
d. Preliminary velocity as needed in fpm (m/s).
e. Final air flow rate in cfm (L/s).
f. Final velocity in fpm (m/s).
g. Space temperature in deg F (deg C).

H. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Entering-water temperature in deg F (deg C).
c. Leaving-water temperature in deg F (deg C).
d. Water pressure drop in feet of head or psig (kPa).
e. Entering-air temperature in deg F (deg C).
f. Leaving-air temperature in deg F (deg C).

I. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.11 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:
   a. Measure airflow of at least 20 percent of air outlets.
   b. Measure water flow of at least 10 percent of terminals.
   c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
   d. Verify that balancing devices are marked with final balance position.
   e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect.
3. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
4. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

3.13 COMMISSIONING

A. TAB shall be provided by the Contractor in accordance with the project specifications. The TAB contractor shall support commissioning by participating in the Cx TAB review as follows:

1. After completion of final TAB, submit preliminary TAB data for CxA review. This need not be the final bound TAB report. However the data shall be in the final electronic form such that the potential for subsequent manual copying and data entry errors is eliminated. Field data that satisfies this criteria is acceptable.
2. After the CxA has accepted the preliminary data submittal, the TAB contractor shall demonstrate consistency between field measurements and the recorded data as specified below. Data to be sampled shall be chosen by the CxA at the time of demonstration.
3. Measured readings shall be equal to the recoded data ± the accuracy and repeatability of the specified TAB instrument and methodology. If a field measurement does not satisfy this acceptance criteria, the deficiency shall be corrected and the demonstration repeated for the corrected efficiency as well as 100% of all similar data.

B. Equipment tested: All HVAC systems & equipment

C. Demonstrate:

1. Determination of the final setpoints for pump speed and fan speed control per the project specifications and AABC, NEBB, or TABB standards. Demonstrate for all setpoints.
2. Airflow rates are balanced and adjusted per the project specifications and AABC, NEBB, or TABB standards

   a. Demonstrate minimum outside airflow rates for all air handling equipment
   b. Demonstrate a 10% sample for all other measurements

3. Hydronic system flow rates are balanced and adjusted per the project specifications and AABC, NEBB, or TABB standards.

   a. Demonstrate for all boilers, chillers, cooling towers, and distribution pumps
   b. Demonstrate a 10% sample for all other measurements

4. Verify TAB of circulating domestic hot water system per the project specifications and AABC, NEBB, or TABB standards. Demonstrate a 10% sample.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections:

1. Division 22 Section "Plumbing Insulation."
2. Division 23 Section "Metal Ducts" for duct liners.”

1.2 SUMMARY

A. Section Includes the following duct systems:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

B. Section Includes the following HVAC piping systems:

1. Condensate drain piping, indoors.
2. Refrigerant suction and hot-gas piping, indoors and outdoors.

1.3 REFERENCES

A. International Energy Conservation Code – 2018 Edition and as amended by local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cell-U-Foam Corporation; Ultra-CUF.
    b. Pittsburgh Corning Corporation; Foamglass Super K.
    c. Or approved equal

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.

E. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA
    d. Or approved equal.

F. Flexible Elastomeric With Integral Covering Membrane: Closed-cell material. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA

2. Covering Membrane

    a. Construction: Blended polymeric top surface, puncture resistant base, scrim reinforced core.
    b. Thickness: 12 mil minimum.
    c. Color: White.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Duct Wrap.

d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Manson Insulation Inc.; AK Flex.
e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 FIRE RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by a NRTL acceptable to authority having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; FlameChek.
b. Johns Manville; Firetemp Wrap.
c. Nelson Firestop Products; Nelson FSB Flameshield Blanket.
d. Thermal Ceramics; FireMaster Duct Wrap.
e. 3M; Fire Barrier Wrap Products.

f. Unifrax Corporation; FyreWrap.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-96.
b. Foster Products Corporation, H. B. Fuller Company; 81-33.
c. Or approved equal

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

B. ASJ Flashing Sealants, and Vinyl, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Products, Division of ITW; CP-76.
   b. Or approved equal

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

   a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

      1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
      2) Or approved equal.

6. PVDC Jacket for Outdoor Applications: 6-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
2) Or approved equal.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
2) Or approved equal.

8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto PVC Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: Color-code jackets based on system. Color as selected by Architect.

4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

D. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; Metal Jacketing Systems.
    b. PABCO Metals Corporation; Surefit.
    c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.
    d. Flange and union covers.
    e. End caps.
    f. Beveled collars.
    g. Valve covers.
    h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Self-Adhesive Outdoor Jacket: 60-mil thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Polyguard; Alumaguard 60.
    b. Or approved equal.

F. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
b. Or approved equal.

2.7 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
b. Compac Corp.; 130.
c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   b. Compac Corp.; 120.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
   d. Venture Tape; 3520 CW.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.8 SECUREMENTS

A. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
      2) GEMCO; Perforated Base.
      3) Midwest Fasteners, Inc.; Spindle.

   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not

limited to, the following:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
c. Spindle: Nylon, 0.106-inch diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
2) GEMCO; Press and Peel.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

1) GEMCO.
2) Midwest Fasteners, Inc.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. C & F Wire.
b. Childers Products.
c. PABCO Metals Corporation.
d. RPR Products, Inc.

2.9 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that applies to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION WITH INTEGRAL COVERING MEMBRANE

A. Seal longitudinal seams and end joints with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. All work shall conform to manufacturer’s requirements.

C. Install exterior sheet insulation with positive slope.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.9 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

3.10 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.
2. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
3. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 DUCT INSULATION SCHEDULE, GENERAL

A. See below for duct insulation requirements:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Factory-insulated flexible ducts.
2. Flexible connectors.
3. Vibration-control devices.
4. Factory-insulated access panels and doors.

3.13 DUCT AND PLENUM INSULATION SCHEDULE

DUCT TYPE	DUCT LOCATION	INSULATION R VALUE	INSULATION TYPE	OTHER REQUIREMENTS
Supply, Return, Exhaust	Not within conditioned space: On exterior of building, on roof, in attic	R-8	Flexible Elastomeric With Integral Covering Membrane	Approved weather proof barrier.
Supply, Return, Exhaust	Not within conditioned space: in ceiling space	R-6	Mineral fiber blanket or rigid fiber board.	R-21 between envelope penetration and motorized damper for exhaust duct.
Supply, Return	Within Conditioned Space: Concealed and Exposed Within Equipment Rooms	R-6	Mineral fiber blanket or rigid fiber board.	
Outside/combustion Air Intake	Concealed or Exposed.	R-7	Mineral fiber blanket or rigid fiber board.	R-21 between intake and motorized damper.
Type I & Type II Commercial Kitchen Hood, Welding Hood Exhaust Duct	All		Fire rated blanket.	2 hour rating.

3.14 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option

B. Insulate indoor equipment in paragraphs below that is not factory insulated.

C. Heating-Hot-Water Pump Insulation:

1. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.
2. Cellular Glass: 3 inches thick

D. Heating-Hot-Water Expansion/Compression Tank Insulation:

1. Mineral Fiber Pipe and Tank: 2 inches thick.

E. Heating-Hot-Water Air-Separator Insulation:

1. Mineral-Fiber Pipe and Tank: 2 inches thick.

3.15 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.16 PIPING INSULATION SCHEDULE

A. Indoor:

1. Heating-Hot-Water Supply and Return, NPS 1.25” and less, 105-140 Deg F: Mineral-Fiber, Preformed Pipe, Type I, 1 inch thick.
2. Heating-Hot-Water Supply and Return, NPS 1.5” and larger, 105-140 Deg F: Mineral-Fiber, Preformed Pipe, Type I, 1.5” inch thick
3. Heating-Hot-Water Supply and Return, NPS 3.5” and less, 141-200 Deg F: Mineral-Fiber, Preformed Pipe, Type I, 1.5 inch thick.
4. Heating-Hot-Water Supply and Return, NPS 4” and larger, 141-200 Deg F: Mineral-Fiber, Preformed Pipe, Type I, 2 inches thick.
5. Refrigerant Tubing and Piping: Flexible elastomeric, 1-1/2 inch thick.
6. Condensate piping: Mineral-Fiber, Preformed Pipe, Type I: 1 inches thick.

B. Outdoor, above ground:

1. Refrigerant Piping: Flexible Elastomeric: 2 inches (50 mm) thick.

3.17 FIELD-APPLIED JACKET SCHEDULE

A. Indoor:

1. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
2. If more than one material is listed, selection from materials listed is Contractor's option.
3. Piping, exposed in Mechanical Room and elsewhere where exposed, up to 8’-0” A.F.F.: PVC: 30 mils thick.
4. Equipment, exposed, Aluminum, 0.024inches thick.

B. Outdoor

1. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
2. Ducts up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches: Galvanized steel, 20 gauge.
3. Ducts and Plenums, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches: Galvanized steel, 18 gauge.
4. Piping, Exposed: Aluminum: 0.020 inches thick.

END OF SECTION 230700

SECTION 230901 – BUILDING AUTOMATION SYSTEM

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. Division 01 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. Fan air flow measuring devices shall be by factory mounted. The air flow measuring device manufacturer’s representative shall inspect the installation when complete and shall provide certification, in writing, that the installation complies with their requirements.

H. 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.

I. Automatic dampers, smoke dampers and combination fire smoke dampers shall be provided under this section. Provision shall be made under the electrical contract for the opening and closing of the fire/smoke dampers and smoke dampers, as required for fire emergency. Provision shall be made under this section for opening and closing dampers and for normal air handler operation. Combination fire/smoke dampers and smoke dampers shall be wired under the electrical contract and controlled via the fire alarm system. Under this section, the CONTRACTOR shall coordinate with the fire alarm sub-contractor. Provide shop drawings, locating dampers on floor plans and on riser diagrams and indicating type of control for each damper, i.e., open/close under fire alarm, open/close with shutdown of specific AHU's under fire alarm, and used for smoke purge control. These shop drawings will be for use by the CONTRACTOR as part of the coordination.

J. 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.

K. 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.

L. 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.

M. 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.

N. Provide control wiring required to other equipment provided under this contract.

O. 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.

P. 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.

1.3 QUALITY ASSURANCE

A. Only firms regularly engaged in the manufacture and installation of this equipment with the characteristics and capacity similar required and whose products have been installed by them and are in satisfactory use in similar service for not less than 10 years will be acceptable.

B. All control equipment used in this project shall have been successfully proven in actual field installations for a period of two (2) years prior to the date of submittal of said equipment to the Architect for approval.

C. The control system shall be installed completely in all respects by competent mechanics, regularly employed by the manufacturer of the control system.

1.4 SUBMITTALS

A. Refer to Division 01 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 descriptions. 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 the finished floor.

1.5 RELATED WORK UNDER ELECTRICAL WORK

A. All power wiring for pumps, fans, unit heaters, clocks, air compressors, aftercooler, etc. See Special Requirements for Mechanical and Electrical Work.

B. The entire system of Automatic Temperature Controls and the Building Automation System shall be powered from the building’s power system. Components and devices to be powered include, but are not limited to, all ATC panels, BAS computers and remote stations, valve actuators, damper actuators, central and unitary equipment controls and terminal unit controls including VAV boxes. The source of 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 Power Distribution Panel(s).

1.6 COORDINATION

A. Refer to Division 01.

1.7 GUARANTEE

A. Refer to Division 01.

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 the 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 an 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 ELECTRIC WIRING

A. All electric wiring, materials and installation shall be in accordance with the latest revision of the National Electric Code, and applicable Local Code, and shall carry the UL label where applicable. All wiring shall be installed in rigid galvanized steel conduit, :" minimum, and shall be a minimum of #14 AWG. All specials, such as junction boxes and connectors, shall be of type designed for use with conduit.

2.3 AUTOMATIC DAMPERS, AND SMOKE DAMPERS

A. Dampers shall have 14 gauge galvanized frames of not less than 3" in width and blades of 16 gauge, or double 22 gauge, galvanized steel, and shall be adequately braced to form a rigid assembly, where required in galvanized ductwork. Dampers shall have blades not more than 8" wide. The linkage and hardware shall be zinc plated steel. Damper blades and rods shall be installed in horizontal position.

B. In copper, aluminum and stainless steel ductwork, damper material shall match the ductwork, with blades of 48 oz. copper, 16 gauge aluminum, or 16 gauge stainless steel.

C. All dampers shall be of the proportioning or opposed blade type and shall be motor operated. Dampers shall have continuous elastomer or stainless steel stops to avoid leakage. Bearings shall be oilite nonferrous sleeve type. All dampers shall be provided with continuous 3/16" x 2" closed cell neoprene gasketing around perimeter of the frame and at interlocking blade edges, to form an airtight seal.

D. All dampers shall be constructed to provide a maximum leakage of 3%, with an approach velocity of 1500 fpm flow, when closed against 4 inches of water. Submit leakage and flow characteristic data for all dampers.

E. All outside air dampers shall automatically return to closed position in the event of loss of electricity or air.

F. Automatic dampers shall be furnished by the control manufacturer and shall be set in place by the HVAC Contractor under the supervision of the control manufacturer, unless otherwise indicated.

2.4 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 respond to a change of plus or minus 3EF. The 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.

2.5 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.

2.6 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 3 1/2" 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. Each zone discharges air temperature

2.7 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.

2.8 ROOM THERMOSTATS

A. All proportioning thermostats shall have an adjustable throttling range. All thermostats shall be provided with an adjustable range of 55 deg F – 85 deg F., key-operated, non-indicating, locked cover type. Finish and final locations shall be approved by the Architect.

2.9 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 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 a canopy light on top of the local control panel with a 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.

D. Instrumentation within the panel shall be identified. All electrical components within the panel shall be factory pre-wired to a numbered terminal strip. All wiring within the panel shall be in accordance with NEMA and UL standards and shall meet local codes.

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 the manufacturer's written instructions, and with recognized industry 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 FIELD QUALITY CONTROL

A. Upon completion of the installation of the automatic temperature control system and after motors have been energized with a normal power source, test the system to demonstrate compliance with requirements. When possible, field correct malfunctioning controls then retest to demonstrate compliance. Replace controls that 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 them in complete operating condition, subject to the approval of the Architect. Complete instructions shall be given to the operating personnel. There shall be one day of instruction given for the Winter cycle and one day of instruction for the Summer cycle operation.

3.5 CONTROL SEQUENCE

A. Control sequence shall be as indicated on the drawings. Pressures and temperatures indicated are approximate and shall be adjusted on the job for maximum performance. After final adjustment, and before acceptance, the control diagrams required shall be revised, or supplemented, to show coordinated settings for all controls, including pneumatic-electric switches on and off pressures, sensitivity (branch pressure change per unit change in controlled variable), throttling range, tabulated settings for instruments in sequence, branch pressures at which instrument set point and controlled variable coincide, automatic reset becomes inactive. Capacity controls for refrigeration equipment and heating equipment shall be coordinated with components furnished with the machines and the necessary controllers, relays, etc.

B. A separate tabulation shall be provided of control settings of all automatic controls including components furnished with the machines. Tabulation shall also include upper and lower limits for all safety and operating controls on the machines. All of the above adjustments will be required at the completion of the job.

3.6 CONTROL SYSTEM TESTING, ADJUSTING, CALIBRATION

A. Work and/or systems installed under this Division shall be fully functioning prior to Demonstration, Acceptance Periods and Contract Close Out. THE CONTRACTOR shall start, test, adjust, and calibrate all work and/or systems under this contract, as described below.

B. Verify proper electrical voltages and amperages and verify that all circuits are free from grounds or faults.

C. Verify integrity/safety of all electrical connections.

D. Verify proper interface with fire alarm system.

E. Test, calibrate, and set all digital and analog sensing, and actuating devices. Calibrate each instrumentation device by making a comparison between the Operator Interface display and the reading at the device, using an instrument traceable to the National Bureau of Standards, which shall be at least twice as accurate as the device to be calibrated (e.g., if field device is +1- 0.5% accurate, test equipment shall be +1- 0.25% accurate over same range). Record the measured value and displayed value for each device in the Control System Commissioning Report.

F. Check and set zero and span adjustments for all actuating devices. Manually activate damper and valve operators to verify free travel and fail condition. Check split range positioners to verify proper operation. Record the results for each device in the Control System Commissioning Report.

G. Check each digital control point by making a comparison between the control command at the DPU and the status of the controlled device. Check each digital input point by making a comparison of the state of the sensing device and the Operator Interface display. Record the results for each device in the Control System Commissioning Report.

H. Verify proper sequences by using the approved checklists to record results and submit with Control System Commissioning report. Verify proper sequence and operation of all specified functions.

I. Perform testing with CONTRACTOR to setup the setpoints for chilled water system, all hot water, dual temperature system. Prior to start work, submit test plan to the Owner's representative for review and approval.

J. Tune all control loops to obtain the fastest stable response without hunting, offset or overshoot. Record tuning parameters and response test results for each control loop in the control System commissioning report. Except from a startup, maximum allowable variance from set point for controlled variables shall be as follows:

1. Air temperature: plus or minus 0.5°F
2. Water temperature: plus or minus 2°F
3. Relative humidity plus or minus 2%

3.7 CONTROL SYSTEM DEMONSTRATION

A. Demonstrate the operation of the Control Systems hardware, software, and all related components and systems to the satisfaction of the Commissioning Agent. Schedule the demonstration with Owner s representative 2 weeks in advance. Demonstration shall not be scheduled until all hardware and software submittals, and the Commissioning Test Report is approved. If the Work fails to be demonstrated to conform to the Contract specifications, so as to require scheduling of additional site visits by the Commissioning Agent for re-demonstration, CONTRACTOR shall reimburse Owner for all direct and indirect costs of subsequent Commissioning Agent site visits.

B. The CONTRACTOR shall supply all personnel and equipment for the demonstration, including but not limited to, instruments, ladders, etc. CONTRACTOR supplied personnel must be competent with and knowledgeable of all project-specific hardware, software, and the HVAC systems. All training documentation and submittals shall be at the job site.

C. The system shall be demonstrated following the same procedures used in the Commissioning Tests by using approved Commissioning Checklists. Demonstration shall include, but not necessarily be limited to the following:

D. Demonstrate that all required software is installed on workstations. Demonstrate that all graphic screens, alarms, trends and reports are installed as submitted and approved.

E. Demonstrate that all points specified and shown can be interrogated and/or commanded (as applicable) from all workstations, as specified.

F. Demonstrate that remote communication abilities are in accordance with these Specifications.

G. Demonstrate correct calibration of input/output devices using the same methods specified for the commissioning tests. A maximum of 10 percent of 110 points shall be selected at random by the Commissioning Agent for demonstration. Upon failure of any device to meet the specified end-to-end accuracy, an additional 10 percent of 110 points shall be selected at random by the Commissioning agent for demonstration. This process shall be repeated until 100 percent of randomly selected 110 points have been demonstrated to meet specified end-to-end accuracy.

H. Demonstrate that all DDC and other software programs exist at respective field panels. The Direct Digital Control (DDC) programming and point database shall be as submitted and approved.

I. Demonstrate that all DDC and other software programs accomplish the specified sequences of operation.

J. Demonstrate that the panels automatically recover from power failures, as specified.

K. Demonstrate that all alarms are received at the appropriate workstations and printers.

L. Demonstrate that the stand-alone operation of panels meets the requirements of these Specifications.

M. Identify access to equipment selected by Commissioning Agent. Demonstrate that access is sufficient to perform required maintenance.

N. Control System Demonstration shall be completed and approved prior to Substantial Completion.

END OF SECTION 230901

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" except sealant class, pressure class, and performance requirements and design criteria shall be as indicated in "Duct Schedule" Article and not on drawings.

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Seismic Design Category D.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Sealants and gaskets.
2. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

1.5 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

C. Welding Qualifications: Qualify procedures and personnel according to AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel, stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel, stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.6 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Kinetics Noise Control.

5. Loos & Co.; Cableware Division.
6. Mason Industries.
7. TOLCO; a brand of NIBCO INC.
8. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.7 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.
e. Maximum Thermal Conductivity:

1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F (0.033 W/m x K) at 75 deg F (24 deg C) mean temperature.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating.

Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

    a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Aeroflex USA Inc.
    b. Armacell LLC.
    c. Rubatex International, LLC

2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

    a. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Do not use powder-actuated concrete.
3. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for indicated branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

B. Paint exposed ductwork to match surroundings-color as approved by the Architect.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

   a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections, selected by Architect from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
   b. Supply Ducts with a Pressure Class of 3-Inch wg or less: Test representative duct sections, selected by Architect from sections installed] totaling no less than 50 percent of total installed duct area for each designated pressure class.

c. Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed] totaling no less than 50 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Duct leakage shall meet leakage class under Duct Schedule on section 3.12 of this specification section.

F. Prepare test and inspection reports.

3.7 DUCT CLEANING

A. Clean duct system(s) before testing, adjusting, and balancing.

B. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

C. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, or duct accessories.
4. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
5. Provide drainage and cleanup for wash-down procedures.
6. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.

B. Supply Ducts:

1. Ducts Connected to Variable-Air-Volume Air-Handling Units:

   a. Pressure Class: Positive 4-inch wg.
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 6.
   d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Equipment Not Listed Above:

   a. Pressure Class: Positive 2-inch wg.
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 6.
   d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

   a. Pressure Class: Negative 2-inch wg.
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 6.

d. SMACNA Leakage Class for Round and Flat Oval: 6.

D. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
2. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Match duct material.

3. Aluminum Ducts: Aluminum.

E. Humid Environment

1. Exposed ducts in humid environment shall be Type 304 stainless steel.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: 45-degree entry.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm or Lower: 90º tee with oval to round tap.
    b. Velocity 1000 to 1500 fpm: 90º tee with oval to round tap.
    c. Velocity 1500 fpm or Higher: 90º tee with oval to round tap.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. ~~**Backdraft**~~
2. ~~**Pressure relief access door**~~
3. Manual volume dampers.
4. ~~**Control dampers.**~~
5. ~~**Fire dampers.**~~
6. ~~**Smoke dampers**~~
7. Flange connectors.
8. Turning vanes.
9. Duct-mounted access doors.
10. Flexible connectors.
11. Flexible ducts.
12. Duct accessory hardware.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

   a. Special fittings.
   b. Manual volume damper installations.
   c. Control damper installations.
   d. Fire-damper installations, including sleeves; and duct-mounted access doors.
   e. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480, Type 304, and having a No. 2 finish for concealed ducts and No. 4 finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

~~**2.2 BACKDRAFT DAMPERS**~~

~~**A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:**~~

~~**1. Air Balance Inc.; a division of Mestek, Inc.**~~
~~**2. Greenheck Fan Corporation.**~~
~~**3. Nailor Industries Inc.**~~
~~**4. Pottorff; a division of PCI Industries, Inc.**~~
~~**5. Ruskin Company.**~~

~~**B. Description: Gravity balanced.**~~

~~C. Maximum Air Velocity: 2000 fpm.~~

~~D. Maximum System Pressure: 1-inch wg.~~

~~E. Frame: 0.052-inch thick, galvanized sheet steel, with welded corners and mounting flange.~~

~~F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch thick, roll-formed aluminum with sealed edges.~~

~~G. Blade Action: Parallel.~~

~~H. Blade Seals: Neoprene, mechanically locked.~~

~~I. Blade Axles:~~

~~1. Material: Nonferrous metal.~~
~~2. Diameter: 0.20 inch.~~

~~J. Tie Bars and Brackets: Aluminum.~~

~~K. Return Spring: Adjustable tension.~~

~~L. Bearings: Steel ball or synthetic pivot bushings.~~

~~M. Accessories:~~

~~1. Adjustment device to permit setting for varying differential static pressure.~~
~~2. Counterweights and spring-assist kits for vertical airflow installations.~~
~~3. Electric actuators.~~
~~4. Chain pulls.~~
~~5. Front of rear screens.~~
~~6. 90-degree stops.~~

~~N. Sleeve: Minimum 20-gage thickness.~~

~~2.3 PRESSURE RELIEF ACCESS DOOR~~

~~A. Pressure Relief Access Door:~~

~~1. Door and Frame Material: Galvanized sheet steel.~~
~~2. Door: Double wall with metal thickness applicable for duct pressure class.~~
~~3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.~~
~~4. Factory set to activate at a 0.5” higher than duct static pressure clarification.~~
~~5. Doors close when pressures are within set-point range.~~
~~6. Hinge: Continuous piano.~~
~~7. Latches: Cam.~~
~~8. Seal: Neoprene or foam rubber.~~
~~9. Insulation Fill: 1-inch thick, fibrous-glass or polystyrene-foam board.~~

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Air Balance Inc.; a division of Mestek, Inc.
   b. Flexmaster U.S.A., Inc.
   c. METALAIRE, Inc.
   d. Nailor Industries Inc.
   e. Pottorff; a division of PCI Industries, Inc.
   f. Ruskin Company.
   g. Trox USA Inc.
   h. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

   a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Air Balance Inc.; a division of Mestek, Inc.
   b. Flexmaster U.S.A., Inc.
   c. METALAIRE, Inc.

d. Nailor Industries Inc.
e. Pottorff; a division of PCI Industries, Inc.
f. Ruskin Company.
g. Trox USA Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Roll-Formed Aluminum Blades: 0.10-inch thick aluminum sheet.
e. Extruded-Aluminum Blades: 0.050-inch thick extruded aluminum.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Aluminum.

C. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

~~2.5 SMOKE DAMPERS~~

~~**A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:**~~

~~**1. Air Balance Inc.; a division of Mestek, Inc.**~~
~~**2. Cesco Products; a division of Mestek, Inc.**~~
~~**3. Greenheck Fan Corporation.**~~

4. ~~Nailor Industries Inc.~~
5. ~~Pottorff.~~
6. ~~Ruskin Company.~~

~~B. General Requirements: Label according to UL 555S by an NRTL.~~

~~C. Smoke Detector: Integral, factory wired for single-point connection.~~

~~D. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.~~

~~E. Blades: Roll-formed, horizontal, overlapping, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel.~~

~~F. Leakage: Class I.~~

~~G. Rated pressure and velocity to exceed design airflow conditions.~~

~~H. Mounting Sleeve: Factory-installed, 0.039-inch- (1.0-mm)-thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.~~

~~I. Damper Motors: Modulating or two-position action.~~

~~J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23.~~

1. ~~Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.~~
2. ~~Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 23.~~
3. ~~Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.~~
4. ~~Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).~~
5. ~~Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).~~
6. ~~Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).~~
7. ~~Electrical Connection: 115 V, single phase, 60 Hz.~~

~~K. Accessories:~~

1. ~~Auxiliary switches for position indication.~~
2. ~~Test and reset switches, damper mounted.~~

~~**2.6 COMBINATION FIRE AND SMOKE DAMPERS**~~

~~**A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:**~~

~~**1. Air Balance Inc.; a division of Mestek, Inc.**~~
~~**2. Cesco Products; a division of Mestek, Inc.**~~
~~**3. Greenheck Fan Corporation.**~~
~~**4. Nailor Industries Inc.**~~
~~**5. Pottorff.**~~
~~**6. Ruskin Company.**~~

~~**B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.**~~

~~**C. Closing rating in ducts up to 4 inch wg (1 kPa) static pressure class and minimum 2000 fpm (10 m/s) velocity.**~~

~~**D. Fire Rating: 1 1/2 and 3 hours.**~~

~~**E. Frame: Hat shaped, 0.094 inch (2.4 mm) thick, galvanized sheet steel, with welded corners and mounting flange.**~~

~~**F. Heat Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links or fire closure device.**~~

~~**G. Heat Responsive Device: Electric resettable link or device and switch package, factory installed, rated.**~~

~~**H. Smoke Detector: Integral, factory wired for single point connection.**~~

~~**I. Blades: Roll formed, horizontal, overlapping, 0.063 inch (1.6 mm) thick, galvanized sheet steel.**~~

~~**J. Leakage: Class I.**~~

~~**K. Rated pressure and velocity to exceed design airflow conditions.**~~

~~**L. Mounting Sleeve: Factory installed, 0.039 inch (1.0 mm) thick, galvanized sheet steel; length to suit wall or floor application with factory furnished silicone calking.**~~

~~**M. Master control panel for use in dynamic smoke management systems.**~~

~~**N. Damper Motors: Modulating or two position action.**~~

~~**O. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors**~~

~~**1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.**~~

2. ~~Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections~~
3. ~~Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.~~
4. ~~Spring Return Motors: Equip with an integral spiral spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).~~
5. ~~Outdoor Motors and Motors in Outdoor Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).~~
6. ~~Nonspring Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).~~
7. ~~Electrical Connection: 115 V, single phase, 60 Hz.~~

~~P. Accessories:~~

1. ~~Auxiliary switches for position indication.~~
2. ~~Test and reset switches, damper mounted.~~

~~2.7 FIRE DAMPERS~~

~~A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:~~

1. ~~Air Balance Inc.; a division of Mestek, Inc.~~
2. ~~Greenheck Fan Corporation.~~
3. ~~METALAIRE, Inc.~~
4. ~~Nailor Industries Inc.~~
5. ~~Pottorff; a division of PCI Industries, Inc.~~
6. ~~Ruskin Company.~~

~~B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.~~

~~C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000 fpm velocity.~~

~~D. Fire Rating: 1-1/2 and 3 hours.~~

~~E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.~~

~~**F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.**~~

~~**1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.**~~
~~**2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.**~~

~~**G. Mounting Orientation: Vertical or horizontal as indicated.**~~

~~**H. Blades: Roll-formed, interlocking, 0.034 inch thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034 inch thick, galvanized steel blade connectors.**~~

~~**I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.**~~

~~**J. Heat Responsive Device: Replaceable, 165 deg F rated, fusible links.**~~

~~**K. Heat Responsive Device: Electric resettable link and switch package, factory installed, 165 deg F rated.**~~

2.8 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.9 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.

5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

2.10 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cesco Products; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. Pottorff; a division of PCI Industries, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," 7-3, "Access Panels - Round Duct," and 8-15 “Double Wall Duct Access Doors.”

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.11 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.12 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.13 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
4. Monoxivent.

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helical ly wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C).
4. Insulation R-Value: Comply with Washington State Energy Code.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches to suit duct size.

D. Welding Fume Extraction-Welding Hood

1. Retractable Telescopic Arm
2. Tube: Aluminum and three piece tube to allow for telescopic movement.
3. Provide with wall bracket.
4. Adjustability: Adjustable to the front by 70° and to the left and right by 90°.

2.14 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

~~**2.15 REMOTE DAMPER OPERATORS**~~

~~**A. Manufacturers: Subject to compliance with requirements, provide products by the following:**~~

~~**1. Pottorff.**~~
~~**2. Ventfabrics, Inc.**~~
~~**3. Young Regulator Company.**~~
~~**4. Greenheck**~~

~~**B. Description: Power balancing system designed for remote manual damper adjustment.**~~

~~**C. Tubing: Brass or Aluminum.**~~

~~**D. Cable: Electric plenum rated cable.**~~

~~**E. Surface Mounting: Provide with wall plates with ports.**~~

~~**F. Surface Cover-Plate Material: Steel, painted to match adjacent surface.**~~

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.
3. Volume dampers not required between AHU discharge and VAV terminal units.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

~~**F. Install fire dampers according to UL listing.**~~

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
2. ~~**Install pressure relief access door between air handling unit and first wall and/or floor penetration.**~~
3. Adjacent to motorized dampers.
4. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

J. All dampers installed in smoke control system shall be smoke dampers and conform to IMC 513.10.4. Dampers operational sequence shall be per controls drawings M4.8 and M4.9. It is the responsibility of mechanical contractor to coordinate with their sub-contractor to provide them. Voltage shall be 24V as scheduled and powered by controls contractor.

K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

O. Connect diffusers or light troffer boots to low-pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with liquid adhesive plus tape.

Q. Install duct test holes where required for testing and balancing purposes.

R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

~~**S. Install pressure relief access door between unit connection and first branch on supply and return for each air handling unit (AHU).**~~

T. Install acoustic turning vanes in all supply, return, and exhaust system mitred elbows 45 degrees and larger and as indicated. Do not install turning vanes in commercial kitchen hood exhaust duct.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. ~~**Operate fire dampers to verify full range of movement and verify that proper heat-response device is installed.**~~
4. Inspect turning vanes for proper and secure installation.
5. ~~**Operate remote damper operators to verify full range of movement of operator and damper.**~~

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related sections include the following:

1. Division 07 Sections “Sheet Metal Flashing”, "Styrene-butadiene-styrene (SBS) Modified Bituminous Membrane Roofing." and "Roof Accessories" for manufactured curbs.

1.2 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.
2. ~~**Ceiling-mounted ventilators.**~~
3. ~~**In-line centrifugal fans.**~~
4. Fan accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Submit the manufacturer’s installation & startup manual as a part of the initial equipment submittal.

C. Submit the manufacturer's operating and maintenance manual as a part of the initial equipment submittal.

D. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. 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.

B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

C. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

1.7 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One sets for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Mfg. Corp.
2. Loren Cook Company.
3. Greenheck.
4. Twin City Blower.

B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drain and grease collector.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

E. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings. Bearings shall be ‘high-heat” type for smoke control fans.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.
5. Belts and drive assembly for smoke control fans shall meet IMC 513.10 and rated for temperature rise of 225°F.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent, factory wired.
2. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
4. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
5. Additional Accessories: As indicated.

G. Capacities and Characteristics: As indicated.

2.2 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.3 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

~~2.4 UTILITY SET FANS~~

~~A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:~~

~~1. Carnes Company.~~
~~2. Hartzell Fan Incorporated.~~
~~3. Greenheck~~
~~4. JencoFan.~~
~~5. Loren Cook Company.~~
~~6. PennBarry.~~
~~7. Quietaire Inc.~~
~~8. Trane; a business of American Standard Companies.~~

~~B. Housing: Fabricated of galvanized steel with side sheets fastened with a deep lock seam or welded to scroll sheets.~~

~~1. Housing Discharge Arrangement: Adjustable to eight standard positions.~~

~~C. Fan Wheels: Single-width, single inlet, with hub keyed to shaft.~~

~~1. Blade Materials: Aluminum.~~
~~2. Coated with Hi-Pro polyester~~
~~3. Blade Type: Backward inclined.~~
~~4. Weatherhood.~~
~~5. Spark-Resistant Construction: AMCA 99, Type A.~~

~~D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.~~

~~E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours.~~

~~1. Extend grease fitting to accessible location outside of unit.~~

~~F. Belt Drives:~~

~~1. Factory mounted, with final alignment and belt adjustment made after installation~~
~~2. Service Factor Based on Fan Motor Size: 1.3.~~
~~3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.~~
~~4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.~~
~~5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.~~

~~G. Accessories:~~

~~1. Accessories listed in subparagraphs below are optional features.~~
~~2. Inlet and Outlet: Flanged.~~

3. ~~Companion Flanges: Rolled flanges for duct connections of same material as housing.~~
4. ~~Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.~~
5. ~~Access Door: Gasketed door in scroll with latch-type handles.~~
6. ~~Scroll Dampers: Single-blade damper installed at fan scroll top with adjustable linkage.~~
7. ~~Inlet Screens: Removable wire mesh.~~
8. ~~Drain Connections: NPS 3/4 (DN 20) threaded coupling drain connection installed at lowest point of housing.~~
9. ~~Weather Hoods: Weather resistant with stamped vents over motor and drive compartment.~~
10. ~~Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, sealed ball bearings, with blades linked outside of airstream to single control lever of same material as housing.~~
11. ~~Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.~~
12. ~~Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.~~
13. ~~Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.~~

~~H. Capacities and Characteristics: See schedule~~

1. ~~Vibration Isolators:~~

   a. ~~Type: Spring isolators.~~
   b. ~~Static Deflection: 2 inches (50 mm).~~

2. ~~Spark Arrestance Class: A.~~

~~2.5 KITCHEN HOOD FANS~~

~~A. Manufacturers~~

1. ~~Captive Aire~~
2. ~~Or Approved Equal~~

~~B. Material: Fan shall be spun Aluminum, base shall be galvanized steel.~~

~~C. Wheel: Backward inclined, non-overloading. Wheel blades shall be welded to inlet cone.~~

~~D. Motor: Heavy duty, ball bearing type, pre-lubricated, L10 life in excess of 200,000 hours.~~

~~E. Belts & Drives: Shall be oil and heat resistant, non-static type. Drives shall be cast type.~~

~~F. Grease spout: Made of aluminum tubing and welded to fan housing.~~

~~**G. Listing: ETL, UL 705, UL 762 and CSA Std. C22.2, No. 113 and with AMCA rated seal.**~~

~~**2.6 IN-LINE CABINET FANS**~~

~~**A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:**~~

~~**1. Loren Cook Company**~~
~~**2. Twin City Blower**~~
~~**3. Greenheck.**~~

~~**B. Description: Direct- or belt-driven centrifugal cabinet fans.**~~
~~**C. Construction: Minimum 18 gauge galvanized steel. Internal blower and motor assembly mounted on rubber vibration isolators. Integral duct collars.**~~
~~**D. Fan Wheels: Steel hub and wheel.**~~
~~**E. Belt-Driven Assembly: Resiliently mounted to housing, with the follow features:**~~

~~**4. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.**~~
~~**5. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings. Bearings shall be 'high-heat" type for smoke control fans.**~~
~~**6. Pulleys: Cast-iron, adjustable-pitch motor pulley.**~~

~~**F. Accessories:**~~

~~**1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent, factory wired, direct drive fans only.**~~
~~**2. Additional Accessories: As indicated.**~~

~~**B. Smoke Control Fans**~~

~~**1. Fans shall meet smoke control system requirements of 2012 IMC section 513.10 with a temperature rise of 225°F.**~~

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Curbs shall be provided by mechanical contractor.

C. Secure power ventilators to roof curbs with cadmium-plated hardware. Coordinate roof penetrations and flashing with roof construction specified in Division 07 Sections "Styrene-butadiene-styrene (SBS) Modified Bituminous Membrane Roofing." and "Sheet Metal Flashing" Secure equipment to upper curb rails.

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices, and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

3.5 COMMISSIONING

A. The equipment and systems referenced in this section are to be commissioned. The contractor has specific responsibilities for scheduling, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the General Contractor's Commissioning Coordinator.

3.6 EQUIPMENT MANUFACTURER'S PARTICIPATION IN PROJECT COMMISSIONING

A. Assist in developing the final functional test procedures**.** ~~**as specified in Sections 220800, 260800, 280800 and related sections.**~~

B. Provide building commissioning support ~~**as specified in Sections 220800, 260800, 280800 and related sections**~~ **as described in Division 01.**

END OF SECTION 233423

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.

1.2 SUMMARY

A. Section Includes:

1. Square ceiling diffusers.
2. Linear slot diffusers.
3. Adjustable bar registers and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carnes.
b. Titus.
c. Price

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Characteristics: See Drawings

2.2 SURFACE-MOUNTED DIFFUSERS

A. Round Surface-Mounted Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Carnes
   b. Titus
   c. Price
   d. Air Concepts

2. Material: Aluminum Cone with Steel Core
3. Finish: White powder coat
4. Adjustability: Directional air pattern control with +/- 30 deg defelction
5. Characteristics: See Drawings

2.3 REGISTERS AND GRILLES

A. Adjustable and Fixed Bar Registers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Carnes.
   b. Titus.
   c. Price

2. Characteristics: As indicated.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Submit the manufacturer's installation & startup manual as a part of the initial equipment submittal.

C. Submit the manufacturer's operating and maintenance manual as a part of the initial equipment submittal.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 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. Filters: One set(s) for each air-handling unit.
2. Gaskets: One set(s) for each access door.
3. Fan Belts: One set(s) for each air-handling unit fan.

1.7 QUALITY ASSURANCE

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. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five years from date of Substantial Completion.
b. For Parts: One year from date of Substantial Completion.
c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
2. LG.
3. **Daikin**

B. When basis of design manufacturer is not utilized, all necessary components, system design, hardware, piping, electrical components and connections, and miscellaneous accessories required by the alternate manufacturer shall be provided.

2.2 INDOOR UNITS 5 TONS OR LESS

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
5. Fan Motors:

   a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
   b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
   c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Air Filtration Section:

   a. General Requirements for Air Filtration Section:

      1) Comply with NFPA 90A.
      2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
      3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

8. Condensate Drain Pans:

    a. Fabricated with slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.

    b. Double-wall, galvanized or stainless-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
    c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
    d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
    e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.
    f. Condensate Drain Pump: Required.
    g. High Level Condensate Protection: Shut down unit on high condensate level.

B. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Enclosure Type: Totally enclosed, fan cooled.
    d. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:

    a. Fabricated with slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.

b. Double-wall, galvanized or stainless-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.
f. Condensate Drain Pump: Required.
g. High Level Condensate Protection: Shut down unit on high condensate level.

7. Air Filtration Section:

a. General Requirements for Air Filtration Section:

1) Comply with NFPA 90A.
2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

2.3 OUTDOOR UNITS 5 TONS OR LESS

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Scroll.
b. Refrigerant Charge: R-410A.
c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 210/240.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 20 deg F.
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Crankcase heater: Required.

B. Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.

C. Evaporator Freeze Thermostat: Temperature-actuated switch that stops unit when evaporator reaches freezing temperature.

D. Filter-dryer: Required

E. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.

F. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.

G. Sound Hood: Wraps around sound attenuation cover for compressor.

H. Thermostatic expansion valve: Required.

I. Reversing Valve: Required.

J. Line Set Solenoid Valve: Required to provide total heat recovery.

K. Time-Delay Relay: Continues operation of evaporator fan after compressor shuts off.

L. Automatic-reset timer to prevent rapid cycling of compressor.

M. Refrigerant Lines: In accordance with Division 23 Section “Refrigerant Piping.”

N. Drain Connection: Required.

2.5 CONTROLS:

A. General: Provide controls by manufacturer to perform input functions necessary to operate the system.

B. Wiring: Daisy chain configuration from indoor unit to indoor unit then to the outdoor unit. Control wiring shall run from the indoor unit terminal block the specific controller for that unit. Wiring shall be a shielded, AWG 18-2 in accordance with Division 26 Section “Low-Voltage Electrical Power Conductors and Cables.”

C. Web Enabled Intelligent Controller

1. General: Wall mounted, hard wired, ABS plastic with KCD display.
2. Control: Capable of individually controlling the following functions at each indoor unit:

   a. On/Off
   b. Operating Mode
   c. Set Point
   d. Fan Speed
   e. Timer Settings
   f. Test Run.

3. Display: Capable of displaying the following information for each indoor unit:

    a. On/Off.
    b. Operating Mode.
    c. Set Point.
    d. Fan Speed
    e. Timer Settings
    f. Test Run
    g. Fault Diagnosis.

4. Communications Adapter: RS485 connection, LCD display.

D. Individual Zone Controller:

1. Self-Diagnosis Function: Required.
2. Display: LCD in 1ºF increments.
3. Monitoring: Status, malfunction flashing, malfunction content, filter sign, operation mode, temperature setting, permit/prohibit selection, fans speed.
4. Scheduling: ON/OFF timer
5. Control Management: Field setting mode, group setting, auto re-start
6. Auxiliary Contact: External dry contact, 12 VDC relay.

E. Gateway:

1. BACnet compatible with indicated monitoring/control points made available to the EMCS.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports as indicated.

D. Install seismic restraints.

E. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch.

F. Install and connect refrigerant tubing to all components. Install tubing to allow access to unit.

G. Install control wiring.

H. Install branch selector boxes.

I. Mount indoor units high enough to allow for sloped horizontal condensate run to be routed above ceiling spaces.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts". Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written startup procedures and instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Fire Rated Sleeves for cables.
4. Grout.
5. Common electrical installation requirements.
6. Utility company coordination requirements.

1.3 DEFINITIONS

A. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

B. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

C. "Provide": Furnish and install, complete and ready for the intended use.

1.4 ACTION SUBMITTALS

A. Product Data: For Fire Rated Sleeves for cables.

1.5 INFORMATION SUBMITTALS

A. Coordination Drawings

1. Provide coordinated layout drawings (composite drawings), prior to commencing site work. Coordinate with trades on the site such as but not limited to HVAC, Plumbing, Electrical, Technologies, Civil, Landscape, Cabinetry, Roofing, Finishes, Fire Protection, and Fire detection.
2. Coordination drawings shall include information furnished by trades Coordinate installation and location of but not limited to the following elements and trades: Civil,

Landscape, HVAC, Plumbing, Fire Protection, Electrical, Technology Systems, Architectural, Structural, and Specialty Systems.

3. Coordinate with architectural system submittals (i.e. roofing, ceilings, finishes, cabinetry) and structural system submittals, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
4. Provide and indicate required maintenance access to equipment and maintain the clearances per manufacturer's and applicable code requirements.
5. Prepare Drawings in Revit Model as follows:

    a. Utilize Revit Model release equal to design documents.
    b. Drawings to be same sheet size and scale as Contract Drawings.
    c. Indicate location, size and elevation above finished floor of equipment and distribution systems.
    d. Incorporate Addenda items and change orders.

6. Advise Architect in the event conflict occurs. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.
7. Verify in field exact size, location, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.
8. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

1.6 COORDINATION

A. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 26, Electrical Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittal.

B. Location of electrical outlets and equipment:

1. Location of electrical outlets and equipment shown on electrical drawings are diagrammatic. Unless indicated otherwise do not use electrical drawings to locate electrical outlets and equipment.
2. Luminaires and outlets:

    a. Ceiling mounted luminaires and outlets: use architectural reflected ceiling plans and details to determine location unless indicated otherwise.
    b. Wall mounted luminaires and outlets:

        1) Use architectural elevation and section drawings to determine location unless indicated otherwise.
        2) Where architectural elevation and section drawings do not indicate location of wall outlets then locate the outlet within 12 inches of location shown on electrical drawings considering field conditions.
        3) Coordinate location with consideration of owner provided equipment such as wall mounted televisions, white boards, furniture, cabinets and the like.

c. Floor mounted outlets: use architectural drawings to determine location unless indicated otherwise. If not clearly indicated, then send request for information to Architect.
d. Cabinet mounted luminaires and outlets: use cabinet details and shop drawings to determine location unless indicated otherwise.

3. Electrical equipment: Utilize approved manufacturer's shop drawing dimensions to determine location of equipment in space. Comply with NEC 110.26 access, working space and dedicated equipment space requirements. Maintain manufacturer requirements for maintenance access.

C. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 26, Electrical specification sections for additional requirements for shop drawings outside of these requirements.

D. Electrical connections to equipment supplied by owner or other trades:

1. Prior to procurement of electrical equipment and field work coordinate with shop drawings and/or manufacturer's installation instructions the actual electrical characteristics of the equipment to be connected.
2. Notify engineer of significant deviations or conflicts between the shop drawings and/or the manufacturer's installation instructions and information in the contract documents.

E. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope so connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

F. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

G. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

H. Coordinate and install wiring for appliances and systems furnished under other specification Divisions or furnished by the Owner. Install electrical wiring in accordance with manufacturer's instructions.

1.7 PERMITS AND FEES

A. Owner will pay all charges and/or fees levied by the serving utility companies relative to this project.

B. Obtain and pay all fees for permits, licensing, and inspections applicable to work of Division 26, 27 and 28

1.8 QUALITY ASSURANCE

A. Regulatory Requirements: Install work and materials to conform with local, State and Federal codes, and other applicable laws and regulations.

B. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. Drawings are not intended to show every item in its exact location, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e. distribution equipment, duct banks, light fixtures, etc.) and equipment proposed to assure that systems and equipment will ft in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

C. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

D. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents. 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.

E. Provide Qualified Personnel that are thoroughly knowledgeable of applicable codes related to electrical systems to perform the electrical work. Installations shall be performed by skilled electrical tradesmen fully aware of the latest techniques, practices, and standards of the industry. Refer to N.E.C. Article 100-Definitions, Qualified Person.

F. Install electrical equipment and components in a neat and workmanlike manner in accordance with recognized practices and industry standards. Refer to N.E.C.110-12. Haphazard or poor installation practice will be cause for rejection of the work.

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

A. Substitution requests for electrical equipment will be entertained under the following conditions:

1. Substitution requests may be submitted for consideration if accompanied by value analysis data indicating that substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.

2. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. Insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

2.2 SLEEVES FOR RACEWAYS AND CABLES

A. 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 Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

C. EMT: Electrical Metallic Tubing.

D. PVC: Schedule 40 or 80.

2.3 FIRE RATED SLEEVES FOR CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M
2. Hilti
3. Specified Technologies, Inc (STI)
4. Wiremold.

B. Factory assembled rectangular steel pathway containing an intumescent insert material that adjusts automatically to cable addition or subtraction.

C. Sleeve shall have an F Rating equal to or greater than the rating of the wall in which the sleeve is installed.

D. Sleeve shall be UL listed and bear the UL Classification marking.

E. Sleeve shall be tested in accordance with ASTM E814 (ANSI/UL1479).

F. Provide square wall plate kits for single sleeve applications. Provide multi-gang wall/floor plate kits for ganged applications.

G. Subject to compatibility with requirements and field conditions, i.e. sleeve size, wall thickness, etc., acceptable products include the following:

1. 3M Fire Barrier Pass-Through Devices
2. Hilti Speed Sleeves
3. Specified Technologies Inc. EZ-Path Fire Rated Pathway (series 33).
4. Wiremold Flamestopper FS4 Series

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL WORK

A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

B. Comply with NECA 1.

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. 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.

F. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete, masonry and gypsum board walls, or fire-rated floor and wall assemblies.

B. Sleeves are required where cables (not in raceway) penetrate walls or floors. Sleeves are not required where raceways penetrate walls, except where raceways penetrate exterior walls/foundations below grade.

C. Concrete Slabs and Walls: Install sleeves during erection of slabs and walls.

D. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Provide insulated bushings on EMT sleeves for cable not in conduit. Bushings shall be plenum rated where installed in a plenum.

G. Extend sleeves installed in floors 4 inches (100 mm) above finished floor level unless noted otherwise.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

L. Fire Rated Sleeves for cables: Fabricate openings in wall or floor assemblies per manufacturer’s recommendations.

3.3 SLEEVE APPLICATION

A. Sleeves for cables not in conduit:

1. Through Non-Rated Interior Walls: EMT sleeves.
2. Through Non-Rated Floors: EMT sleeves.
3. Through Fire Rated Interior Walls: Fire Rated Sleeves for cables.
4. Through Fire Rated Floors: Fire Rated Sleeves for cables.

B. Sleeves for conduits:

1. Through Exterior Walls Below Grade: Refer to details on structural Drawings. Absent any such details provide cast iron pipe or PVC, Schedule 40 or 80, sleeve two trade sizes larger than the conduit.

C. Sleeves for Cable Trays:

1. Through Non-Rated Interior Walls: Rectangular galvanized sheet metal opening.

2. Through Fire Rated Walls: Stop cable tray 6 inches maximum for each side of wall and provide multiple fire rated sleeves for cables with combined allowable area for cable equal to the capacity of the cable tray unless noted otherwise.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

SECTION 260503 – DEMOLITION OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Demolition and removal of selected portion of electrical systems, including special systems normally specified in Division 27 and 28.
2. Salvage of existing items to be reused.
3. Salvage of existing items to be delivered to the Owner.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Remove and salvage items noted as ‘salvage’, ‘return to Owner’ or similar manner on the Drawings.

C. Remove and salvage items as requested by the Owner. Conduct a meeting with the Owner prior to commencing demolition to determine items that the Owner wishes to retain.

1.5 PRE-TESTING

A. Prior to commencing work, perform testing of devices and systems to verify devices and systems to remain are in good working condition. Devices shall include wiring devices and lighting control devices. Systems shall include, but is not limited to, fire alarm, intercom, and theatrical systems.

B. Prepare a type written report documenting any items found to be damaged or in a non-working condition. Submit report to the Owner and Architect prior to commencing work. All devices and systems shall be considered in good working conditions if a report is not submitted and acknowledged by the Owner prior to commencing work.

C. Arrange a time to perform testing with the Owner with at least two weeks advanced notice.

D. Provide tests as follows on existing feeders to remain and notify engineer of any abnormalities:

1. Megger testing.
2. Infrared scanning at terminations.

E. Provide tests as follows on existing branch panels, switchboards, switchgear, and other electrical distribution equipment:

1. Infrared scanning.
2. Grounding/bonding continuity.

F. Existing Branch Circuits that Remain: Trace and ring-out existing branch circuits. Update panel schedules and relabel outlets, disconnect switches, boxes, and the like with actual branch circuit designations. Include such information in record drawings.

G. Where infrared scanning results indicate excessive heat, tighten the mechanical lugs and retest after 24 hours.

H. Include testing reports for above in closeout documentation. Record measurements and actions taken.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ELECTRICAL SYSTEMS DEMOLITION

A. Remove items depicted or denoted for demolition on the Drawings. Unless noted otherwise, removal of the items shall include devices, boxes, cable, supporting elements, raceway, etc. associated with the item back to the panelboard or nearest j-box or device to remain.

B. Drawings are intended to indicate the general scope of demolition work. Visit the Project site to verify existing conditions prior to bidding. Determine means and methods for performing work. Identify existing building finishes, ceiling types, access, and fire walls. Determine locations, routings, and distances as necessary. Coordinate with the Owner to gain access to the facility.

1. Wherever walls, ceilings, structures, or electric-powered equipment are indicated as being removed on the Drawings (including architectural demolition plans and mechanical demolition plans) remove associated electrical system components, equipment, devices, fixtures, raceways, and wiring. Remove, relocate, and extend existing installations, as necessary, to accommodate demolition work, new work, and to maintain the existing electrical installations that shall remain operational. Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.
2. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
3. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories

C. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to loads that remain in operation (i.e., facilities, luminaires, wiring devices, equipment, etc.). Extension of conduit and wire to equipment shall be compatible with the surrounding area.

1. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel and/or junction boxes where appropriate.
2. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.

D. Where existing conduits and/or cables, which remain in service, pass through areas to be renovated and where such conduits and/or cables interfere with new work, reroute these conduits and/or cables to avoid new construction. Provide necessary boxes, cables, splicing and fittings for the rerouting of the circuits. Field-verify to determine complete scope of work prior to bidding.

E. Existing conduit may remain if all the following are true:

1. Conduit will be reused to feed items installed under this contract.
2. Conduit does not interfere with other trades.
3. Conduit was originally installed meeting specifications related to this project.
4. Conduit will not be exposed in a finished area (unless noted otherwise).

F. Provide plugs on boxes to remain where conduits have been removed.

G. Conduits concealed in masonry walls or under concrete slabs may be cut back, sealed and abandoned.

H. Provide blank cover-plates on all abandoned boxes to remain in existing masonry or stud walls. Plate color and material shall match wiring devices plates specified for the project. In the

absence of such specification, match the color and material of existing wiring devices in the area.

I. Maintain power to end-of-line or downstream devices to remain. Provide raceways, boxes, conductors and all other necessary materials as required to re-establish damaged or interrupted feeders and branch circuits. Intercept existing feeders or branch circuits at nearest accessible space or device and reconnect to original feeder or branch circuit source.

J. Repair or replace ceilings, ceiling tiles, and ceiling-grids that are damaged by this contractor.

K. Electrical installations that remain shall be concealed, unless otherwise indicated or unless located within unfinished utility-type spaces. Cut and patch existing walls and ceilings as required. Exposed conduits and raceways will be rejected, unless prior approval has been obtained. Confirm scope of work and specific requirements for all such work directly with the Owner and the Architect.

L. Prior to drilling existing precast concrete walls, detect and locate existing structural members imbedded within the precast panels to ensure they are not damaged.

3.2 SPECIAL SYSTEMS DEMOLITION

A. Remove items depicted or denoted for demolition on the Drawings. Unless noted otherwise, removal of the items shall include devices, boxes, cable, supporting elements, etc. associated with the item back to the control panel, terminal block, punch block, patch panel, or similar type of termination point.

3.3 REMOVED MATERIALS

A. Existing wiring removed shall be regarded as scrap materials to be recycled by this contractor. Scrap value shall be determined by the contractor and accounted for in the contractor’s bid.

1. All other demolished electrical items (e.g., panels, luminaires, receptacles, switches, controllers, system devices, etc.) shall be regarded as the Owner’s property. The Owner reserves the right to identify which items shall be salvaged—and, thus, carefully removed by this contractor and placed in storage on site as directed by the Owner. The contractor shall be responsible for the proper disposal of all demolished materials that the Owner does not want to salvage. Coordinate specific requirements directly with Owner.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1. Ballasts in luminaires installed prior to 1980 shall be incinerated in EPA approved incinerator or disposed of in EPA certified containers and deposited in an EPA landfill certified for PCB disposal or recycled by permitted ballast recycler. Punctured or leaking ballasts must be disposed of according to Federal Regulations under the Toxic Substance Control Act. Provide to Owner and architect/engineer with a Certificate of Destruction to verify proper disposal.

2. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure (TCLP), to be hazardous waste shall be disposed of in a permitted hazardous waste disposal facility or by a permitted lamp recycler.

END OF SECTION 260503

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. **Metal-clad cable, Type MC, rated 600 V or less**
3. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
1. Section 260533 “Raceway and Boxes for Electrical Systems” for allowable applications of raceways and cable assemblies. Cable assemblies, such as Type MC cable, shall not be permitted unless noted otherwise.
2. Section 260553 “Identification for Electrical Systems” for conductor color coding.

1.3 DEFINITIONS

A. PV: Photovoltaic.

B. RoHS: Restriction of Hazardous Substances.

C. VFC: Variable-frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Copper Building Wire

1. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
2. Conductors: complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

B. 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. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

D. Temperature Ratings: All conductors shall be rated 90-degree C minimum.

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. 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.

C. Circuits:

D. Single circuit and multi-circuit with color-coded conductors. Separate neutral conductors shall be included for each circuit originating from a unique overcurrent protection device.

E. Conductors: 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 THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Steel or Aluminum, interlocked.

I. Jacket: PVC applied over armor.

2.3 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.

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. Lugs for attachment to telecommunications systems grounding busbars shall be two-hole with long barrels and irreversible crimp terminations.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. 100 amps and less: Copper stranded.
2. Over 100 amps: Copper, stranded.

B. Branch Circuits: Copper. Solid or stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exterior Feeders and branch circuits routed horizontally on roofs: Type XHHW-2, single conductors in raceway.

B. Other Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.

C. Feeders connected from the load-side of VFDs to electric motors: Type XHHW-2 single conductors installed in a raceway or Type XHHW-2 MC cable where permitted.

D. Conductors serving circuits downstream of a device with GFCI or GFP protection shall have XHHW-2 insulation.

E. PV Circuits: Type PV for PV source circuits rated at [**600**] [**1000**] [**2000**] V.

F. Metal Clad Cable

1. Uses permitted:

   a. Branch circuits rated less than 50 amps
   b. In areas that have accessible ceiling space

2. Uses not permitted:

   a. Feeders
   b. Homeruns that are more than 50 feet of cable length from device to panel.
   c. Areas where there is no access to the ceiling space
   d. Areas that have no ceiling or exposed structure
   e. Exposed
   f. Wet or damp areas

3.3 CONDUCTOR SIZES

A. Minimum Wire Size (Interior Work): No. 12 AWG, except No. 14 AWG shall be permitted for signal, pilot control circuits and fixture whips.

B. Minimum Wire Size (Exterior Work): No 10 AWG.

C. Use #10 AWG minimum conductor size in lieu of #12 AWG minimum for 20 ampere, 120 volt branch circuits where homeruns are longer than 75 feet. Increase in size as required for a maximum of 3 percent voltage drop from panel to load.

D. Derate conductors based on quantity of current carrying conductors in each conduit. Refer to the NEC for derating factors.

E. Derate conductors for high ambient temperatures. Refer to the NEC for derating factors.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.5 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.

3.6 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Ground bonding common with lightning protection system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

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 ELECTRICAL GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chatsworth.
2. Cooper B-Line.
3. Erico.
4. Harger.

B. Products shall be UL listed.

C. Copper busbar, 0.25-inch thick minimum, insulated stand-offs, factory predrilled standard size holes.

D. Electrical Grounding Busbars: Height shall be 4-inches minimum and length shall be 24-inches minimum unless indicated otherwise on Drawings.

E. Connector Lugs: Lugs for connecting to grounding electrode conductors and bonding conductors shall be UL listed two-hole, long barrel, electro tinplated compression lugs.

2.3 TELECOMMUNICATIONS GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line
2. Chatsworth
3. Erico.
4. Harger
5. Legrand Ortronics
6. Panduit

B. Products shall be UL listed meet the specification of TIA/EIA 607 and conform to BICSI recommendations.

C. Copper busbar, 0.25-inch thick minimum, insulated stand-offs, factory predrilled standard size holes per TIA/EIA 607 standard.

D. Telecommunications Main Grounding Busbars: Height shall be 4-inches. Length shall be 20-inches minimum unless indicated otherwise on Drawings. Chatsworth 40153 series or equal.

E. Telecommunications Grounding Busbars: Height shall be 2-inches. Length shall be 10-inches minimum unless indicated otherwise on Drawings. Chatsworth 13622 series or equal.

F. Connector Lugs: Lugs for connecting to telecommunications grounding busbars shall be UL listed two-hole, long barrel, electro tinplated compression lugs.

2.4 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 B3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.

4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.5 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 manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type 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. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

H. Conduit Hubs: Mechanical type, terminal with threaded hub.

I. Water Pipe Clamps:

1. Mechanical type, two pieces with zinc-plated bolts.

   a. Material: Tin-plated aluminum or Die-cast zinc alloy.
   b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector or copper ground connector rated for direct burial.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding Conductors: Green-colored insulation with continuous yellow stripe.

C. Isolated Grounding Conductors: Green-colored insulation with more than one continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

3.3 TELECOMMUNICATIONS GROUNDING

A. Provide grounding in accordance with TIA 607 and as indicated on the Drawings.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Use exothermic-welded connectors for outdoor locations.

C. 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.

D. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. 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. Perform tests and inspections.
B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal.

a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.

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.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

1.3 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 finished ceiling, including the following:

   a. Luminaires.
   b. Air outlets and inlets.
   c. Sprinklers.
   d. Access panels.

PART 2 - PRODUCTS

2.1 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. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Galvanized steel.
3. Channel Width: Selected for applicable load criteria.
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

B. Conduit and Cable Support Devices: [**Steel**] [**Steel and malleable-iron**] [**Stainless-steel**] [**Glass-fiber-resin**] hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug 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. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2. 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.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with 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 105.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by 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 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. Damp or wet locations: Utilize hot dipped galvanized steel slotted support systems. Apply galvanizing-repair paint to comply with ASTM A780 on cut edges.

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 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 supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.
8. 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. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Surface raceways.
5. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.
2. Section 260519 “Low-Voltage Power Conductors and Cables” for cable assemblies such as metal clad cable.

1.3 DEFINITIONS

A. Retain terms that remain after this Section has been edited for a project. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

C. LFMC: Liquidtight flexible metal conduit.

D. LFNC: Liquidtight flexible nonmetallic conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. IMC: Comply with ANSI C80.6 and UL 1242.
4. EMT: Comply with ANSI C80.3 and UL 797.
5. FMC: Comply with UL 1; zinc-coated steel.
6. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings:

1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Fittings for EMT:
   a. Material: Steel.
   b. Type: compression.

5. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS 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. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. Rigid HDPE: Comply with UL 651A.
4. Continuous HDPE: Comply with UL 651B.

B. Nonmetallic Fittings:

1. Fittings, General: Listed and labeled for type of conduit, location, and use.
2. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 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.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Screw-cover type unless otherwise indicated.

D. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. 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. MonoSystems, Inc.
b. Wiremold; Legrand North America, LLC.
c. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.

2. Single Channel for Power locations: One-piece raceway with matching device boxes, fittings and all components necessary for a complete raceway system.

a. Design Basis: Wiremold 500 or 700 series or equivalent to meet fill requirements.
b. Finish: Manufacturer’s standard enamel.

3. Two-Compartment Divided Surface Metal Raceway for Power and Data: UL Listed two-piece steel construction with baked-on powder-coat epoxy finish. Provide divider integral with base. Corner- and T-fittings shall have a 2.5-inch (minimum) bend-radius to support CAT-6A communications cables.

    a. Design Basis: Wiremold 4000 series with V4050 mounting brackets and V5507D faceplates for duplex receptacles. Provide wiring device brackets for low-profile mounting of standard duplex receptacles in-line with the raceway.
    b. Provide angled communication endplates/raceway adapters ARA-S2 that angle the IT connector/jack to increase cabling bend-radius capacity.
    c. Provide manufacturer's special fittings and radius control inserts to meet bend radius compliance standards for augmented Cat-6 (6A) communications cabling.
    d. Technology outlets shall provide two (2) labeling covers compliant with TIA-606 standard.
    e. Include all components necessary for fully equipped, complete, and functional raceway system.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Steel Surface-Mount Boxes for Finished Spaces (only where specified): NEMA OS 1, cast bell-box style, no visible knockouts, no holes, no gaps, no sharp edges, smooth, size to match flush faceplate dimensions.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

H. Device Box Dimensions: 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep).

I. Gangable boxes are allowed.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 for indoor dry locations and Type 4 for wet and outdoor locations with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.6 SLEEVE AND SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

C. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM (Ethylene-propylene-diene terpolymer rubber) or NBR (Acrylonitrile-butadiene rubber) interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic or carbon steel or stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

D. Grout: Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Above Grade Exposed Conduit: GRC or IMC.
2. Concealed Conduit, Aboveground: GRC or IMC.

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. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Severe Physical Damage: EMT.
2. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:

   a. .

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: IMC.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and 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. Comply with NEMA FB 2.10.
2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
3. Use fittings as follows:

   a. Outdoor and wet/damp areas: compression
   b. Conduits larger than 1-inch trade size: compression

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not install raceways or electrical items on any rotating equipment.

D. Do not fasten conduits onto the bottom side of a metal deck roof.

E. 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.

F. Complete raceway installation before starting conductor installation.

G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines. The following are exceptions for concealing conduits:

1. Where specifically noted or indicated on the drawings
2. Electrical rooms with surface mounted panels
3. Mechanical rooms
4. In open ceilings with exposed structure
5. Sound Booth
6. Unfinished utility corridors with exposed ceiling structure.

K. Do not install conduits exposed to solar heat gain such as roof tops unless indicated on the drawings.

L. Support conduit within 12 inches (300 mm) of enclosures to which attached.

M. Raceways Embedded in Slabs:

1. Conduit embedded in concrete slabs shall be positioned within the middle third of the slab and secured with approved supports. In no case shall the outside dimension of the conduit exceed 1/3 the thickness of the slab. Conduits in slabs shall not be placed any closer than 3 conduit diameters on-center, and they shall not cross over each other.
2. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
4. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
5. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

N. 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.

O. 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.

P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

S. 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.

T. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

U. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

V. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

W. 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. or from conditioned spaces to non-conditioned spaces or to exterior structures.
2. Conduit extending from interior to exterior of building.
3. Where otherwise required by NFPA 70.

X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations.

Y. 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.

Z. 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.

AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

BB. Locate boxes so that cover or plate will not span different building finishes.

CC. 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.

DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

EE. Set metal floor boxes level and flush with finished floor surface.

FF. Existing Building Surfaces: In finished rooms where an existing wall or ceiling remains in place, cut and patch to match the surrounding finishes as required to conceal all raceways. Coordinate work directly with contractor responsible ceiling, walls, and partition finishes.

GG. Conceal raceways within existing finished ceilings, walls, and partitions, unless otherwise indicated on the drawings or as follows:

1. Existing Hollow Walls (such as stud walls, hollow masonry walls, or other wall types with internal voids or vertical cavities):

    a. Outlet Boxes: If possible, use existing openings in wall, provided the opening is positioned within 24-inches of the location shown on plan for the new outlet. Otherwise, cut and patch wall as needed to install box flush.
    b. Conduit: If possible, fish FMC (or MC cabling where permitted) down within the existing wall cavity. Otherwise, saw-cut and patch wall as needed to conceal conduit within the wall. Finish wall to match original.
    c. This Contractor shall visit the facility to review existing conditions and determine means and methods of installation prior to bidding.
    d. Where specifically identified on the drawings, use surface-mounted boxes and surface metal raceway or surface-mounted conduit painted to match the surrounding finishes.

2. Existing Solid Walls (such as precast panels or filled masonry walls):

    a. Use surface-mounted boxes and surface metal raceway or surface-mounted conduit painted to match the surrounding finishes.

3. Existing Floors: Cut and patch existing floors as needed to accommodate new installations. Coordinate all such work with the general contractor prior to bidding.

HH. Conduits below on grade structural slabs: provide support from structural slab for conduits to hold the conduits in place due to soil settlement under the slab. Refer to geotechnical report for anticipated soil settlement amount. Support shall be anchored or embedded in the structural slab and be of corrosion resistant material. Provide support spacing in compliance to NEC for PVC conduit.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. 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.

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. 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70.
B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

C. Comply with ANSI Z535.4 for safety signs and labels.
D. Comply with NFPA 70E requirements for arc-flash warning labels.
E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

   1. Black letters on an orange field.
   2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

   1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
   2. Colors for 208/120-V Circuits:

      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
      d. Neutral: White

   3. Color for Equipment Grounds: Green.
   4. Colors for Isolated Grounds: Green with two or more yellow stripes.
   5. Black letters on an orange field.
   6. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

C. Warning Label Colors:

   1. Identify system voltage with black letters on an orange background.

D. 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. .

E. 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.

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.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, [**polyester**] or [**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 sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.

2.5 TAPES AND STENCILS

A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

B. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.6 TAGS

A. Nonmetallic Preprinted Tags: Polyethylene tags, thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

2.7 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

   a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
   b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
   c. Engraved legend with black letters on white face.
   d. Self-adhesive.
   e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. 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 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

B. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint 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 bond, using materials and methods recommended by 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 Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify 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 finish work.

F. Install signs with 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 surface of conductor, cable, or raceway.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

K. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

L. Vinyl Wraparound Labels:

1. Secure tight to 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.

M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

N. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Labels:

1. On each item, install 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- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

P. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

S. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.

T. 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- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

U. 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 most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide 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. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A: Identify with self-adhesive raceway labels or vinyl tape applied in bands.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
2. Apply the following identification colors:

a. 208Y/120 Volt, Distribution System: White.
b. Fire Alarm System: Red.
c. Motor and Other Control Systems: Black.
d. Telephone System: Green/Yellow.
e. Emergency 208Y/120 Volt Distribution System: White/Yellow.
f. Security System: Blue/Yellow.
g. Ground: Green.

D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.

H. Auxiliary Electrical Systems Conductor Identification: Marker tape or Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
4. Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands or snap-around color-coding bands:

    a. Fire Alarm System: Red.
    b. Security System: Blue and yellow.

I. Grounding Electrode Conductors and Grounding System Conductors: At each electrical room and communications room ground bus bar, label each raceway or conductor at the ground bus bar. Identify the destination of each grounding electrode conductor, bonding jumper and grounding system conductor. The labeling shall be by permanent adhesive label on the raceway. Conductors that terminate in the same room and the entire path is readily visible do not require labeling.

J. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

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.

L. Operating Instruction Signs: Self-adhesive labels.
M. Emergency Operating Instruction Signs: Self-adhesive labels with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.
N. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment: Laminated acrylic or melamine sign.
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 self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Emergency system boxes and enclosures.
    e. Enclosed switches.
    f. Enclosed circuit breakers.
    g. Enclosed controllers.
    h. Variable-speed controllers.
    i. Power-transfer equipment.

j. Contactors.
k. Remote-controlled switches, dimmer modules, and control devices.
l. Battery-inverter units.
m. Monitoring and control equipment.
n. UPS equipment.

END OF SECTION 260553

SECTION 260800 - COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrical equipment connected to Normal electrical systems, including the following:

   a. branch-circuit panelboards.
   b. Grounding systems.

2. Electrical equipment connected to Essential electrical systems that provide an alternative source of power in the absence of power from the Normal electrical system, including the following:

   a. branch-circuit panelboards.
   b. Grounding systems.
   c. UPS.

3. Controls and instrumentation, including the following:

   a. Equipment monitoring systems.
   b. Energy monitoring and control systems.
   c. Electrical metering and metering system.
   d. Lighting control systems.
   e. Fire-alarm systems.

4. Systems testing and verification, including Normal and Emergency electrical systems, and transitions from Normal to Emergency electrical systems and back.

1.2 DEFINITIONS

A. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they mean "as-built" systems, assemblies, subsystems, equipment, and components.

1.3 INFORMATIONAL SUBMITTALS

A. Construction Checklists by CxA: Draft construction checklists will be created by CxA for Contractor review.

B. Construction Checklists by Contractor: Include the following for construction checklists:

1. Instrumentation and control for lighting control systems.

2. Low-voltage power cables.
3. Control voltage power cables.
4. Electrical feeders and branch circuits.
5. Low-voltage motor starters.
6. Low-voltage air circuit breakers.
7. Protective relays.
8. Metering devices.
9. Molded-case circuit breakers.
10. Low-voltage power circuit breakers.
11. Grounding systems.
12. Ground-fault protection systems.
13. Panelboards.
14. Receptacles and devices.
15. Variable-frequency drives.
16. Battery systems.
17. Flooded lead-acid batteries.
18. VRLA batteries.
19. UPS systems.
20. Lighting.

1.4 QUALITY ASSURANCE

A. Testing Equipment and Instrumentation Quality and Calibration: For test equipment and instrumentation required to perform electrical Cx work, perform the following:

1. Submit test equipment and instrumentation list. For each equipment or instrument, identify the following:

   a. Equipment/instrument identification number.
   b. Planned Cx application or use.
   c. Manufacturer, make, model, and serial number.
   d. Calibration history, including certificates from agencies that calibrate the equipment and instrumentation.

2. Test equipment and instrumentation must meet the following criteria:

   a. Capable of testing and measuring performance within the specified acceptance criteria.
   b. Be calibrated at manufacturer's recommended intervals with current calibration tags permanently affixed to the instrument being used.
   c. Be maintained in good repair and operating condition throughout duration of use on Project.
   d. Be recalibrated/repaired if dropped or damaged in any way since last calibrated.

B. Proprietary Test Instrumentation and Tools:

1. Equipment Manufacturer's Proprietary Instrumentation and Tools: For installed equipment included in the Cx process, test instrumentation and tools manufactured or prescribed by equipment manufacturer to service, calibrate, adjust, repair, or otherwise

work on its equipment or required as a condition of equipment warranty, perform the following:

a. Submit proprietary instrumentation and tools list. For each instrument or tool, identify the following:

1) Instrument or tool identification number.
2) Equipment schedule designation of equipment for which the instrument or tool is required.
3) Manufacturer, make, model, and serial number.
4) Calibration history, including certificates from agencies that calibrate the instrument or tool, where appropriate.

PART 2 - EXECUTION

2.1 CONSTRUCTION CHECKLISTS

A. Prepare detailed construction checklists for electrical systems, subsystems, equipment, and components. Complete and submit construction checklists.

2.2 CONSTRUCTION CHECKLIST REVIEW

A. Review and provide written comments on draft construction checklists. CxA will create required draft construction checklists and provide them to Contractor.

B. Return draft Construction Checklist review comments within 10 days of receipt.

C. When review comments have been resolved, CxA will provide final construction checklists, marked "Approved for Use, (date)."

D. Use only construction checklists, marked "Approved for Use, (date)."

2.3 GENERAL TESTING REQUIREMENTS

A. Certify that electrical systems, subsystems, and equipment have been installed, calibrated, and started and that they are operating according to the Contract Documents and approved Shop Drawings and submittals.

B. Certify that electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents and approved Shop Drawings and submittals, and that pretest set points have been recorded.

C. Set systems, subsystems, and equipment into operating mode to be tested according to approved test procedures (for example, normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

D. Measure capacities and effectiveness of systems, assemblies, subsystems, equipment, and components, including operational and control functions to verify compliance with acceptance criteria.

E. Test systems, assemblies, subsystems, equipment, and components operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and response according to acceptance criteria.

F. Construction Checklists: Prepare and submit detailed construction checklists for electrical systems, subsystems, equipment, and components.

1. Contributors to development of construction checklists must include, but are not limited to, the following:

a. Electrical systems and equipment installers.
b. Electrical instrumentation and controls installers.

G. Perform tests using design conditions, whenever possible.

1. Simulated conditions may, with approval of Architect, be imposed using an artificial load when it is impractical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by CxA, and document simulated conditions and methods of simulation. After tests, return configurations and settings to normal operating conditions.
2. Cx test procedures may direct that set points be altered when simulating conditions is impractical.
3. Cx test procedures may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are impractical.

H. If tests cannot be completed because of a deficiency outside the scope of the electrical system, document the deficiency and report it to Owner. After deficiencies are resolved, reschedule tests.

I. Coordinate schedule with, and perform Cx activities at the direction of the CxA.

J. Comply with Construction Checklist requirements, including material verification, installation checks, startup, and performance tests requirements specified in Sections specifying electrical systems and equipment.

2.4 Cx TESTS FOR ELECTRICAL SYSTEMS

A. Verification of Normal Electrical System Operation:

1. Prerequisites: Acceptance of results for construction checklists for Division 26 electrical components associated with Normal electrical system.
2. Equipment and Systems to Be Tested: Division 26 electrical equipment.
3. Test Purpose: Verify operation of Normal electrical system.
4. Test Conditions: Energize components of Normal electrical system, one at a time.
5. Acceptance Criteria: Proper operation of Normal electrical system over a 24-hour period.

B. Verification of Emergency Electrical System Operation:

1. Prerequisites:

a. Acceptance of results for construction checklists for Division 26 electrical components associated with Essential electrical system.
b. Completion of "Verification of Normal Electrical System Operation" tests.

2. Equipment and Systems to Be Tested: Division 26 electrical equipment.
3. Test Purpose: Verify operation of Emergency electrical system.
4. Test Conditions:

a. Energize components of Normal electrical system.
b. Simulate a failure of Normal electrical system.

5. Acceptance Criteria: Transfer of power from Normal to Emergency electrical system within OPR.

C. Verification of Control and Instrumentation:

1. Prerequisites: Acceptance of results for construction checklists.

a. Section 260923 "Lighting Control Systems."

D. Test Purpose: Verify operation of control and monitoring systems for Normal and Essential electrical systems.

E. Test Conditions:

1. Energize components of Normal and Emergency electrical system.
2. Test operation of equipment.

F. Acceptance Criteria: Operation of equipment according to OPR.

END OF SECTION 260800

SECTION 260923 - LIGHTING CONTROL SYSTEMS AND DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Digital lighting management systems.
2. Daylight-harvesting controls and photoelectric sensors.
3. Indoor occupancy and vacancy sensors.
4. Emergency lighting shunt relay (UL-924).
5. Conductors and cables.

1.2 SUBMITTALS

A. Product Data and Shop Drawings:

1. Submit manufacturer's technical product data for each type of lighting control system and its components.
2. Manufacturer's warranty documentation specifically for this contract.
3. Floor plans and reflected ceiling plans showing occupancy and daylight-harvesting photoelectric sensor locations.
4. Include typical mounting details for each sensor type.
5. Detailed point to point wiring diagrams.
6. Wiring schedules.
7. Typical wiring diagrams for each component.
8. Provide sequence of operations for each space type in a format suitable for programming requirements of the specific system and meeting the intent of the sequence of operation provided by the architect/engineer.

B. Closeout Documentation:

1. Field quality-control test reports.
2. Record drawings reflecting as-built information, including floor plans, wiring diagrams, equipment and wiring schedules, and room schedules.
3. Operation and Maintenance Manuals:

   a. Manufacturer's technical product data and maintenance data.
   b. Manufacturer's warranty documentation.

4. Software and Firmware Operational Documentation:

   a. Software service agreement.
   b. Software operating and upgrade manuals.

1.3 WARRANTY

A. Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, software, and devices that fail to perform as specified within extended warranty period.

1. Special Extended Warranty Period: Shall exceed four (4) years starting from the date of Substantial Completion.

   a. If the manufacturer's warranty commences upon the date materials are delivered, then the manufacturer's warranty period shall be at least five (5) years to meet the requirement stated above.

1.4 SOFTWARE AND FIRMWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion provide a 5-year software service agreement to the Owner.

B. Software and Firmware Upgrades:

1. At Substantial Completion, update software and firmware to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Verify upgrading software includes operating system and new or revised licenses for using software.
2. Upgrade Notice: Provide a 30-day notice to Owner to allow scheduling and access to the system and to allow Owner upgrade to computer equipment if necessary.
3. Upgrade Reports: Prepare written report after each update, documenting upgrades installed.

1.5 QUALITY ASSURANCE

A. Codes and Standards:

1. NFPA 70, National Electrical Code (NEC).
2. UL 508, Standard for Industrial Control Panels.
3. UL 916, Standard for Energy Management Equipment.
4. UL 917, Standard for Clock Operated Switches.
5. UL 924, Standard for Emergency Lighting and Power Equipment.
6. 47 CFR, Subparts A and B, for Class A digital devices.

B. Comply with NEC, NEMA, and FCC emission requirements for Class A applications. Comply with applicable city, county, and state codes and ordinances.

C. Certification: Manufacturer shall certify that products will meet product specifications and local energy codes. If any additional equipment is required to meet coverage patterns and local energy codes, provide additional equipment at no additional cost to the Owner.

D. Selection, quantity, and placement of all lighting control sensors as indicated on the drawings shall be regarded as the basis of design. Under this contract, engage a factory-authorized representative to determine optimal selection, quantity, and placement of sensors and other system components using the manufacturer's actual devices, and to guarantee the proper application and correct operation of such devices. Any deviation from the basis of design still must comply with these specifications and must result in function and performance that meets or exceeds that of the basis of design.

E. Manufacturer's Field Service and Commissioning: Engage a factory-authorized service representative to inspect, test, and adjust sensors and associated system components, and to guarantee sensor performance.

F. Ceiling-mount devices and wall-mount devices installed above 6 ft. shall be flat and/or textured white. Wall-mount devices installed 42-inch above floor shall match device color and wall plate specified in Section 262726 "Wiring Devices".

PART 2 - PRODUCTS

A. Source Limitations: Obtain lighting control module and power distribution components through one source from a single manufacturer

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acuity Brands, Inc. (nLight / Sensor Switch).
2. Lutron
3. Crestron Electronics, Inc. (Green Light).
4. Eaton / Greengate / Cooper Lighting Controls, Inc.
5. Encelium / Osram Sylvania, Inc.
6. Hubbell Building Automation / Lighting Controls (NX Distributed Intelligence).
7. Intelligent Lighting Controls, Inc.
8. Leviton Manufacturing Co.
9. Watt Stopper/Legrand Vantage Controls/Digital Lighting Management.

C. System Description and Operation

1. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photoelectric sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible to minimize overall device count of system.

2. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher-level network backbone.
3. Lighting control zone shall be capable of automatically configuring itself for default operation without any startup labor required.
4. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
5. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.
6. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e., not in a remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.
7. System shall have a primary wall mounted network control “gateway” device capable of accessing and controlling connected system devices and linking into an Ethernet LAN.
8. System shall use “bridge” devices that route communication and distribute power for up to 8 lighting zones together for purposes of decreasing system wiring requirements.
9. System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control profiles.
10. Individual lighting zones shall be capable of being segmented into several channels of occupancy, photoelectric sensor, and switch functionality for more advanced configurations and sequences of operation.
11. System shall be capable of operating a lighting control zone according to several sequences of operation. Note operating modes should be utilized only in manners consistent with local energy codes.

    a. Auto-on / auto-off (via occupancy sensors)
    b. Manual-on / auto-off
    c. Auto-to-override on
    d. Manual-to-override on
    e. Auto on /predictive off
    f. Multi-level on (multiple lighting levels per manual button press)

12. System programming shall be done in the following fashion:

    a. For completely networked systems, system programming and control adjustments can be done via software from a single point in the network.
    b. For stand-alone systems, programming shall be done by hand-held remote control or by software app via standard wireless protocol such as Wi-Fi or Bluetooth.

13. Control software shall enable integration with a BAS via BACNET IP.

D. System Cabling: Intelligent devices shall be connected to the LRC (lighting room controller). Communications and Class 2 low voltage power shall be provided to each intelligent device via standard low-voltage UTP Category 5 cabling with RJ45 connectors. RJ45 adapters may be used to allow standard analog sensors to be used.

1. All cabling for intra-room connectivity of control devices (example, between power packs and from power packs to sensors and switches) shall be pre-manufactured and provided by controls manufacturer.
2. Intelligent lighting control devices shall communicate digitally and possesses at least two RJ45 connectors.
3. Devices within a lighting control zone shall be connected using low-voltage cabling, in a daisy-chain fashion, and in any order.
4. System shall provide the option of having pre-terminated plenum rated Category 5 cabling supplied with hardware.

E. Management Software

1. Every device parameter (e.g., sensor time delay and photoelectric sensor set-point) shall be available and configurable remotely from the software.
2. The following status monitoring information shall be made available from the software for all devices for which it is applicable: current occupancy status, current occupancy sensor status, remaining occupancy time delay(s), current photoelectric sensor reading, current photoelectric sensor inhibiting state, photoelectric sensor transitions time remaining, current dim level, device temperature, and device relay state(s).
3. The following device identification information shall be made available from the software: model number, model description, serial number, manufacturing date code, custom labels, and parent network device.
4. Software shall require all users to login with a username and password.
5. All sensitive stored information and privileged communication by the software shall be encrypted.
6. All device firmware and system software updates must be available for automatic download and installation via the internet.
7. Software shall be capable of managing systems interconnected via a WAN (wide area network).

F. Applications:

1. Furnish and install digital lighting management systems in each room, space, or area as indicated on the Drawings, or wherever the following applies:

   a. Wherever lighting is controlled by a low-voltage multi-button control station (as opposed to a line-voltage switch).
   b. Wherever the Energy Code requires the lighting to be turned on via manual operation only and/or a room where the lighting is controlled by one or more vacancy sensors.

G. Intelligent Lighting Room Controller (LRC)

1. The LRC associated with each Digital Lighting Management System is not necessarily shown on the plans.

    a. Each controller shall be mounted above the accessible ceiling, unless otherwise noted. Where there are no suspended ceilings, mount controller above nearest accessible ceiling or near the associated power panelboard. The contractor shall be responsible for determining the optimum locations in the field.
    b. Controllers mounted above accessible ceilings shall be furnished with a plenum-rated enclosure. If ceiling is not accessible, provide an access panel in the ceiling or coordinate with the Owner an acceptable location for a surface-mounted enclosure.

2. System shall be true digital control with digital sensors and other components. Hybrid analog systems are not acceptable.
3. The installation of software shall not be required. At a minimum, the user interface shall provide the following functions:

    a. Automatic discovery of system devices.
    b. Commissioning of devices into logical control zones and areas.
    c. Allow the user to name zones, groups, presets, schedules, and individual loads.
    d. Setup control functions for system inputs and outputs.
    e. Monitor status and override individual relays and dimmers.

4. Programming shall be stored in non-volatile memory, so that all field-settings and programming are retained in the event of a power outage.
5. Unit power supply shall be dual-rated or rated to match its branch lighting circuit connection indicated on the plans.
6. Each LRC that is required in a space shall be capable of accommodating and controlling at least two (2) line-voltage lighting circuits. Provide additional units as required for application indicated on the Lighting Plans and/or Schedules.
7. Unit must be capable of providing 0-10 VDC 200 mA dimming controls for each zone (or “switchleg”) of LED dimmable drivers. Dimmer interface shall be achieved via lighting control stations with programmable pushbuttons. Applications, zones, and quantities shall be determined per the drawings.
8. Unit must interface with presence sensors that are designated as vacancy sensors to enable lights to be turned on only manually—not automatically unless the lights had timed-out within the previous 30 seconds.
9. Integral surge protection: Meets ANSI/IEEE Standard C62.41-1980, tested to withstand momentary voltage surges up to 6000V and current surges up to 200A without damage.
10. Furnish and install a completely functioning turnkey system. Include all necessary accessories, programming, settings, commissioning, and testing.
11. Communications and Class 2 low-voltage power connection between LRC and input devices (control stations, sensors, etc.) shall be standard low-voltage UTP Category 5 cabling with RJ45 connectors.

H. Low-Voltage Momentary-Contact Programmable Pushbutton Lighting Control Stations

1. Provide programmable multibutton-button control stations corresponding to each application indicated on the lighting plans and lighting control diagrams, including power enable/disable and dimming controls. “Buttons” may also be provided via an optional touchscreen interface device.
2. Include an LED status indictor integral to each programmable button or a touchscreen status indicator.
3. Include factory-produced symbols etched into each programmable button to indicate its general function, such as on/off, up, down (dimming), etc. Refer to details on the drawings. If an optional touchscreen interface device is provided, labeling and symbols may be programmed on the display.
4. Multiple control stations located within in the same vicinity shall be mounted in a common wall-box with a multi-gang faceplate.
5. Initial Programming: Upon energizing luminaires, each control station shall be programmed to provide basic manual on/off functions (so that no luminaire remains on or off 24/7 without manual control). This initial programming shall be provided prior to the manufacturer’s factory-authorized technician performing their official system programming, configuration, startup, and system commissioning services.
6. Communications and Class 2 low-voltage power connection between device and LRC shall be standard low-voltage UTP Category 5 cabling with RJ45 connectors.

I. Presence Sensors (Indoor Occupancy and Vacancy Sensors)

1. Refer to indoor occupancy/vacancy sensors below for types and performance specifications.

    a. Auxiliary Contacts: Provide each zone of lighting control with an additional auxiliary contact/relay, form C, dry contacts, rated for and compatible with the building automation system (BAS). Contact may be provided integral to either the presence sensor or the LRC. Coordinate with the Division 23 contractor.

2. Presence sensors shall function as vacancy sensors by default, which requires the occupant to manually turn-on the lights.
3. Communications and Class 2 low-voltage power connection between device and LRC shall be standard low-voltage UTP Category 5 cabling with RJ45 connectors.

J. Photoelectric Sensors (Digital Daylight-Harvesting Dimming Controls)

1. Refer to Daylight-Harvesting Dimming Controls (Digital) below for types and performance specifications.
2. Device shall be provided in conjunction with a dimming daylighting system capable of being programmed and calibrated to maintain the lighting design level in the room served.
3. The daylight sensor shall provide ambient light level information to the LRC allowing daylight responsive lighting control.

4. Communications and Class 2 low-voltage power connection between device and LRC shall be standard low-voltage UTP Category 5 cabling with RJ45 connectors.

2.2 DAYLIGHT-HARVESTING DIMMING CONTROLS, DIGITAL

A. Manufacturers: Match same manufacturer provided for Digital Lighting Management system above.

B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, lights are dimmed.

1. The system shall operate in an open or closed loop sequence of operation reducing the amount of electric light as the quantity of daylight entering the room increases.
2. It shall be possible to configure multiple daylight zones in a room with open loop sensors. Each zone shall be programmable to proportionally respond to the light level provided by the daylight sensor.
3. Lighting control set point is based on the following two lighting conditions:
   a. When no daylight is present (target level).
   b. When significant daylight is present (exceeding target level).
4. System programming is done with two hand-held, remote-control tools.
   a. Initial setup tool.
   b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
5. Programming shall be stored in non-volatile memory, so that all field-settings and programming are retained in the event of a power outage.

C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with integrated or separate power-pack, to detect changes in indoor lighting levels that are perceived by the eye.

1. If photoelectric sensor is associated with a digital lighting management system, in which case the LRC (lighting room controller) shall function as the power-pack.
2. Sensor shall be mounted and positioned to provide an unobstructed view of the windows per the manufacturer's directions.

D. Electrical Components, Devices, and Accessories:

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Sensor Output: zero to 10 V(dc) to operate luminaires. Sensor is powered by controller unit.
3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc (120 to 640 lx).

E. Power Pack (if not integral to LRC): Digital controller capable of accepting three 8PSJ inputs with one output rated for 20 A LED load at 120 V(ac). Sensor has 24 V(dc) Class 2 power source.

2.3 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers: Match same manufacturer provided for Digital Lighting Management system above.

B. General Requirements for all Presence Sensors:

1. Wall- or ceiling-mounted, solid-state indoor occupancy and vacancy sensors, as indicated on the drawings, designed to detect the presence of human activity within the desired space and to control the on/off function of the luminaires within that space.
2. Passive-infrared, ultrasonic or dual-technology.
3. Integrated or separate power pack.

    a. If sensor is associated with a digital lighting management system, in which case the LRC (lighting room controller) shall function as the power pack.

4. Hardwired connection to switch or multi-button control station.
5. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
6. Sensors shall be able to function together with other sensors to provide expanded coverage areas by simply daisy-chaining together each device with low-voltage communications cabling.
7. Operation:

    a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time-delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time-delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time-delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    d. Programming shall be stored in non-volatile memory, so that all field-settings and programming are retained in the event of a power outage.

8. Power Pack (if not integral to LRC): Dry contacts rated for 20 A LED load at 120 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.

9. Mounting:

    a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
    b. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
11. Auxiliary Contacts: Provide each zone of lighting control with an additional auxiliary contact/relay, form C, dry contacts, rated for and compatible with the building automation system (BAS). Coordinate requirements with the Division 23 contractor.

C. PIR Type: Wall- or ceiling-mounted as indicated; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch (150 mm) minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch (23 200 sq. mm).
2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a 360-degree circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch high ceiling.

D. Ultrasonic Type: Wall- or ceiling-mounted as indicated; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12-inch (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inch/s (305 mm/s).
2. Detection Coverage (Small Room): Detect occupancy anywhere within a 360-degree circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch (2440 mm) high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch (2440 mm) high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch (2440 mm) high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 ft. (27.4 m) when mounted on a 10 ft. (3 m) high ceiling in a corridor not wider than 14 ft. (4.3 m).
6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. (110 sq. m) if positioned 84-inch (2100 mm) above finished floor.

E. Dual-Technology Type: Wall- or ceiling-mounted as indicated; detect occupants in coverage area using PIR/microphonics or PIR/ultrasonic detection methods. The type of detection technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch and detect a person of

average size and weight moving not less than 12-inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a 360-degree circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. if positioned 84-inch above finished floor.

2.4 EMERGENCY LIGHTING SHUNT RELAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Entertainment Networks Corp.
2. Electronic Theater Controls, Inc. (ETC)
3. Bodine/Philips
4. Hubbell Building Automation, Inc.
5. Intelligent Lighting Controls, Inc.
6. LVS Controls, Inc.
7. Nine 24, Inc.
8. Watt Stopper
9. Or, where applicable, the same manufacturer as LRC associated with digital lighting management systems (listed above).

B. Description: NC, electrically-held relay in NEMA 1 enclosure, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924. Provide with test station integral to relay where ceiling-mounted or in a single-gang box where remote mounting is required.

1. Rated 1000 W at 120 V(ac) for LED lighting.
2. Voltage: Match the circuit voltage.
3. Test Station: LED status indicators (normal/utility power, emergency, test), test button, white faceplate where mounted flush in the ceiling, unless indicated otherwise on the drawings.
4. LED Dimming Applications: Provide 0-10V dimming override feature that forces the control line to “full on” in the emergency bypass mode, unless indicated otherwise on the drawings.

C. Function: The UL-924 device shall control luminaires designated for emergency lighting during both normal and emergency modes by interfacing with associated normal switching means and by monitoring for loss of power to the normal lighting branch circuit. In the event of a power outage, luminaires connected to the emergency branch lighting circuit shall automatically be switched-on regardless of the status or position of associated normal lighting control devices (switches, dimmers, sensors, LRCs, contactors, etc.). Under normal power, the UL-924 device shall mimic the normal switching means, as indicated on the drawings.

2.5 EQUIPMENT ENCLOSURES

A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.

2.6 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 DELEGATED DESIGN

A. This contract shall include the complete design and application of lighting control systems. Determine all system components, cabling specifications, and programming required for complete and functional operation. If necessary, obtain clarification from Architect/Engineer prior to bidding regarding intent of contract documents.

B. Provide additional quantities and placement of sensors as needed to achieve coverage of area served at actual mounting heights.

C. The wiring methods indicated on the electrical drawings are to indicate design intent only. Approved manufacturer controls products may have different driver and sensor requirements and different wiring methods than what is shown on the electrical drawings. Contractors are required to familiarize themselves with all required wiring, additional part and pieces, required installation labor, etc. to provide for a complete installed system that meets the intent and functionality of the specified system.

D. The Contractor shall provide as part of the shop drawing submittals, complete lighting drawings including all wiring, equipment, equipment locations, etc. for the submitted system.

E. All costs shall be included in the bid for a complete operational system that meets the specified and designed system.

F. Control Intent: Control Intent includes, but is not limited to the following:

1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
2. Initial sensor and switching zones
3. Initial time switch settings

3.2 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION OF SENSORS

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies, as applicable.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3.4 INSTALLATION OF WIRING

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.

B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.

C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

E. Include a neutral conductor connected to every “switch point”, such as wall-switch occupancy sensors, in accordance with NEC 404.2(C).

F. Ceiling-Mounted Sensors: Provide a minimum 8-ft. slack loop of extra control cabling so the Owner can readily modify the placement of sensors in the future.

G. Open cabling methods may be utilized above accessible ceilings for Class 2 wiring. All cabling in exposed areas, above inaccessible ceilings, and inside walls shall be installed in raceway.

H. IDENTIFICATION

I. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

J. Label switches and contactors with a unique designation as specified or as indicated on the drawings.

3.5 PROGRAMMING AND DEVICE SETTINGS

A. Manufacturer's Field Service and Commissioning: Engage a factory-authorized service representative to program, configure, test, and adjust components associated with each lighting control system and each lighting control device.

B. Initial Programming: Upon energizing luminaires associated with lighting control stations, each control station shall be programmed to provide basic manual on/off functions (so that no luminaire remains on or off 24/7 without manual control). This initial programming shall be provided prior to the manufacturer's factory-authorized technician performing their official system programming, configuration, startup, and system commissioning services.

C. Occupancy and Vacancy Sensor Settings and Adjustments

1. Position, aim, and adjust sensors to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
2. Lights shall turn on immediately after the light-switch, dimmer, or control station is engaged.
3. Lights must stay on while presence is detected.
4. Lights shall turn off after a preset time-delay commencing from the last moment presence was detected (corresponding to vacancy). The initial time-delay off setting shall be 10 minutes. Coordinate final settings directly with the Owner.
5. Provide a walk-though with the Owner's representative to confirm final settings and overall functionality.

D. Continuous Dimming Daylight-Harvesting, Field Settings, and Adjustments

1. Sensor operation shall be based upon a closed-loop control method. Placement, installation, and programming of device shall be in accordance with the manufacturer's installation instructions and recommendations.

2. During nighttime hours (no daylight), with all lights turned on and turned up 100%, determine the average lighting level (foot-candles) at 30-inches AFF throughout the space. This value shall be regarded as the design level.
3. Program and calibrate dimmable daylighting system to maintain this design level throughout the daylight hours and to turn the lights off completely whenever the lighting levels exceed the design levels by 10%.

3.6 SYSTEM STARTUP AND SYSTEM COMMISSIONING

A. System Startup: Manufacturer's authorized technician shall confirm proper installation and operation of system components.

1. Confirm lighting controls are located, installed, and adjusted as required by the factory and the contract documents for each room.
2. Verify operation of each lighting control device as specified. Measure light levels throughout the room with a grid spacing of no greater than five foot on-center and adjust each photo sensor to confirm uniform light levels in compliance with values listed in the initial footcandle settings listed in the contract documents. Confirm time-delay settings comply with initial time-delay settings listed in the contract documents.
3. Verify lighting controls function as a complete and operational system to meet requirements of the Energy Code and the contract documents.
4. Manufacturer shall submit test documentation for each room including light level grid showing light levels and time delay test results and a written statement verifying that system meets above requirements. Include copy of test reports in the Operation and Maintenance Manual.

B. System Commissioning: Commissioning of lighting control devices and digital lighting management systems shall be as indicated in Section 260800. Manufacturer's certified installer of lighting control systems shall coordinate and assist in all commissioning requirements by third party. Each system and devices shall be fully programmed and functioning as specified prior to commissioning.

C. Factory authorized representative will be available for a pre-wiring meeting to review submittal drawings, recommended wiring practices and programing requirements.

D. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system. Provide notice no-less than three weeks prior to a startup visit. Several business days may be required to confirm dates and times.

E. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities, and daylight-harvesting setpoints.
2. System programming (e.g., manual on, auto off, dimming levels, zone switching, etc.).

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

C. Prepare test and inspection reports.

D. Manufacturer Field Services and Commissioning:

1. Engage factory-authorized service representative to perform field tests/inspections and to make any necessary adjustments to lighting control systems and devices.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested by Owner within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose, including up to 10 hours of labor plus the necessary travel time.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylight-harvesting controls, adjust set points and deadband controls to suit Owner's operations.

3.9 DEMONSTRATION

A. Coordinate demonstration of products and training of Owner’s maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section “Demonstration and Training” for requirements, <u>excluding</u> requirements related to video-recordings. Include in this contract training/demonstration time plus any necessary travel time/expenses.

1. Digital Lighting Management Systems: 2 hours
2. Daylight-Harvesting Sensors: 1 hour.
3. Occupancy and Vacancy Sensors: 1 hour.
4. Emergency Lighting Shunt Relays: 0.5 hour.

3.10 MAINTENANCE

A. Software and Firmware Service Agreement: Install and program software upgrades that become available as specified above.

END OF SECTION 260923

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard-grade receptacles, 125 V, 20 A.
2. GFCI receptacles, 125 V, 20 A.
3. Twist-locking receptacles.
4. Toggle switches, 120/277 V, 20 A.
5. Wall plates.
6. Poke-through assemblies.

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.

G. SPD: Surge protective device.

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.

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. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with requirements in this Section.

F. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations.

G. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Essential Electrical System: Red.
3. Isolated-Ground Receptacles: Orange.

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.

J. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).

2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Straight Blade Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper; 5361 (single), 5362 (duplex).
   b. Hubbell; HBL5361 (single), 5362 (duplex).
   c. Leviton; 5361 (single), 5362 (duplex).
   d. Pass & Seymour; 5361 (single), 5362 (duplex).

2. Description: Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498 and FS W-C-596.

B. Isolated-Ground Duplex Receptacles, 125 V, 20 A:

1. Description: Straight blade; equipment grounding contacts shall be connected only to green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.

C. Weather-Resistant Duplex Receptacle, 125 V, 20 A:

1. Provide weather resistant version of the straight blade receptacles series specified above.
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.
5. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

2.3 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper: SGF20
   b. Hubbell: GFRST20_ST (AutoGuard™)
   c. Leviton: G5362
   d. Pass & Seymour: 2095

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.

2.4 TWIST-LOCKING RECEPTACLES

A. Twist-Lock, Single Receptacles:

1. Configuration: NEMA WD 6, Configuration as noted on Drawings
2. Standards: Comply with UL 498.

B. Twist-Lock, Isolated-Ground, Single Receptacles, 125 V, 20 A:

1. Grounding: Equipment grounding contacts shall be connected only to green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
2. Configuration: NEMA WD 6, Configuration L5-20R.
3. Standards: Comply with UL 498.

2.5 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper: CSB120
   b. Hubbell: CSB120
   c. Leviton: 1221-2
   d. Pass & Seymour: CSB20AC1

2. Standards: Comply with UL 20 and FS W-S-896.

B. Three-Way Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper: CSB320
   b. Hubbell: CSB320
   c. Leviton: 1223-2
   d. Pass & Seymour: CSB20AC3

2. Comply with UL 20 and FS W-S-896.

C. Four-Way Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper: CSB420
b. Hubbell: CSB420
c. Leviton: 1224-2
d. Pass & Seymour: CSB20AC4

2. Standards: Comply with UL 20 and FS W-S-896.

D. Pilot-Light Switches: 120/277 V, 20 A:

1. Description: Illuminated when switch is on.
2. Standards: Comply with UL 20 and FS W-S-896.

2.6 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: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Indoor 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, thermoplastic with lockable in-use cover.

2.7 POKE-THROUGH ASSEMBLIES Insert drawing designation

A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.

B. Standards: Comply with scrub water exclusion requirements in UL 514.

C. Service-Outlet Assembly: Flush type, receptacle and blank gang quantity per plans.

D. Size: Selected to fit nominal 4-inch (100-mm) cored holes in floor and matched to floor thickness.

E. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.

F. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.

G. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. 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, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
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 up, and on horizontally mounted receptacles to the left.

a. In existing buildings, match the configuration of existing devices.

F. Wet locations: Provide weatherproof cover plates at exterior and interior wet locations as required by the current adopted NEC whether indicated as such on the drawings or not, in addition to those devices that are specifically denoted on the drawings with a “W” or “WP” to receive weatherproof covers

G. Maintenance Receptacles for HVAC equipment: whether denoted on the drawing or not, provide accessible 125V, 20A, duplex GFCI receptacle located within 25 feet of HVAC equipment per current adopted NEC. Connect to 20 amp general purpose circuit

H. 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.

I. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.

J. Adjust locations of floor devices 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.

B. Provide GFCI receptacles or GFCI breaker as required by NEC 210.8 at the following locations whether denoted on the drawings or not:

1. Within 6-feet of the outside edge of ta sink or other “wet location” applications unless exception is applicable by the most current adopted NEC.
2. Restrooms, locker rooms, and bathing/showering areas
3. Outdoors, including mechanical rooftop units unless exception is applicable by the most current adopted NEC.
4. Other locations as required by the current adopted edition of the NEC

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
3. Using the test plug, verify that the device and its outlet box are securely mounted.
4. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 265100 - LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. LED interior lighting.
2. Exit lighting.
3. Luminaire accessories and support components.

B. Related Requirements:

1. Section 260923 "Lighting Control Systems and Devices" for automatic control of lighting, including controllers/dimmers, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. EPA: Effective projected area (as it relates to the wind force exerted on an object, in accordance with the standard, AASHTO LTS-5).

D. Fixture: See "Luminaire."

E. IP: International Protection or Ingress Protection Rating.

F. LED: Light-emitting diode.

G. Lumen: Measured delivered output of luminaire.

H. Luminaire: Complete lighting unit, including light source, reflector, integral or remote driver, circuitry, lens, diffuser, housing, and accessories.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description, profiles, and dimensions of luminaires.
4. Include data on EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES LM-79 and IES LM-80.
7. Use same luminaire designations as indicated on Drawings.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, unique configurations, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Finish/Color Samples for Initial Selection or Verification: As specified for specific luminaire types on the Luminaire Schedule for each type of luminaire requiring a custom factory-applied finishes/colors.

1. Include samples of luminaires and accessories involving color and finish selection.
2. Include samples for each type of lighting pole, standard, and luminaire-supporting device and for each color and texture specified.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

B. Warranty documents.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications:

1. Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
2. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

B. IESNA RP-16-05 Addendum “A”: Industry-standard nomenclature and definitions of lighting terms and lighting technologies, including solid-state (LED) luminaires.

C. UL Compliance: Comply with UL 1598 and listed for wet locations, as specified.

D. Source Limitations:

1. Provide luminaires from a single manufacturer for each luminaire type

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Structural failures, including luminaire support components.
2. Faulty operation of luminaires and accessories.
3. Deterioration or corrosion of metals, metal finishes, color retention, and other materials beyond normal weathering.

B. Luminaire Warranty Period: Greater than four (4) years from date of Substantial Completion.

1. If the manufacturer’s warranty commences upon the date materials are delivered, then the manufacturer’s warranty period must be at least five (5) years to meet the requirement stated above.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

B. Ambient Temperature (Indoor Lighting): 5 to 104 deg F (-15 to +40 deg C).

C. Exterior Temperature (Outdoor Lighting): minus 20 to plus 120 deg F (-29 to +50 deg C).

1. Relative Humidity: Zero to 95 percent.

D. Altitude: Sea level to 1000 feet (300 m).

2.2 LUMINAIRE REQUIREMENTS

A. Luminaire Types and Acceptable Manufacturers: As indicated on the Drawings. Refer to the Luminaire Schedule.

1. Model numbers shall not be regarded as complete or entirely accurate. Do not order products based solely on a model number. For each luminaire type, the contractor shall reconcile its description, including options and accessories, with its intended application derived from relevant information conveyed throughout the entirety of contract documents.
2. The manufacturer listed first for each luminaire type shall be regarded as the Basis of Design. Alternative products by other listed manufacturers must be at least equivalent in style, quality, features, and performance to that of the Basis of Design.

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. Factory-Applied Labels: Comply with UL 1598. Include CCT and CRI ratings. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

D. Recessed luminaires shall comply with NEMA LE 4.

2.3 LED LUMINAIRES

A. Delivered lumen output as indicated on the Luminaire Schedule.

B. IESNA LM-79 compliant, latest edition.

C. IESNA LM-80 compliant, latest edition; 50,000 hours minimum, unless otherwise noted.

D. CRI and CCT as indicated on Luminaire Schedule in accordance with ANSI C78.377.

E. NEMA.SSL-1 compliant for operational characteristics and electrical safety of LED drivers and power supplies. ANSI/NEMA C82.77 compliant for maximum allowable harmonic distortion produced by power supplies/drivers.

F. Power Factor > 0.9, unless noted otherwise.

G. Total Harmonic Distortion (THD) < 20%, unless noted otherwise.

H. Provide integral Type 4 surge protective device (SPD) rated for 10 kA peak surge per UL 1449 standards.

2.4 EXIT SIGNS

1. General Characteristics: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

2. Internally Lighted Sign:

   a. LED; 100,000 hours minimum rated lamp life.
   b. Provide AC-only non-emergency type (without battery) for exit signs connected to line-voltage emergency power circuit as indicated on the Drawings.
   c. Self-Powered Exit Signs (Battery Type): Provide internal emergency power unit. Refer to the Luminaire Schedule for application.

      1) Integral automatic charger in a self-contained power pack.
      2) Battery: Sealed, maintenance-free, nickel-cadmium type.
      3) Charger: Fully automatic, solid-state type with sealed transfer relay.
      4) Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      5) LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
      6) Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

2.5 MATERIALS

A. Metal Parts:

   1. Free of burrs and sharp corners and edges.
   2. Sheet metal components shall be steel unless otherwise indicated.
   3. Form and support to prevent warping and sagging.

B. Steel:

   1. ASTM A36/A36M for carbon structural steel.
   2. ASTM A568/A568M for sheet steel.
   3. Epoxy-coated.

C. Stainless Steel:

   1. Manufacturer's standard grade.
   2. Manufacturer's standard type, ASTM A240/240M.

D. Galvanized Steel: ASTM A653/A653M.

E. Aluminum: ASTM B209. Corrosion-resistant.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit servicing without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during servicing and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

G. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation (UV-stabilized). Lens Thickness: At least 0.125 inch minimum, unless otherwise indicated.

H. Glass Lenses, Diffusers, or Globes: Annealed crystal glass, tempered Fresnel glass, unless otherwise indicated. Acrylic lenses

2.6 FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finishes and Color Selections: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping.

1. Finishes/colors to be selected by the Architect/Engineer from the manufacturer’s full range of standard finishes/colors during the review of action submittals, unless the color is specifically indicated on the Luminaire Schedule.
2. If noted on the Luminaire Schedule, provide custom color matching Architect’s color sample or RAL designation.

D. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

E. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

F. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Powder Coat: Comply with AAMA 2604. Electrostatic-applied powder coating; single application and cured to a minimum 2.5- to 3.5-mil dry film thickness. Coat interior and exterior of pole for equal corrosion protection

2.7 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12-gage.

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, roofs, canopy ceilings, and overhang ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

C. Coordinate layout and installation of luminaires with other construction. Do not modify layout or locations of luminaires without documented approval to do so, unless indicated otherwise on the Drawings.

D. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

E. Adjust luminaires that require field adjustment or aiming to provide optimum illumination. Coordinate and confirm final adjustments with Owner.

F. Fasten luminaire to structural support.

G. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and servicing.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

H. Flush-Mounted Luminaires:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

I. Wall-Mounted Luminaires:

1. Attached to structural members in walls or a minimum 20-gauge or 1/8-inch thick backing plate attached to wall structural members.
2. Attached using through bolts and backing plates on either side of wall as recommended by luminaire manufacturer.
3. Do not attach luminaires directly to gypsum board.

J. Suspended Luminaires:

1. Pendant mount, where indicated, minimum 5/32-inch-diameter aircraft cable supports, adjustable, and quantity of supports as indicated or as recommended by luminaire manufacturer, whichever is greater.
2. Hook mount, where applicable.
3. Rods: Where longer than 48 inches, brace to limit swinging.
4. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
5. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod or wire support as indicated for suspension for each unit length of luminaire chassis, including one at each end.
6. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

K. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify settings, programming, functions, and operation of components integral to the luminaire, whether dimming drivers, integral presence sensors, or photoelectric sensors—in addition to other control systems specified in Section 260923 “Lighting Control Systems and Devices.”
3. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
4. Inspect luminaires for nicks, mars, dents, scratches, and other damage.

C. Luminaire will be considered defective if it does not pass operation tests and inspections.

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 STARTUP AND SYSTEMS COMMISSIONING

A. Comply with requirements for startup and system commissioning specified in Section 260923 "Lighting Control Systems and Devices."

B. Emergency Power Units and Exit Signs: Charge batteries and depress switch to conduct short-duration test.

3.7 ADJUSTING

A. CLEANING

1. Thoroughly clean each installed luminaire within one month of substantial completion.

END OF SECTION 265100

SECTION 270005 – SPECIAL CONDITIONS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. The latest edition (revision) of the Fashion Institute of Technology Telecommunications Standard(s).

1.2 SUMMARY

A. Section Includes:

1. Communications equipment coordination and installation.
2. Common communications installation requirements.

1.3 ABBREVIATIONS AND DEFINITIONS

A. Coordinate abbreviations listed here with abbreviations indicated on drawings. Bring any possible discrepancies to the attention of the Architect/Engineer/Designer for determination of which applies to which condition(s)

B. AASHTO: American association of State Highway and Transportation Officials.

C. AHJ: the Authority Having Jurisdiction.

D. ASTM: ASTM International, formerly known as American Society for Testing and Materials.

E. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

F. BBC: Bonding Backbone Conductor, also commonly referred to as a BCT, Bonding Conductor for Telecommunications.

G. BICSI: Building Industry Consulting Service International.

H. Cable Runway: Also referred to as “Cable Ladder,” a relatively flat fabricated structure consisting of two longitudinal side rails (typically 1” to 1-1/2” high) connected by transverse members (typically 1” to 1-1/2” wide.)

I. Cable Tray: A “generic” term commonly referring to Basket Tray, Channel Cable Tray, Ladder Cable Tray, and/or Cable Runway.

J. Channel Cable Tray, also referred to as “Cable Channel”: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel.

K. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

L. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

M. EMI: Electromagnetic interference.

N. EPDM: Ethylene-propylene-diene terpolymer rubber.

O. Ground(ing): more appropriately “Bonding” (or earthing), connecting metallic items together to reduce voltage potential to reduce injury and/or damage.

P. IDC: Insulation displacement connector.

Q. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails (typically 3” to 6” high) connected by individual transverse members (“rungs” typically 1” to 1-3/4” in diameter).

R. LAN: Local area network.

S. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

T. NBR: Acrylonitrile-butadiene rubber.

U. NEMA: National Electrical Manufacturers Association.

V. NRTL: Nationally Recognized Testing Laboratory: A testing and labeling laboratory acceptable to the Authority Having Jurisdiction (examples include U.L and ETL)

W. OSP: Outside Plant

X. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

Y. PBB: Primary Bonding Busbar, also commonly referred to as the TMGB, Telecommunications Main Grounding Bar.

Z. RCDD: Registered Communications Distribution Designer.

AA. SBB: Secondary Bonding Bar, also commonly referred to as the TGB, Telecommunications Ground Bar.

BB. Solid-Bottom (Nonventilated) Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom without ventilation openings.

CC. Trough (Ventilated Cable Tray): A fabricated structure consisting of longitudinal side rails and a bottom having openings for the passage of air.

DD. U.L.: Underwriter's Laboratories, Inc.

EE. UTP: Unshielded twisted pair.

FF. WAN: Wide Area Network.

1.4 STANDARDS, Referenced in various Division 27 Documents:

A. Building Code and Edition noted in Codes Section of Documents

B. Electrical Code and Edition referenced in Codes Section of Documents.

C. ANSI/BICSI 001-2017, Information and Communication Technology Systems Design and Implementation Best Practices for Educational Institutions and Facilities

D. ANSI/BICSI 002-2019, Data Center Design and Implementation Best Practices

E. ANSI/BICSI 004-2018, Communication Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities

F. ANSI/BICSI 007-2017- Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises

G. ANSI/BICSI 008-2018 - Wireless Local Area Network (WLAN) Systems Design and Implementation Best Practices

H. ANSI/BICSI N1-2019: Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure

I. ANSI/BICSI N2-17: Installation of Telecommunications and ICT Cabling to Support Remote Power Applications

J. ANSI/BICSI N3-20: Planning and Installation Methods for the Bonding and Grounding of Telecommunications and ICT Systems and Infrastructure

K. ANSI/TIA-568.0-E Generic Telecommunications Cabling for Customer Premises

L. ANSI/TIA-568.1-E Commercial Building Telecommunications Cabling Standard

M. ANSI/TIA-568.2-D Balanced Twisted-Pair Telecommunications Cabling and Components Standards

N. ANSI/TIA-569-E, Telecommunications Pathways and Spaces.

O. ANSI/TIA-606-D, Administration Standard for Commercial Telecommunications Infrastructure.

P. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

Q. ANSI/TIA TSB-162-B Telecommunications Cabling Guidelines for Wireless Access Points

R. ANSI/TIA-862-B, Structured Cabling Infrastructure Standard For Intelligent Building Systems

S. ANSI/TIA-942-D, Data Center Cabling

T. ANSI/TIA-1005-A, Telecommunications Infrastructure Standard for Industrial Premises

U. ANSI/TIA-1152-A, Requirements for Field Test Instruments and Measurements for Balanced Twisted Pair Cabling

V. ANSI/TIA-1179-B, Healthcare Facility Telecommunications Infrastructure Standard

W. ANSI/TIA-5017, Telecommunications Physical Network Security

X. BICSI; Telecommunications Distribution Methods Manual (TDMM), 14th Edition

Y. BICSI; Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition

Z. NESC: National Electrical Safety Code.

AA. TIA TSB-184-A Power Delivery (4-pair)

1.5 SUBMITTALS

A. Current Certifications for:

1. Installation Supervisor.
2. Installer(s).
3. Testing Supervisor.
4. Installer(s) as a “Manufacturer’s Certified Contractor.”

B. Firm demonstration of a minimum of 5 years’ experience installing structured cabling of the same or similar type and occupancy.

C. Reference list of 5 previous successful projects of similar size and scope including:

1. Name of project
2. Location of Project.
3. Description of work.
4. Time of Completion.
5. Clint’s name (an individual) as reference.
6. Contact information of Refence.

1.6 COORDINATION

A. Coordinate arrangement, mounting, and support of communications equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 REFER TO OTHER DIVISION 27 SPECIFICATIONS FOR SPECIFIC PRODUCT REQUIREMENTS

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give way to piping systems installed at a required slope.

3.2 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 270005

SECTION 270526 – INTERIOR PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Metal wireways and auxiliary gutters.
3. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.
2. Section 270005 “Special Conditions for Communications Systems”

1.3 DEFINITIONS

A. Refer to Section 270005 “Special Conditions for Communications Systems” and drawings for definitions and abbreviations.

1.4 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. LEED Submittals:

1. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

D. Samples: For wireways, nonmetallic wireways and surface pathways and for each color and texture for final color/texture selection by Architect. Samples to be 12 inches (300 mm) long.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Provide products in compliance with Division 26 Specifications and this section.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a NRTL, and marked for intended location and application.
2. Comply with TIA-569.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 4X as described in Part 3 or as otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed Type 4X and labeled as defined in NFPA 70, by a NRTL, and marked for intended location and application.
2. Comply with TIA-569.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged, flanged-and-gasketed type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with Division 26 Specifications for electrical conditions for boxes, enclosures and cabinets.
2. Comply with TIA-569-B.
3. Boxes, enclosures and cabinets installed in wet locations shall be listed as NEMA 4X.

B. Device Box Dimensions: minimum size of 4-11/16 inches square by 2-1/2 inches deep (120 mm square by 65 mm deep).

C. Gangable boxes are prohibited.

D. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 or Type 4X as noted with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:

a. Material: Fiberglass.
b. Finished inside with radio-frequency-resistant paint.

E. Fire Rated poke-through(s): Complying with UL fire rating for drilled hole insertion flush in the floor.

1. Legrand Evolution Series: 8AT Series.
2. Round “flush” 9-1/4 inch diameter die-cast aluminum cover assembly with sliding cable doors, finish to be selected by the Architect.
3. Power receptacle insert: Provide one power insert per poke-through, Catalog No. 68REC, with two 20 amp, 125 volt power receptacles.
4. Data Jack mounting plate: Provide one data jack mounting plate per poke through, Catalog No. 682A, with two data jacks as described in the Cabling Section and drawings.
5. AV mounting plates: Provide three Decora Device mounting plates per poke-through, Catalog No. 8DEC. Provide blank covers for unused openings, quantity of 1 per poke-through.

F. Cabinets:

1. NEMA 250, Type 1 except as noted, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC or IMC. Pathway locations include the following:

   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
   d. Gymnasiums

4. Concealed in Ceilings and Interior Walls and Partitions: EMT, except as noted on drawings.
5. Damp or Wet Locations: GRC or IMC, except as noted on drawings.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway or EMT.
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway or EMT.
8. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

B. Minimum Pathway Size, unless noted otherwise: 1-1/4 inch (32-mm) trade size. Minimum size.

C. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

E. Install surface pathways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and below steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm) of enclosures to which attached.

I. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
3. Arrange pathways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from RNC to GRC or IMC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits of 2-inch (53-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg)tensile strength. Leave at least 12 inches (300 mm)of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

R. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. 1-Inch (25-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
2. 1 1/4-Inch (32-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway 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. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, 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 pathway sealing fittings according to NFPA 70.

U. Install devices to seal pathway 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 pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

W. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC[and EMT] conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
2. 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 (70 deg C) temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
   d. Attics: 135 deg F (75 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
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 time of installation. Install conduit supports to allow for expansion movement.

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 match Div 26 boxes, unless specifically noted otherwise.

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 surface 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. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves where cables penetrate interior walls and floor. Provide conduit support for all sleeves greater than (1) sleeve and all sleeves over 2 inch diameter.

B. Provide bushings on both ends of sleeves, prior to installation of cabling."

C. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Provide mechanical conduit seals to eliminate liquid entry.

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270526

SECTION 271510 - COMMUNICATIONS CABLING CAT6

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. UTP cable.
2. Cable connecting hardware, patch panels, and cross-connects.
3. Telecommunications outlet/connectors.

B. Related Sections:

1. Specification Section 270005 – Special Conditions for Division 27 for special conditions applicable to the furnishing and Installation of Division 27 systems.

1.3 DEFINITIONS

A. Refer to Specification Section 270005 and drawings for abbreviations and definitions.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Category cabling system shall comply with transmission standards in TIA/EIA-568, when tested according to test procedures of the standard.

B. All cabling, since it is connecting to the existing FIT infrastructure shall be provided in accordance with these specifications by Linear Tech. the Linear Tech contact is Edgar.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Example of labeling schedules.
2. Cabling administration drawings indicating proposed cable routings and termination locations.

3. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.

C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration complete in faceplates for color selection and review of technical features.

D. Sample of "Field quality-control reports."

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field-testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of a Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency and compliance to Electrical Code classification as plenum, riser or general use as appropriate and allowed for this project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive and store cables in accordance with manufacturer's requirements and recommendations.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels in accordance with manufacturer's requirements and recommendations.

1.9 COORDINATION

A. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Connecting Blocks: One of each type.
3. Device Plates: One of each type.
4. Multiuser Telecommunications Outlet Assemblies: One of each type.

PART 2 - PRODUCTS

2.1 UTP CABLE – INDOOR PLENUM

A. Suppliers: Subject to compliance with requirements, provide products by one of the following:

1. GM Data for Category Cable moves adds and changes.
2. Converge One for WAP moves adds and changes.

B. Description: 100-ohm, 8-conductor (formed into 4-pairs) UTP, Category 6 covered with an overall jacket.

1. Conductors to be 23 AWG solid copper.
2. Comply with ICEA S-90-661 for mechanical properties.
3. Comply with TIA/EIA-568 for Category 6 performance requirements.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, NFPA 70, and NFPA 262 as Plenum Rated: CMP.
5. Capable of PoE Types 1, 2, 3 and 4 (90 watt minimum).
6. Jacket color(s) as noted on the drawings.

2.2 UTP CABLE HARDWARE

A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of Category 6 or higher.

B. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors or modular punch with matching jack for permanent termination of installed cables.

1. Number of Jacks per Field: One for each UTP cable minimum.

C. Faceplate Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

1. Jack color(s) as noted on drawings.

D. Patch Cords: Factory-made, four-pair cables in 36-inch (900 mm), 48-inch (1200-mm), 72-inch (1800 mm) and 120-inch (3000 mm); 50% of horizontal cables installed of each length for a total to match the twice the number of installed horizontal cables; all terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall be color coded and have color-coded boots for circuit identification.

2.3 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: Category 6 (or higher) 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568.

B. Workstation Outlets: Number of ports as indicated on the drawings; connector assemblies mounted in furniture of faceplate(s) as indicated on the drawings.

1. Faceplates:
2. Stainless Steel (polished, brushed, or painted as noted),
3. Brass,
4. High-impact plastic, (to match the electrical devices in the same area).
5. Coordinate color with Architect and Division 26 Section "Wiring Devices."
6. For use with snap-in jacks accommodating any combination of UTP, optical fiber, Audio Video and coaxial connectors.
7. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.4 GROUNDING

A. Comply with ANSI-J-STD-607.

2.5 IDENTIFICATION PRODUCTS

A. Comply with requirements in Division 27 Section "Identification for Communications Systems."

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except as noted on the drawings. Conceal cables except in unfinished spaces and as specifically noted.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Division 27 Section "Pathways for Communications Systems."

B. Wiring Method:

1. Conceal conductors and cables in accessible ceilings, walls, and floors.
2. Where cables are exposed, including in cable tray, cables shall be enclosed in inner duct or shielded with solid bottom tray panels.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. MUTOA shall not be used as a cross-connect point.
4. Consolidation points may be used only as indicated on drawings:
5. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot- (3-m-) long service loop and at the “Workstation” end provide a 3-foot (1-m) service loop.
13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.

3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet (1800 mm) long not less than 12 inches (300 mm) in diameter below each feed point.

E. Installation of Cable Routed Outdoors and In/under Slab on Grade Floors:

1. Install Indoor/outdoor rated cable only.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569 for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.3 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA/EIA-569, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.4 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607.

3.5 IDENTIFICATION

A. Comply with requirements for identification specified in Division 27 Section "Identification for Communications Systems."

1. Administration Class: 4.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Using a digital method, develop Cabling Administration Drawings and Schedules for system identification, testing, and management. Use unique, alphanumeric designation in accordance with Client Requirements for each cable. Label all cable, jacks, connectors, and terminals to which a cable connects with same designation.

C. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

D. Paint and label colors for equipment identification shall comply with TIA/EIA-606 for Class 4 level of administration, including optional identification requirements of this standard.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606. Furnish electronic record of all drawings, in software and format selected by Owner.

F. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

   a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames.

4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606.

1. Use flexible vinyl or polyester on cables that flex as cables are bent.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568.
2. Visually confirm specified Category marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. UTP Performance Tests:

   a. Test for each outlet. Perform the following tests according to TIA/EIA-568:

      1) Wire map.
      2) Length (physical vs. electrical, and comparison to length requirements).
      3) Insertion loss.
      4) Near-end crosstalk (NEXT) loss.
      5) Power sum near-end crosstalk (PSNEXT) loss.
      6) Equal-level far-end crosstalk (ELFEXT).

7) Power sum equal-level far-end crosstalk (PSELFEXT).
8) Return loss.
9) Propagation delay.
10) Delay skew.

5. As ports are subjected to a “final performance verification tests after the complete communications cabling and workstation outlet/connectors are installed.

a. Voice Tests: These tests assume that dial tone service has been installed. And test connection to a network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, making and receiving a local, long distance, and digital subscription line telephone call. Repair or replace any cable that fails.
b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to test. Connecting to the network interface device at the demarcation point. Logging onto the network and ensuring proper connection to the network. Repair/replace all cables that fail final testing.

C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as a program native file, a text files, and printed and submitted in all three forms.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION 271510

SECTION 27 4116 - INTEGRATED AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL NOTES

A. Audiovisual System Designer herein shall be referred to as Architect.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the contract including instructions to Bidders, General and Supplementary Conditions and Division 1 Specifications Sections apply to the work of this Section.

B. ANSI-Infocomm standards (10:2013) Audiovisual Systems Performance Verification

C. AVIXA S601.01:201X Energy Management for Audiovisual Systems (revises ANSI/INFOCOMM 4:2012)

D. AVIXA F501.01:2015 (Formerly INFOCOMM F501.01:2015) Cable Labeling for Audiovisual Systems

E. AVIXA V20I.0I:20IX Projected Image System Contrast Ratio (replaces 3M: 2011)

F. AVIXA A102.01.2017 (Formerly A103.01:2017 Audio Coverage Uniformity in Listener Area

G. ANSI/AVIXA D401.01:20IX Standard Guide for Audiovisual Systems Design and Coordination Processes (replace 2M: 2010)

H. AVIXA F502.01:201X Rack Building for Audiovisual Systems

I. AES 67-2018

J. 2010 ADA Standards for Accessible Design

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Power, and all conduits for both power and low voltage, shall be furnished and installed by Electrical Contractor. All back boxes to be furnished and installed by Electrical Contractor as indicated in the Schedule of Responsibility on drawing TA0.01 unless otherwise noted (UON).

B. Coordination with the Electrical Contractor is required to assure correct audiovisual conduit routing, audiovisual back box locations, and technical power circuit locations as specified in Division 26 – Electrical.

C. Requirements and materials that apply to the work of others related to audiovisual systems are listed here to define and establish audiovisual system requirements. Coordinate the work of this section with the work of other sections as required in order to maintain satisfactory progress of the work of other sections. Refer to schedule of responsibility on TA0.01, UON.

1.4 WORK OF THIS SECTION

A. This section covers all audiovisual (AV) systems as described for Fashion Institute of Technology (FIT) Haft Auditorium. The objective is to provide professional systems, installed, acceptance tested, and ready to use.

B. This written specification and the large format TA series drawings shall be collectively referred to herein as the Contract Documents. System features that show up in one part may not be shown in others. In the case of conflict between written specifications and drawings, Contractor must seek written clarification from the Architect. In the event the Contractor fails to obtain such written clarification, the interpretation of the Architect will prevail. Where conflict exists with other specifications concerning such work or materials, this specification takes precedence unless otherwise approved in writing by the owner.

C. This section includes all labor, materials, equipment, and services necessary to furnish and install the Audiovisual System in FIT Haft Auditorium, New York, NY as shown on the drawings.

1.5 PROJECT CONDITIONS

A. All dimensions and equipment locations shall be verified in the field prior to fabrication by the Audiovisual Contractor, who shall make at least one (1) visit to the job site prior to preparation of shop drawings.

B. Coordinate conduit placement, routing, and separation with the Electrical Contractor to ensure proper installation.

C. No claims for additional compensation shall be allowed due to the Audiovisual Contractor’s misunderstanding of the work involved or lack of a thorough investigation of the job site.

1.6 CONTRACTOR RESPONSIBILITY

A. It shall be the responsibility of the Audiovisual Contractor to furnish and install equipment complete in all respects and to furnish and install any additional equipment required to fulfill the intent of the Contract Documents regardless of whether or not such items are herein specified or indicated without claim for additional payment or costs.

B. The work specified herein shall be accomplished by a single Audiovisual Contractor who has complete responsibility for the systems described. The Audiovisual Contractor is required to have five (5) years’ experience with systems of similar size and scope in professional performing arts centers.

C. The Audiovisual Contractor shall be responsible for coordinating with other trades a complete and suitable installation of electrical isolation equipment to meet the intent of this specification.

D. No electrical equipment (except approved equipment) shall be located within the Acoustically Sensitive Spaces or installed on walls common to Acoustically Sensitive Spaces (Refer to Part 1 Paragraph 10). The Audiovisual Contractor shall report all discrepancies between this requirement and the Contract Documents to the Architect and Electrical Engineer prior to installation of such equipment.

1.7 DESIGN INTENT

A. The Audiovisual Contractor shall furnish and install Infrastructure and Major Equipment for system including but not limited to wire, cable, equipment racks, wiring devices, and listed Major Equipment. Infrastructure, Major Equipment, and installation of Infrastructure and Major Equipment shall be bid as one portion of the project.

B. The Audiovisual Contractor shall furnish line item pricing for Infrastructure and Major Equipment List written in this specification.

1.8 FUNCTIONAL REQUIREMENTS

This report provides a narrative description of the basis of design for the audiovisual systems in the Morris W and Fannie B. Haft Theater, at the Fashion Institute of Technology (FIT) in New York, NY. The descriptions included are based on our understanding of the program as relayed to us during workshop and phone conversations with the FIT production staff, administrative team, faculty, and design teams.

CODE REQUIREMENTS

This document provides for preliminary design intent for all audiovisual systems within the facility. As the project continues through the design and construction process, this project will be governed by applicable local, national, and international building codes, State of New York and NYC Construction Codes, ANSI Standard, ADA Standards for Accessible Design (2010), as well as AVIXA/INFOCOMM, and AES standards for audiovisual system design & installation, including but not limited to the following:

- ANSI-INFOCOMM standards (10:2013) Audiovisual Systems Performance Verification
- AVIXA S601.01:201X Energy Management for Audiovisual Systems (revises ANSI/INFOCOMM 4:2012)
- AVIXA F501.01:2015 (Formerly INFOCOMM F501.01:2015) Cable Labeling for Audiovisual Systems
- AVIXA V20I.0I:20IX Projected Image System Contrast Ratio (replaces 3M:2011)
- AVIXA A102.01.2017 (Formerly A103.01:2017 Audio Coverage Uniformity in Listener Area
- ANSI/AVIXA D401.01:20IX Standard Guide for Audiovisual Systems Design and Coordination Processes (replace 2M: 2010)
- AVIXA F502.01:201X Rack Building for Audiovisual Systems
- AES 67-2018
- Americans with Disabilities Act (ADA), 2010

PART A - DESIGN NARRATIVE

1 - FACILITY WIDE SYSTEMS

Performance Audio/Video Network

The Haft Theater shall feature an IP based audio & video transport system, allowing staff & users a flexible and efficient approach to routing media feeds, for both production and back-of-house use. The system is designed to minimize the number of physical patches necessary for efficient operation, allowing more ease of use and higher operational efficiency by the users. The system uses a series of video input and output devices that connect to dedicated AV network switches. Interconnections are made through control software, digitally connecting or disconnecting feeds from and to any performance space within the center. The AV Networks can be selectively connected to FIT Enterprise Networks, for specific streaming need, or for periodic, scheduled firmware updates to equipment.

The AV network systems consists of three (3) independent groupings of infrastructure and equipment: audio over IP primary and secondary (Dante), and control/intercom/AVoverIP. During general, day-to-day operation, all network infrastructure for audiovisual systems is isolated from other networks (enterprise, lighting, building systems, etc), however select connection to the outside world, or allowing internet access to the network can be coordinated with the enterprise networks.

- Basis of design manufacturers for sitewide equipment and digital signal processing can include:
    - DSP – QSYS
    - Networking – Netgear AV
    - Control Systems - Crestron

Rack Room
Existing AV equipment is distributed in inefficient locations in support areas around the performance hall. As part of the renovation, AV head end racks will be potentially relocated. This rack room, conditioned by supplemental mechanical systems, will also serve control racks for production lighting systems, and enterprise IT equipment. Pathways to route existing wiring device locations as well as new wiring infrastructure will need to be carefully reviewed to route around the existing concrete structure as many walls will not permit penetrations for pathways. Any rework of existing architecture will be reviewed as opportunities to provide chases/pathways for current and future opportunities to route infrastructure cabling.

2 – PERFORMANCE SPACE

Haft Theater
The Haft Theater is a 700 seat proscenium/end-stage performance space with stage house, serving primarily theatre/spoken word performance and presentation style events. The hall accommodates unamplified and amplified music, as well as theatre reinforcement (for musical theater) and sound effects. Equipment and functionality included:

- Performance Audio system, providing support for audio reinforcement of music performance, and reinforcement of theatre productions and conceptual sound effects. The system consists of

primary loudspeakers deployed in an "Left/Center/Right" arrangement, hanging from the proscenium reflector. Supplemental loudspeakers are provided to extend the frequency response of the primary speakers, or as fill loudspeakers for imaging purposes. Surround loudspeakers within the hall are to be replaced, and assigned for patching purposes. Facilities production panels are located throughout the stage allowing connection of equipment to the system, including microphones and other input devices, stage monitors, and specialty network devices. Facilities production panels are also added to locations currently without connectivity. Control is achieved from a digital mixing console (with Dante backbone) located at the existing mix position at the rear of the audience chamber. Basis of design manufacturers can include:

- Loudspeakers – L-Acoustics A-Series constant-curve line-source array
- Amplifiers – L-Acoustics Controller Amplifiers
- Digital Mixing System – Allen & Heath Avantis series (Live); SQ series (Video)

- Performance Video Projection System – A fixed-frame batten-mounted projection screen and video projector shall be provided for presentation use. To accommodate the flexible video deployment as required per production or event, connection points for coaxial and category cable (AVoverIP) video are provided throughout the space, with specific connectivity for presentation positions from the stage. Basis of design manufacturers can include:

  - Projector – Christie 4k, 20,000 lumens
  - Screen – Draper StageScreen

- Support Systems

  - Assistive listening systems, which transmits the acoustic stage (via room microphone) or console feed sound over a radio frequency to receivers used by the hearing impaired, is included. Alternative use of the system is to broadcast additional languages, or provide audio description for the sight impaired and shall include a two-channel system for this reason. Basis of design – Listen Technologies or Williams Sound – Have Listen Tech in other venues.
  - Production Intercom - 2-channels of analog, party-line style intercom are provided for this room (Clear-Com). The intent is for 1-channel to be for primary theater operations, and 1-channel for use with the production video team.
  - Video/Audio Show Relay – a fixed PTZ camera and room microphone are installed to provide show relay to front-of-house and back-of-house support spaces. A black and white camera is also provided, with infrared illuminator, allowing for low-light viewing of the stage to select video displays.
  - Stage Management Systems – a portable stage manager station consisting of two portable rack cases is included, for flexible, ADA compliant deployment to designated areas backstage, in control rooms, or within the house for tech rehearsal purposes. The stage manager station includes an intercom remote station and microphone for back-of-house paging. Additionally, a touchpanel in the station allows control over camera feeds and chimes, and show-relay mutes. The second rack case includes dual displays, allowing the stage manager to view the color PTZ camera view and an additional source, such as the low-light camera or broadcast program feed.

- Loose Equipment – Wired microphones, DI boxes, cables, stands, portable loudspeakers and monitor wedges appropriate to the program are provided.

Video Production System

The Haft Theater video production system is intended to provide single-operator control of multiple (OPC based on three) PTZ cameras that are permanently installed within the Theater. In addition, select locations in the house have additional infrastructure (12G-SDI and CAT 6A) for deployment of operator-cams on tripods. Audio is received via direct outs from the primary live mixing console, or individual channels can be mixed for broadcast via dante channels routed into the video production audio console.

- Basis of Design can include the following (To be discussed with FIT):
- PTZ Cameras – Panasonic
- Switcher – Black Magic Design
- Audio – Allen & Heath SQ with Dante Card
- Streaming Appliance/Application – TBD

Dressing Rooms

The Dressing/Changing rooms and production support spaces are intended as support spaces for the main theater. These rooms shall contain loudspeakers and displays for audio & video show relay of the performance space. Local volume controls are included, with a priority-page override system, allowing the stage manager announcement to be heard, regardless of the volume control position.

- Basis of Design – Displays – Samsung
- Basis of Design – Show Relay Loudspeakers - ElectroVoice

1.9 SCOPE OF WORK

A. Furnish shop drawings and receive approval, prior to fabrication and installation.

B. Furnish all materials and labor and any engineering services to supply a complete and professionally installed system in working order as described herein. Labor furnished shall be specialized and experienced in audiovisual system installation.

C. Furnish and install all wire and cable called out in the Contract Documents.

D. Coordinate all back box locations with the Electrical Contractor and appropriate general trades.

E. Furnish any additional items, not specifically mentioned herein, to meet system requirements as specified, without claim for additional payment. Such items may include but are not limited to hardware, transformers, line/distribution amplifiers and other devices for proper installation, interface, isolation, or gain structure.

F. Perform initial adjustments and verification tests. Submit verification test report to the Architect five days prior to commissioning.

G. Participate in acceptance testing and perform final adjustments utilizing Audiovisual contractor furnished test equipment and project engineers.

H. Furnish and participate in user training.

I. Furnish system documentation including copies of all relevant drawings and equipment manuals in compliance with the Contract Documents.

J. Furnish maintenance services for the specified period from the date of acceptance.

K. Guarantee all new equipment, software, hardware, components, and workmanship for the specified period from the date of acceptance.

L. Refer to drawing TA0.01 Audiovisual General Notes for the Schedule of Responsibility.

1.10 SUBMITTALS

A. Pre-bid Submittals:

1. Contractors must pre-qualify in order to bid on this project. Contractors must provide proof of the following qualifications and certifications and evidence of experience in similar audio and/or video installations. Submit listed qualifications to Architect for review ten (10) days prior to submission of a bid. Late submittal will result in exclusion from bid.

   a. Credential for project manager, project engineer, and lead installer which must include NICET, EST, and/or CTS-I certifications.
   b. Proof of the AV Contractor's membership in NSCA or AVIXA (Audiovisual and Integrated Experience Association). Indicate current AVSP level.
   c. Proof that the AV Contractor has been continuously engaged in the installation and service of AV equipment for at least five (5) years in systems of similar size, scope, and project type.
   d. Proof that the AV Contractor holds current certifications necessary to perform Graphic User Interface Programming and Configuration.

2. The following AV Contractor shave been pre-qualified to bid on this project:

   a. Adwar Video
      125 Gazza Blvd.
      Farmingdale, NY 11735
      (631) 777-7070 x132
      Contact: Mandy Dowgiallo
      mandy@adwarvideo.com

   b. Masque Sound
      21 East Union Avenue
      East Rutherford, NJ 07073
      (201) 939-8666
      Contact: Jeanne Wu
      jeannewu@masquesound.com

   c. Professional Audio Designs
      11629 W Dearbourn Avenue
      Wauwatosa, WI 53226
      (414) 476-1011

Contact: Kim Leonard
kim@proaudiodesigns.com

d. Solotech
1717 Diplomacy Row
Orlando, FL 32809
(702) 614-8882
Contact: Aaron Beck
Aaron.beck@solotech.com

e. Sound Associates
979 Saw Mill River Road
Yonkers, NY 10710
(914) 963-3452
Contact: Phillip Peglow
ppeglow@soundassociates.com

f. Clair Global Integration
3327 Ambrose Avenue
Nashville, TN 37207
(717) 626-4000
Contact: Joe Bunting / Phillip DiPaula
jbunting@clairglobal.com
pdipaula@clairglobal.com

B. Bid Submittals:

1. Contractors shall examine all drawings and read all divisions of this specification in order to avoid omissions and duplications and to ensure a complete job. No allowances shall be made for failure to read and understand the Contract Documents. Discrepancies between drawings and the specifications or obvious omissions shall be referred to the Architect prior to the bid date. Where discrepancies occur and pre-bid instructions have not been obtained, the Contractor agrees to abide by the Architect's decisions.
2. Bid proposals shall include all work and all equipment as specified, as well as any additional equipment and materials not listed here, to be used in assembling the system to fulfill the design intent.
3. The bid submittal shall include the following:

a. Infrastructure and Major Equipment List and installation bid.
b. Major Equipment List line item pricing.

1) Installation costs for General Equipment including hardware and labor shall be furnished.
2) Pricing shall include in-bound freight, shipping, and all delivery charges.

C. Shop Drawings Submittals:

1. Within thirty (30) days of contract award, submit four (4) copies of detailed shop drawings to the Architect for approval. All shop drawings shall be marked with the related drawing number when submitted.
2. System installation and fabrication shall not begin without written approval from the Architect.
3. Review of shop drawings shall not constitute final approval of system function. Said review does not in any way relieve the Contractor from the responsibility of furnishing material or performing work as required by the Contract Documents.
4. Failure of the Contractor to submit shop drawings in ample time for the evaluation shall not entitle the contractor to an extension of contract time, and no claim for extension by reason of such default will be allowed.
5. At a minimum, shop drawings shall include:

    a. Table of Contents
    b. Itemized list of all equipment and materials to be used in assembling the system.
    c. Catalog cut sheet or data sheet for each listed item.
    d. One-line Signal Flow diagrams for all sound reinforcement systems, visual systems, and auxiliary systems showing point to point wiring interconnections of all equipment with wire run numbers and patch bay designations. Show all transformers, switches, relays, control circuits, and modifications to equipment. Show all equipment items which are required for realization of the functions described herein.
    e. Complete lists of all wire run numbers along with the termination location of each end of each wire run.
    f. Schematic diagrams for any custom circuitry and all typical connections between audio lines, patch bays, visual system lines and rack mounted equipment.
    g. Drawings of all items which are to be custom fabricated or modified. Drawing shall be in scale suitable for fabrication. They shall show materials, finishes, hardware, back boxes, connectors, and panel/control markings. Submit samples of lettering/label size and typeface to be employed on custom plates, panels, and other equipment.
    h. Submit samples of custom work, finishes, or other materials as required by the Architect to verify appearance and quality. All costs for shipping samples shall be the responsibility of the Contractor.
    i. Full size drawings illustrating the physical layout and labeling of patch bays.
    j. Mechanical drawings of all assemblies, major and sub-assemblies, racks, cabinets, and enclosures, indicating provisions for proper cable management, power management, and thermal management.
    k. Mechanical drawings showing all proposed mounting details of all major equipment (e.g. loudspeakers, cameras, projectors, video displays, projection screens), and associated rigging and interface with adjacent architecture.
    l. Vibration and noise control information shall be included and coordinated with the Electrical Contractor.
    m. Conduit Routing Plan, to be coordinated with electrical contractor prior to cable pull.
    n. Cabling schedule providing information as detailed in AVIXA (formerly known as Infocomm) Standard F501.01:2015 to be coordinated with the Architect and Owner prior to cable pull and termination.

6. The above listed drawings shall be produced on AutoCAD 2004 min. or similar computer drafting program. Scans or photocopies of the Contract Documents are not acceptable.

7. The use of electronic files from other sources (e.g. Architect's backgrounds, Architect's drawings, vendor-supplied panel drawings) shall not absolve the Contractor of the responsibility for ensuring that the Shop Drawings represent a completely engineered coordinated system. The Contractor has final responsibility for providing systems that conform to all requirements in the Contract Documents.
8. The Contractor shall review Electrical Contractor shop drawings for all vibration and noise control equipment and systems information.
9. Proposed Touch Panel Graphical User Interface (GUI) layouts shall be submitted for approval prior to the commencement of control system programming.

D. Substitutions:

1. Substitutions shall be submitted as per the General Conditions of the Contract Documents.
2. The proposed substitutes must be equivalent or superior to the specified products in quality, performance, construction, function, conformance to system objectives and not affect system functionality, signal type, distribution, and features.
3. All substitutions must receive the express written consent of the Architect and Owner.
4. The Architect reserves the right to substitute new products which become available subsequent to the issuance of the Contract Documents, provided that:

   a. The contractor has not yet purchased the originally specified equipment.
   b. The substitute equipment shall not materially increase the Contractor's cost.

1.11 JOB CONDITIONS

A. Keep the job adequately staffed at all times. Unless illness, loss of personnel, or other circumstances beyond the control of the Contractor intervene, keep the same individual charge throughout.

B. Cooperate with all appropriate parties in order to achieve well-coordinated progress with overall construction completion schedule and satisfactory results.

C. Watch for conflicts with work of other contractors on the job and execute, without fair claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or to preserve acoustic or visual performance, symmetry, and pleasing appearance.

D. Immediately report to the Architect any design or installation irregularities, particularly architectural elements that interfere with the intended coverage angles of loudspeakers, camera, or projection equipment, so that appropriate action may be taken.

E. Perform any and all cutting, patching, and painting for proper and finished installation of the system and repair any damage done as a result of such installation.

F. Audiovisual System work areas are to be maintained in a clean and orderly condition. Clean up and dispose of trash from all audiovisual system work areas.

1.12 ACOUSTICALLY SENSITIVE SPACES

A. The following areas have been designated as “Acoustically Sensitive Spaces:

1. Control Rooms
2. Amplifier Rack Rooms
3. Electrical Equipment Spaces
4. Mechanical Equipment Spaces

B. An acoustically sensitive space is defined as a room or space, which requires special construction consideration to meet room acoustic, acoustic isolation, and noise control or vibration control requirements.

C. All conduit runs penetrating acoustically sensitive spaces shall have both ends sealed by means of removable closed cell neoprene foam after all cables have been run to prevent sound transmission from adjacent spaces.

D. All audiovisual wiring devices in acoustically sensitive spaces shall have a gasket sealing the faceplate to the back box to prevent sound transmission from adjacent spaces.

1.13 DELIVERY AND HANDLING

A. The Audiovisual Contractor shall coordinate delivery and installation of all equipment with the Construction Manager and/or Electrical Contractor.

B. If required by the Construction Manager or Electrical Contractor, audiovisual equipment shall be delivered in a minimum of three (3) separate shipments that shall include:

1. Shipment #1: All items in which conduit is terminated which includes back boxes, wiring device faceplates with receptacles, projection screen cases, etc.
2. Shipment #2: All items which require structural backing such as rigging components, monitor and projector mounts, etc.
3. Shipment #3: All items that are not required until the building/area of work is secure and ready for electronic equipment. This shall include equipment racks, wiring device face plates, portable equipment, etc.

C. Audiovisual Contractor shall deliver all material to the job site suitably crated, packed, and protected and bearing the label and the nomenclature of the product(s) found in each carton or crate.

1.14 QUALITY ASSURANCE

A. Parts listed shall be complete and equipment furnished shall conform to manufacturer’s specifications.

B. All materials shall be new and shall conform to the applicable provisions of Underwriter’s Laboratories (ULEQ) and American Standards Association (ASA).

C. Procure and pay for all permits, licenses, and inspections, and observe any requirements stipulated therein. Conform in all trades with all local regulations and codes.

D. Comply with federal, state, and local labor regulations and applicable union regulations.

E. Installation shall conform to the latest federal, state, and local electrical safety codes of authorities having jurisdiction. Where conflict exists, the most stringent code or regulation shall apply.

1.15 GUARANTEE AND SERVICE

A. The Audiovisual system shall conform to all applicable code requirements and shall be in conformance with industry standards of operation and practice.

B. All new systems and components shall be guaranteed free of defects in materials and workmanship for a period of one (1) year from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.

C. Installation of relocated existing equipment shall be guaranteed free of defects in materials and workmanship for a period of one (1) year from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.

D. All audiovisual system software updates shall be automatically issued to the Owner free of charge during the warranty period.

E. The Contractor shall be available on call and on eight (8) hour notice during the first month following acceptance of the system, to assist the Owner’s representatives in any problems which may arise during the initial period of operation.

F. The Contractor shall provide same day response to service requests, via 24/7 phone support.

G. If during guarantee period any component is out of service for more than seven (7) consecutive days due to unavailability of parts or service, the contractor shall furnish and install identical new component. If an identical component is not available, the contractor will substitute equivalent equipment with written approval of the owner.

H. During the course of the guarantee period, the Contractor shall provide a minimum of three (3) service visits to the site for inspection and adjustment of equipment and programming. Contractor shall submit proposed schedule for these visits and shall notify Owner and Architect in writing at least one (1) month in advance of each visit.

1.16 INSURANCE

A. All equipment and materials shall be fully insured against loss or damage up until acceptance of the system by the Owner or until the Owner relieves the Contractor in writing of this responsibility, whichever is earlier.

PART 2 - EQUIPMENT

2.1 GENERAL

A. Whenever any equipment is specified by manufacturer and model number, it is for the purposes of establishing a standard of quality, performance, construction, and function.

B. All materials and equipment shall be new and of the latest design or model offered for sale by the manufacturer.

C. Equipment models furnished shall operate at the required AC line voltage (i.e. 120 Volts) and frequency (i.e. 60 Hz)

D. Contractor shall furnish at minimum, quantities as indicated in the Contract Documents as required for complete installation.

E. Audiovisual Wire and Cable:

1. Approved manufacturers:

a. Belden
b. Berk-Tek
c. Liberty
d. Crestron
e. Extron
f. West-Penn

2. All wire numbers listed in the Contract Documents are Belden unless otherwise noted.
3. Where required, install plenum rated cable listed and labeled for plenum installation.

F. Electrical Wire and Cable (including ground conductors)

1. Where conflict exists with any codes or ordinances, such codes and ordinances shall take precedence.
2. Where conflict exists with Electrical Specifications, the higher standard or more stringent requirement shall apply.

G. Wiring Devices:

1. Specifications – Duplex Receptacles

a. Grade: Specification, Hubbel IG5362 or equal
b. Type: NEMA 5-20R
c. Color: Orange

2. Specifications – Plug Mold

a. Grade: Wiremold V/G 2000 Series or equal
b. Size: As specified or required.

3. Specifications – Outlet Strips

   a. Grade: UL Listed, Wiremold or equal.
   b. Size: As specified or required.

4. Approved Manufacturers:

   a. Waber
   b. Wiremold
   c. Hubbell
   d. Bryant
   e. GE
   f. Leviton

H. Electrical Plates and Panels:

1. Specifications – Rack mount panels

   a. Material: 11-gauge steel or 1/8” aluminum, minimum thickness.
   b. Finish: Black or to match adjacent equipment.
   c. Size: 19” wide, standard EIA mounting hole spacing, height as specified or required.

2. Specifications – Back Box Enclosures

   a. Material: Code grade steel.
   b. Finish: Black or Galvanized.
   c. Size: As specified or required.

3. Specifications – Plug Box and Termination Panels

   a. Material: 11-gauge steel or 1/8” aluminum, minimum thickness.
   b. Finish: Black (unless otherwise noted by the Architect).

4. Any and all recessed face plates shall have a minimum ¾” reveal beyond the back box to hide the intersection between the wall material and the back box excluding standard decora-style plates.
5. Approved Manufacturers:

   a. Hoffman
   b. Whirlwind
   c. Pro-Co
   d. Wireworks.

I. Any equipment to be located outdoors or in damp locations must carry a NEMA 3R rating and be labeled accordingly.

J. Audio Transformers:

1. All transformers shall be selected for proper installation and load of the circuits as required by as-built conditions and per manufacturer’s recommendations.

K. Control System Programming:

1. All control system programming, installation, testing, and debugging to be performed by a manufacturer certified programmer, supplied either directly by the AV Contractor staff or via a manufacturer authorized and certified independent programmer.
2. AV Contractor shall furnish complete control system programming, including all source code and on-site coordination, testing, and debugging.
3. AV Contractor shall furnish all programming of control system equipment including:

    a. Nightly system shut down.
    b. Janitorial/Off-hour maintenance control.
    c. Emergency Life/Safety override.
    d. TBD

4. In rooms where a volume control system and digital signal processor (DSP) exist, the control system shall be programmed such that:

    a. The appropriate preset on the DSP system and display system shall be selected based on that activity taking place.

5. Provisions for control from a computer via web interface (e.g. XPanel) shall be included.
6. Control system programming shall accommodate future addition of touch panels and mobile applications (e.g. Crestron Mobile Pro) for Apple iPhone/iPad and Android devices.
7. AV Contractor to schedule meeting with owner and Architect to review control system functionality and operational requirements prior to the commencement of work.

L. Intelligent Building Technology (IBT) Integration:

1. Coordinate with the Building Automation System (BAS) programmer to gather the appropriate protocols, addressing, and systems.
2. Coordinate with the manufacturer of the IBT system to obtain proper configuration of IBT equipment and components.
3. Create a dashboard for display of building energy management information.

M. Audio DSP System:

1. Audio Inputs

    a. All system audio inputs shall be programmed with limiters.
    b. It shall be possible to matrix any input to any output within the system.

2. Audio Outputs:

    a. All audio outputs shall be programmed with high pass filters, parametric equalization, delay, and limiters.
    b. It shall be possible to matrix any input to any output within the system.

3. Assistive Listening or Hearing Assistance System (HA):

    a. HA shall receive the same signal as being heard via the loudspeakers.

b. HA shall be set up in accordance with ADA requirements.

4. The DSP software shall be installed on the digital audio work station (DAW) specified in the Major Equipment List.

N. Equipment furnished shall be that specified herein.

O. Detailed performance specifications shall be those published by the manufacture effective on the date of this document for all equipment specified herein.

P. The AV Contractor shall verify all projection screen dimensions, surface type, and frame style with the Contract Documents and submit the information with the required shop drawings for approval by the architect prior to ordering any material. Failure to coordinate screen information shall not result in additional costs to the Owner.

Q. The AV Contractor shall verify all projector lenses for appropriate focal length and intended image size with the Contract Documents, based on field measurements of actual throw distance. Failure to coordinate lens information shall not result in additional costs to the Owner.

R. All miscellaneous materials including brackets, pole extensions, mounting hardware, electrical connectors, and other items to properly install the equipment specified shall be included as part of this project whether it is listed or not.

S. Existing structural mounting to be reused as conditions permit.

T. If required, Cost Reduction and/or Value Engineering shall be conducted by the Architect and Owner based on final bid amounts.

2.2 MAJOR EQUIPMENT

A. Vendor Quotes:

1. Contractor shall be responsible to coordinate with owner to verify manufacturer financial program is appropriate in regards to equipment for this project, as well as the associated soft costs and miscellaneous hardware and cabling costs.

B. Major Equipment List:

1. The major equipment list itemizes system components and their quantities to provide the systems as shown in the contract documents. It is the responsibility of the contractor to provide any additional accessories, patch cabling, interfaces, and other miscellaneous equipment not described herein to provide a working system as called out in the functional requirements section of this specification (1.7), unless otherwise noted as owner furnished or future equipment. For items not given specific quantities in these documents, it is the responsibility of the contractor to verify those quantities with the owner and architect prior to system installation.

2. Refer to Attachment 27 41 16 Schedule A for the Major Equipment List

PART 3 - EXECUTION

3.1 INSTALLATION OF SYSTEMS

A. Locate all apparatus requiring adjustments, cleaning, or similar attention so that it will be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.

B. Furnish and install brackets, braces, and supports. Minimum fastening or support safety factor shall be at least five (5). Design shall be approved by the Architect.

C. All supporting structures supplied by the Contractor not having standard factory paint finish shall be painted. Paint specifications shall be supplied by the architect or indicated herein.

D. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors or finishes may be specified herein.

E. Finish of blank panels and custom assembly panels shall match adjacent equipment panels.

F. Switches, connectors, jacks, receptacles, outlets, cables, and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched, or screened. Markings for these items are detailed in the contract documents to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Architect prior to marking.

G. The equipment specified herein is designed to operate in environments of normal humidity, dust, and temperature. Protect equipment and related wiring where extreme environmental conditions can occur.

H. Coordinate with millwork fabricator for installation of audiovisual equipment into credenzas, lecterns, etcetera.

I. Review and coordinate Graphic User Interface Control System appearance and functionality:

1. Crestron DigitalMedia© System: The DigitalMedia© systems shall be installed, configured, and tested by a DMC-E certified technician and/or engineer, in accordance with the guidelines set forth in the Crestron HD-DTDS Specification.

2. AMX AV Control System: AV Control system shall be installed, configured, and tested by an ACE-P certified technician and/or engineer, in accordance with the guidelines set forth in the AMX Solutions Master program. The Resource Management Suite shall be installed, configured and tested by a ACE-RMS certified technician and/or engineer, in accordance with the guidelines set forth in the AMX Solutions Master program.

3. Extron Certified Associate professional license for basic Extron Systems. An Extron Control Professional Certification shall be required for Graphic User Interface (GUI) requiring customized GUI Design.

3.2 CONDUIT

A. Review and coordinate audio installation with the Electrical Contractor to ensure proper operation of the audio system.

B. All wiring shall be in conduit unless authorized by the Architect, approved by the Architect in writing, and permitted by code. Exceptions are short runs at equipment terminations where there is no means of connecting conduit to the equipment.

C. Where installed exposed, conduits shall be parallel with or at right angles to walls or ceiling and /or follow surface contours and shall be supported from walls or ceilings by means of approved clamps or hangers. Conduit connections to equipment racks shall be insulated.

D. Minimum size conduit shall be trade size ¾". All conduits shall be sized for maximum 40% fill or less if required by code.

E. Conduits carrying high voltage or high amperage wiring serving equipment subject to abrupt start-up and possible slapping of wiring within conduit shall not pass through Acoustically Sensitive Spaces.

F. Conduits connected to dimmer racks or to transformers shall not pass directly into Acoustically Sensitive Spaces. Conduits connected to dimmer racks or transformers shall not penetrate walls, floors, or slabs of Acoustically Sensitive Spaces within thirty (30) feet of those equipment room walls or slabs. All penetrations in the path of conduits within thirty (30) feet of electrical rooms containing dimmer racks or transformers shall be resilient penetrations.

G. Large numbers of conduits penetrating walls of Acoustically Sensitive Spaces shall be individually sleeved and shall pass through walls, floors, slabs, and ceilings perpendicularly.

H. Conduits shall not be installed to connect or contact rigidly other non-electrical equipment or building systems which are vibration isolated.

I. Coordinate all conduit sizes, locations, and quantities with the Electrical Contractor to provide proper routing, signal separation, and wire group type. Failure to do so shall not allow for additional compensation. Provide a conduit routing plan for approval by the Architect prior to installation. Routing plan shall include intended sizes, separation, and cable fill chart.

J. Existing conduit and cabling infrastructure to be reused is to be done so to the maximum extent possible without compromising audiovisual system performance.

3.3 RESILIENT PENETRATIONS OF WALLS AND SLABS

A. All conduit and cable penetrations shall be sleeved, packed, and caulked airtight to form a resilient penetration at the following locations:

1. Mechanical Equipment Rooms
2. Electrical and Dimmer Equipment Rooms
3. Acoustically Sensitive Spaces
4. Rooms with Acoustically Isolated Construction.

B. Openings shall be oversized and sleeved to provide an inner diameter of one (1) to two (2) inches greater than the outside diameter of the duct or pipe. The conduit shall be centered in the opening and shall not rigidly contact the wall, floor, or ceiling. The resulting gap shall be packed with glass fiber packing material and foam rod. The gap shall be caulked to an airtight seal using permanently flexile acoustical sealant.

C. Acoustical sleeves may be used in lieu of resilient penetrations described above. Multiple conduit penetrations may be constructed following the detail for multiple penetrations identified in the Contract Documents.

3.4 ELECTRICAL POWER

A. Review and coordinate electrical power system installation including grounding with the Electrical Contractor to ensure proper operation of the audiovisual system.

B. Verify that All AC power circuits designated for audio equipment are wired with the correct polarity and ground. Report in writing any discrepancies found to the Architect for corrective action.

1. Provide distribution of electrical power within the equipment racks with a minimum of one space AC receptacle for each four (4) in use per branch circuit.
2. The Electrical Contractor shall ensure that all audio grounding does not intersect with any building ground except at earth.

3.5 STEEL SUPPORTS

A. Fabricate and install any supports so that the installation does not weaken or overload the building structure. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joists, or structural steel, nor welding to structural steel, shall be permitted except as authorized in writing by the Architect.

3.6 SEISMIC RESTRAINTS

A. All hanging or free-standing equipment and cabinets furnished, including but not limited to racks, loudspeakers, projection screens, and mounts shall be secured to substantial building structures. The equipment described herein shall resist seismic acceleration in any direction up to a limit of the greater of 1.0G or the limit prescribed by the local governing codes.

B. Loudspeaker hanging details, rack bracing, and other seismic restraints may not be shown on the Contract Documents. The Contractor is responsible for development of these drawings to be submitted and approved by the Structural Engineer.

3.7 BOXES

A. With the exception of portable equipment, all boxes, conduits, cabinets, equipment, and wiring shall be held in place and the mounting shall be plumb and square.

B. All boxes shall be securely mounted to building structure. All boxes shall be installed so that wiring contained in them is accessible. Install blanking devices or threaded plugs in all unused holes.

C. Wiring groups and circuits shall be isolated as indicated herein. Common pull or junction boxes are not permitted except as authorized in writing by the Architect.

D. Clean all box interiors prior to installing plates, panels, or covers.

3.8 WIRING METHODS AND PRACTICES

A. Furnish and install all audiovisual wire and cable ensuring proper pulling tension, bend radius, quantities, types, lengths, routing, wire group separation, and identification.

B. Spare wire runs of each group and type shall be pulled to each termination location. The number of spares shall be ten (10) percent of those in actual use or one, whichever is greater

C. Splicing of cables is not permitted between terminations of specified equipment.

D. Do not pull wire or cable through any box fitting or enclosures where change of raceway alignment or direction occurs; do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, and rollers to protect cables from excess tension, abrasion, or damaging bending during installation.

E. Use wire pulling lubricants and pulling tensions in accordance with the wire and cable manufacturer’s recommendations.

F. All wires shall be permanently identified at each wire end by marking with adhesive on crimp-on markers and a chart kept of each wire’s function. This applies to wire within a rack assembly as well as wire running in conduit.

G. Wire ends shall be wrapped with appropriate heat shrink tubing. Each shield or drain wire shall be covered with heat shrink to avoid unintentional connections.

H. Use ring or tongue lugs on all barrier strip terminals. Do not exceed two (2) lugs per terminal. Use crimping tools that are designed for the application or solder. Do not cut strands from conductors to fit lug terminals. Spare terminal blocks, equivalent to ten percent (10%) of those in actual use shall be furnished.

I. Form in an orderly manner all conductors in enclosures and boxes, wire ways, and wiring troughs, furnishing circuit and conductor identification. Tie using tie wraps of appropriate size and type. Limit spacing between ties to twelve (12) inches and furnish and install circuit and conductor identification at least once in each enclosure.

J. When the audiovisual cables are pulled, leave a five-foot (5’) tail at each end to all field locations and a fifteen-foot (15’) tail at all equipment rack locations. Temporary labels shall be applied at both ends of each cable. Permanent labels shall be applied when the cables are cut back and terminated.

K. All labeling of audiovisual cables shall comply with AVIXA F501.01:2015 (Formerly INFOCOMM F501.01:2015) Cable Labeling for Audiovisual Systems Standard.

L. . The numbering system used in compliance with this standard shall be verified with the owner prior to implementation. A schedule of all cabling and its labels shall be provided to the owner and Architect for review prior to pulling and termination of cables.

3.9 GROUNDING

A. Audiovisual system wiring shall conform to the following procedures:

1. Audio equipment AC ground pins shall connect to AC ground.
2. Audio equipment chassis shall connect to rack frames.
3. Audio rack frames shall connect to AC ground bus in panel board by means of #2 gauge (minimum) conductor
4. Audio shields between AC powered pieces of equipment shall be connected to ground at one end only. Terminate capacitance as required.
5. Audio signal paths between AC powered pieces of equipment shall be connected using balanced lines and/or transformer isolation as required.
6. No unbalanced signal paths may be connected to patch bays.
7. Isolate all audiovisual system wiring from racks, back boxes, and conduit.
8. Isolate all audiovisual system racks from conduit and other conductive surfaces. Use insulated bushings for conduit connections and a dielectric plinth between racks and conductive flooring.
9. AC isolated ground system shall be isolated from all other facility grounds.

B. All metallic conduit, boxes, and enclosures shall be grounded in accordance with the current National Electric Code (NEC).

C. Metallic enclosures containing active equipment shall be grounded with due regard for the minimization of electrical noise. This may include the provisions of grounding conductors separate from AC ground.

3.10 EQUIPMENT RACKS

A. The equipment racks shall be considered as custom assemblies and shall be assembled, wired, and tested in the Contractor’s shop. Final assembly of racks shall take place on site after transportation but will conform to the same test results achieved in the shop.

B. Placement of equipment in equipment racks, as shown in the drawings, is for maximum operator convenience. The insertion of additional equipment not indicated herein or any changes of placement of the equipment must be indicated in writing to the architect before assembly.

C. Racks shall be installed plumb and square without twists in the frame or variations in level between adjacent racks.

D. All wire, cable, terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled as to their function, circuit, or system. Labeling on

manufactured equipment shall be by engraved plastic laminate or by thermal printer on adhesive tape, with white lettering on black background or dark background that is similar to panel finish.

E. Provide stiffeners to custom panels to prevent panel deformation during normal plugging or switching operations.

F. All field termination shall enter the rack via a bulkhead panel(s) mounted to the rear-rails of the equipment rack.

G. All wires and cable used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted engineering practice.

H. Harnessed cables shall be combed straight, tie wrapped every eight (8) to twelve (12) inches, and attached to the structure as necessary. Each cable that breaks out from the harness for a termination shall be provided with ample service loop to permit equipment removal from the racks without disconnecting.

I. Harnessed cables shall be formed in either a vertical or horizontal relationship to equipment, controls components, or terminations.

J. Cables shields shall be connected to the isolated ground system with due regard for the ground loops.

K. All system components and related wiring shall be located with due regard from the minimization of induced electromagnetic and electrostatic noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience of the operator.

L. All rack mounted equipment with front panel controls, shall be furnished with security covers to avoid tampering with preset levels. If specific security covers are not included in the equipment list, the Contractor will furnish the manufacturers suitable alternate.

M. Every device shall be installed with regard for proper polarity. Absolute polarity shall be maintained through the entire audio chain.

3.11 INITIAL ADJUSTMENT

A. Verify all circuits and extensions for correct connection, continuity, and polarity. Absolute polarity shall be maintained between all points in the system.

B. Connector polarity shall be maintained except for terminations at equipment manufactured to other standards. Verify that polarity connections are consistent throughout the system.

C. Verify that the audio system is operational and the system gain structure is within the recommendations of major component manufacturers.

D. Verify that the all video sources (cameras, players, etc.) and that all video destinations (Projectors, displays, recorders, etc.) are sending and receiving video signals. EDID parameters for all digital video devices shall be reviewed with the owner to verify resolution requirements at all video output devices. Confirm all equipment managed by the audiovisual control system can receive

and send control signal as applicable, and that all control parameters and functionality as requested by the owner in the meeting prior to the beginning of work identified in section 2.1.K.9 of this specification have been implemented.

3.12 VERIFICATION TESTS

A. Confirm that each individual wire and cable run has been labeled and documented in compliance with AVIXA F501.01:2015 (Formerly INFOCOMM F501.01:2015).

B. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. Contractor shall furnish a wide band oscilloscope in order to verify this condition.

C. Confirm that the system is free of audible clicks, pops, hums, and other noises when any operating control is activated, with or without an input signal

D. For all audio and video lines, confirm:

1. Proper circuits appear at each termination location.
2. Proper circuits appear at each jack bay location.
3. Continuity of all conductors.
4. Proper polarity is maintained.
5. Absence of shorts between conductors within each circuit.
6. Absence of shorts between circuit conductors and conduit.

E. Confirm that the loudspeakers and mountings are free of buzzes and rattles when the speaker is swept with sine wave tones over its rated bandwidth at one-half (1/2) its maximum rated power.

F. For all permanently mounted loudspeaker terminations, furnish impedance measurement of each pair of loudspeaker lines with all loudspeakers connected and all amplifiers disconnected. These measurements shall be documented in a table listing impedance for each third octave from 20 Hz to 20 kHz and shall be accurate to the nearest 0.1Ω.

G. For each installed data network cable or fiber optic cable, verify that performance conforms to the relevant TIA/EIA specifications.

H. For all electronic devices mounted in racks and connected to patch bays confirm:

1. Every audio input and output is balanced.
2. Proper polarity is maintained throughout the entire audio signal path.

I. Confirm that there are no short circuits between the neutral and isolated ground conductors for each clean power circuit.

J. Confirm every input and output for video system including:

1. Proper signal to displays.
2. Proper sync to playback and recording equipment.

3.13 VERIFICATION TEST REPORT

A. Submit five (5) copies of a written report detailing the results of Initial Adjustments and Verification Test including all relevant drawings, charts, test instrument data and photographs. This report shall be completed and submitted to the Architect for review a minimum of five (5) days prior to Acceptance Testing and final tuning. With this report, submit written certification that the installation conforms to the requirements stated herein, is complete in all respects, and is ready for inspection, testing, and tuning.

3.14 ACCEPTANCE TESTING

A. Acceptance Testing shall be performed by the Architect during a period designated by the Architect. Contractor shall furnish a minimum of two (2) technicians for the acceptance testing period.

B. All systems shall be compliant with AVIXA (standard 1M:2009 Uniform Distributed Audio Standard as applicable.

C. The minimum time required for Acceptance Testing is two (2) working days of dedicated quiet. Coordinate this time period so that free access, work lighting, and electrical power are available on site.

D. The AV Contractor shall bear any costs incurred for additional Architect's time and expenses due to failure to have the system functioning in accordance with specification requirements at the time scheduled for Architect's Acceptance Testing and Tuning.

E. Ensure that audiovisual areas are in a clean and orderly condition ready for Acceptance Testing.

F. At the time of Acceptance Testing, submit one (1) copy of the operation and maintenance manual to the Architect (refer to Paragraph 3.15).

G. Furnish test equipment meeting the following minimum specifications on site, at all times during the Acceptance Testing. Prior to Acceptance Testing, provide the Architect with a listing of the equipment model numbers and their software versions (if applicable) to be made available.

1. Oscilloscope: 1GHz bandwidth sensitivity – 1mV/cm
2. Digital Multi-meter: 1% accuracy
3. Function Generator: 1GHz bandwidth, distortion <1%
4. Real Time Analyzer: 1/3 octave with microphone.
5. Pink Noise Source: 20 Hz – 20 kHz
6. Impedance Sweep Meter: 20 Hz – 1 kHz range, 1Ω - 50Ω.
7. Polarity Checker: Microphone level, Line Level, and Loudspeaker Level.
8. NTSC bar graphs and other test patterns for video verification.
9. Ultra High definition (4K60) Video test generator with VGA, DVI, HDMI 2.0, SDI, and 3G-HDSDI outputs

H. Be prepared to verify the performance of any portion of the system by demonstrations, listening, and viewing tests, and instrumented measurements.

I. Make additional mechanical and electrical adjustments within the scope of the work which may be deemed necessary by the Architect as a result of the Acceptance Test. This may include realigning and re-aiming of video or audio systems, changes in system gain structures, grounding, filtering, or interfaces.

J. Final acceptance will be contingent upon issuance by the Architect of a letter of acceptance stating that the work has been completed and is in accordance with the Contract Documents. The warranty period will begin upon issuance of said letter.

3.15 SYSTEM DOCUMENTATION

A. Within fifteen (15) days of the Acceptance Testing, prepare and submit five (5) neatly bound copies of the operations and maintenance manuals to the Owner. Manuals shall be placed in an orderly fashion into a three-ring binder with spine labels indicating contents. These copies are in addition to the one (1) copy furnished to the Architect during Acceptance Testing.

B. Manual shall include but not be limited to the following:

1. Table of contents
2. Written Guarantee and Service Policy
3. Basic power on/off and operational procedures.
4. All Available manufacturer's operation and service literature for each major system component
5. A one-line signal flow diagram with all cable runs and patch points identified by alphanumeric characters
6. A copy of the Verification Test Report
7. Two (2) copies of as-built conduit riser diagram obtained from the Electrical Contractor
8. A copy of the final tuning settings as furnished by the Architect
9. Electronic versions of all documents included in the manual and electronic back up of all software, firmware, and files to restore initial install presets for all applicable devices copied on to (2) USB storage devices.

C. Furnish a framed copy of the as-built signal flow diagram to be mounted in the ***TBD.*** This diagram shall have all cable runs and patch points identified by alphanumeric characters.

3.16 TRAINING

A. The AV Contractor shall provide up to forty-eight (48) hours instruction in the safe and proper operation of the equipment, in particular the audio DSP, sound console, and control systems, to the owner's designated representatives.

1. AV Contractor shall schedule instruction with the Owner's designated representatives.
2. Instruction shall not necessarily follow immediately after the system commissioning.
3. Instruction shall be independent of the system check-out and activation. Duration of system commissioning shall not affect the length of instruction time.
4. Instruction, at Owners discretion, may occur in multiple time blocks of less than eight (8) hours each.

5. AV Contractor shall be responsible for making and furnishing video documentation of instruction for future viewing to the Owner. Video documentation can be requested by the owner up to the entire (48) hours of instruction as detailed in this section, and shall be furnished to the owner as individual .mp4 files per training session. Files shall be labeled by the contractor indicating the date of training and a brief description of the content of the video. All files shall be furnished to the owner on a USB storage device provided by the contractor.

END OF SECTION 274116

Room Name	Room Type / Number	Description	Manufacturer	Model/Part #	Qty	Notes
Auditorium	Microphone & Accessories	House Microphone	Shure	VP88	1	
Auditorium	Microphone & Accessories	Wireless Microphone Antenna Distribution System	Shure	UA844+	1	
Auditorium	Microphone & Accessories	Wireless Microphone Antenna Distribution System	Shure	UA844+	1	Owner Furnished
Auditorium	Microphone & Accessories	Wireless Microphone Receiver	Shure		3	Owner Furnished
Auditorium	Microphone & Accessories	Wireless Microphone Antenna	Shure	UA874	2	
Auditorium	Audio Electronics	Mixing System	Allen & Heath	Avantis	1	with Dante Card
Auditorium	Audio Electronics	Secondary Mixing System	Allen & Heath	SQ5	1	with Dante Card
Auditorium	Audio Electronics	Mixing System I/O	Allen & Heath	DT168	1	with Rackmount kit
Auditorium	Audio Electronics	Mixing System I/O	Allen & Heath	DT168	2	Portable
Auditorium	Audio Electronics	DSP	QSC	Core 110f	1	
Auditorium	**Audio Electronics**	**Q-SYS Software-based Dante License, 32x32**	**QSC**	**SLDAN-32-P**	**1**	
Auditorium	Audio Electronics	DSP I/O	QSC	QIO-GP8x8	1	
Auditorium	Audio Electronics	DSP I/O Mounting Kit	QSC	QIO-RMK	1	
Auditorium	Audio Electronics	Amplifier	L-Acoustics	LA12X	1	Main PA
Auditorium	Audio Electronics	Amplifier	L-Acoustics	LA7.16i	1	Surround Speakers
Auditorium	Audio Electronics	Amplifier	L-Acoustics	LA2Xi	2	Front Fills and Foldbacks
Auditorium	Audio Electronics	Amplifier	Extron	NetPA U 1004	2	Production Monitors
Auditorium	Control System	Control Processor	Crestron	CP4	1	
Auditorium	Control System	Touch Panel - Wall	Crestron	TSW-1070	1	Black
Auditorium	Control System	Touch Panel - Desktop	Crestron	TS-1070	3	Black
Auditorium	Loudspeaker	Main Loudspeaker	L-Acoustics	A15 Focus	4	
Auditorium	Loudspeaker	Main Loudspeaker	L-Acoustics	A15 Wide	2	

Room Name	Room Type / Number	Description	Manufacturer	Model/Part #	Qty	Notes
Auditorium	Loudspeaker	Main Loudspeaker Rigging Hardware	L-Acoustics	A15 Bump	2	
Auditorium	Loudspeaker	Center Loudspeaker	L-Acoustics	A10 Focus	2	
Auditorium	Loudspeaker	Center Loudspeaker	L-Acoustics	A10 Wide	1	
Auditorium	Loudspeaker	Center Loudspeaker Rigging Hardware	L-Acoustics	A10 Bump	1	
Auditorium	**Loudspeaker**	**Subwoofer**	**L-Acoustics**	**KS21**	**4**	
Auditorium	Loudspeaker	Front Fill Loudspeaker	L-Acoustics	5XT	4	
Auditorium	Loudspeaker	Surround Loudspeaker	L-Acoustics	X6i	12	
Auditorium	Loudspeaker	Surround Loudspeaker Mounting Hardware	L-Acoustics	X6i Tilt Support	12	
Auditorium	Loudspeaker	Surround Loudspeaker Mounting Hardware	L-Acoustics	X6i Tilt	12	
Auditorium	Video Distribution	Video Decoder	Crestron	DM-NVX-D30	8	
Auditorium	Video Distribution	Video Encoder	Crestron	DM-NVX-E30	3	
Auditorium	Video Distribution	PTZ Camera	Panasonic	AW-UE150K	3	Black
Auditorium	Video Distribution	Remote Camera Controller	Panasonic	AW-RP60	1	
Auditorium	Video Distribution	Video Router	Blackmagic	Videohub 40x40	1	
Auditorium	Video Distribution	Video Switcher Panel	Blackmagic	ATEM 1 M/E Advanced Panel 20	1	
Auditorium	Video Distribution	Video Switcher	Blackmagic	ATEM 2 M/E Constellation UHD 4K Live Production Switcher	1	
Auditorium	Video Distribution	Video Recorder	Blackmagic	HyperDeck Studio 4K Pro	1	
Auditorium	Video Distribution	HDMI SDI Converter	Decimator	12G-CROSS	4	
Auditorium	Video Distribution	HDMI SDI Converter	Datavideo	DAC-45	1	
Auditorium	Video Distribution	Video Streamer & Recorder	Epiphan	Pearl Nano	1	
Auditorium	Production Video Monitoring	IR Camera	Blue Mango	BMH-HG15M	1	
Auditorium	Production Video Monitoring	IR Camera Lens	Pelco	FG50020P IR-MSI	1	
Auditorium	Production Video Monitoring	Infrared Illuminator	Bosch	IIR-50940-MR	1	

Room Name	Room Type / Number	Description	Manufacturer	Model/Part #	Qty	Notes
Auditorium	Production Video Monitoring	Video Display, 65"	Samsung	QM65C	2	Stage Extension
Auditorium	Production Video Monitoring	Display Mount	Chief	LTM1U	2	
Auditorium	Production Video Monitoring	Video Display, 43"	Samsung	QM43C	4	Dressing Rooms
Auditorium	Production Video Monitoring	Display Mount	Chief	LTM1U	4	
Auditorium	Production Video Monitoring	Video Display, 55"	Samsung	QM55C	1	Video Studio
Auditorium	Production Video Monitoring	Display Mount	Chief	LTM1U	1	
Auditorium	**Video Projection**	**Projector**	**Christie**	**4K2100-JS**	**1**	
Auditorium	**Video Projection**	**Projector Lens**	**Christie**	**140-111104-XX**	**1**	
Auditorium	**Video Projection**	**Projector Screen**	**Draper**	**Stage Screen**	**1**	**Complete System. TechVision XH800X ALR Surface. 16:9 121.5" x 216" Size.**
Auditorium	**Video Projection**	**Projector Screen**	**Draper**	**Stage Screen Fly Bracket (Pair)**	**1**	
Auditorium	Production Intercom	Production Intercom Power Supply	Clear-Com	PS-702	1	
Auditorium	Production Intercom	2-ch Remote Station	Clear-Com	RM-702	2	
Auditorium	Production Intercom	Single-Channel Beltpack	Clear-Com	RS-701	8	
Auditorium	Production Intercom	Single-Ear Standard Headset	Clear-Com	CC-110	8	
Auditorium	Production Audio Monitor	Ceiling Loudspeaker (Pair)	Electro-Voice	EVID-C6.2	4	
Auditorium	ALS	ALS Transmitter	Listen Technologies	LT-800-072-01	1	
Auditorium	ALS	Dante Adapter	Listen Technologies	LA-466	1	
Auditorium	ALS	Rack Mount Kit	Listen Technologies	LA-326	1	
Auditorium	ALS	Antenna Kit	Listen Technologies	LA-122	1	
Auditorium	ALS	ALS Receiver	Listen Technologies	LR-4200-072	27	
Auditorium	ALS	Ear Speaker	Listen Technologies	LA-401	27	
Auditorium	ALS	Earphone/Neck Loop Lanyard	Listen Technologies	LA-430	7	
Auditorium	ALS	12-Unit Charging Tray	Listen Technologies	LA-381-01	2	

Room Name	Room Type / Number	Description	Manufacturer	Model/Part #	Qty	Notes
Auditorium	ALS	ALS Notification Signage Kit	Listen Technologies	LA-304	1	
Auditorium	Audio, Video & Data Patching	Audio Patch Panel	Bittree	489-S	2	
Auditorium	Audio, Video & Data Patching	Loudspeaker Patch Panel	Custom	by AV Contractor	1	
Auditorium	Audio, Video & Data Patching	48-Port CAT 6A Network Patchbay - 2RU; 2x24 Ports	Belden	10GX Shielded KeyConnect Patch Panel, 48-port, 2RU	2	
Auditorium	Audio, Video & Data Patching	AV Network Switch	Netgear	M4250-40G8F-PoE+	1	Dante Switch
Auditorium	Audio, Video & Data Patching	AV Network Switch	Netgear	M4250-40G8F-PoE+	1	Video Studio Switch
Auditorium	Audio, Video & Data Patching	AV Network Switch	Netgear	M4300-52G-PoE+ (550W PSU)	1	Video Distribution Switch
Auditorium	Audio, Video & Data Patching	AV Network Switch	Netgear	M4300-52G-PoE+ (550W PSU)	1	Control, Dante Secondary Switch
Auditorium	Miscellaneous	Equipment Rack	Middle Atlantic	BGR-4532	2	
Auditorium	Miscellaneous	Portable Equipment Rack	SKB	1KSB-R8U	1	Wireless Mic Rack
Auditorium	Miscellaneous	Portable Equipment Rack	SKB	1KSB-R4U	1	Stage Manager Rack
Auditorium	Miscellaneous	Rack Drawer	Middle Atlantic	D3	3	
Auditorium	Miscellaneous	Rack Shelf	Middle Atlantic	U317	1	
Auditorium	Miscellaneous	Brush Grommet Panel	Middle Atlantic	BR1	4	
Auditorium	Miscellaneous	UPS	Middle Atlantic	UPX-RLNK-OL2000R-8	1	
Auditorium	Miscellaneous	AC Power Sequencer	Middle Atlantic	USC-6R	1	
Auditorium	Miscellaneous	AC Power Raceway and Additional Outlets	Middle Atlantic	Contractor Nominated	1	
Auditorium	Miscellaneous	Rack Fan	Middle Atlantic	Contractor Nominated	2	
Auditorium	Miscellaneous	Rack Isolating Kit	Middle Atlantic	BGR-ISO	2	
Auditorium	Miscellaneous	Rack Isolation Knockout	Middle Atlantic	ISO-KOP	2	
Auditorium	Miscellaneous	Rack Copper Ground Bar	Middle Atlantic	BB-12	2	
Auditorium	Miscellaneous	Rack Light	Middle Atlantic	LT-GN-PNL	4	

Room Name	Room Type / Number	Description	Manufacturer	Model/Part #	Qty	Notes
Auditorium	Portable Equipment	Foldback Loudspeaker	L-Acoustics	X12	2	
Auditorium	Portable Equipment	Foldback Loudspeaker	L-Acoustics	X8	2	
Auditorium	Portable Equipment	Loudspeaker Cable - 5'	Lex Products	LPA-SPK12/4-005	2	
Auditorium	Portable Equipment	Loudspeaker Cable - 10'	Lex Products	LPA-SPK12/4-010	4	
Auditorium	Portable Equipment	Loudspeaker Cable - 25'	Lex Products	LPA-SPK12/4-025	4	
Auditorium	Portable Equipment	Loudspeaker Cable - 50'	Lex Products	LPA-SPK12/4-050	2	
Auditorium	Portable Equipment	Microphone Cable - 5'	Lex Products	LPA-XLR-20/2-005	6	
Auditorium	Portable Equipment	Microphone Cable - 10'	Lex Products	LPA-XLR-20/2-010	8	
Auditorium	Portable Equipment	Microphone Cable - 25'	Lex Products	LPA-XLR-20/2-025	10	
Auditorium	Portable Equipment	Microphone Cable - 50'	Lex Products	LPA-XLR-20/2-050	2	
Auditorium	Portable Equipment	TRS Cable - 5'	Lex Products	LPA-TRS-202-2-05D	4	
Auditorium	Portable Equipment	Long-Frame Patch Cable - 12"	Contractor Nominated	Contractor Nominated	4	
Auditorium	Portable Equipment	Long-Frame Patch Cable - 24"	Contractor Nominated	Contractor Nominated	8	
Auditorium	Portable Equipment	Long-Frame Patch Cable - 30"	Contractor Nominated	Contractor Nominated	4	
Auditorium	Portable Equipment	Patch Cable - Loudspeaker - NL4 - 18"	Contractor Nominated	Contractor Nominated	4	
Auditorium	Portable Equipment	Patch Cable - Loudspeaker - NL4 - 30"	Contractor Nominated	Contractor Nominated	4	
Auditorium	Portable Equipment	Microphone, Stands & Accessory Allowance - $5000	Contractor Nominated	Contractor Nominated	1	
Auditorium	Portable Equipment	Intercom - Speaker Station in Box (Biscuit)	Clear-Com	KB702 + V-Box	2	
Auditorium	Portable Equipment	Intercom - Handset	Clear-Com	HS-6	1	
Auditorium	Portable Equipment	Intercom - Call Flasher	ProIntercom	Blazon180	1	
Auditorium	Portable Equipment	Audio Adapter Kit	Remote Audio	Adapt-A-Pak Light	1	
Auditorium	Portable Equipment	Audio Testing Device	Whirlwind	Qbox	1	

Room Name	Room Type / Number	Description	Manufacturer	Model/Part #	Qty	Notes
Lobby	Audio Electronics	Amplifier	Extron	NetPA U 1004	1	ADD ALT 1
Lobby	Audio Electronics	Ceiling Loudspeaker (Pair)	Electro-Voice	EVID-C6.2	5	ADD ALT 1
Lobby	Video Electronics	Video Decoder	Crestron	DM-NVX-D30	1	ADD ALT 1
Lobby	Video Electronics	Video Display, 75"	Samsung	QM75C	1	ADD ALT 1
Lobby	Video Electronics	Display Mount	Chief		1	ADD ALT 1
Lobby	Video Electronics	Digital Signage Player	BrightSign	LS445	1	ADD ALT 1

End of 27 41 16 Schedule A

SECTION 280005 – SPECIAL CONDITIONS FOR SAFETY AND SECURITY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Safety and Security equipment coordination and installation.
2. Common safety and security installation requirements.

1.3 ABBREVIATIONS AND DEFINITIONS

A. Coordinate abbreviations listed here with abbreviations indicated on drawings. Bring any possible discrepancies to the attention of the Architect/Engineer/Designer for determination of which applies to which condition(s).

B. AASHTO: American association of State Highway and Transportation Officials.

C. ADA (ADAG): Americans with Disabilities Act.

D. AHJ: the Authority Having Jurisdiction.

E. ASTM: ASTM International, formerly known as American Society for Testing and Materials.

F. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

G. BHMA: Builders Hardware Manufacturers' Association.

H. EMI: Electromagnetic interference.

I. ETL: Electrical Testing Laboratories, a division of Intertek Testing Laboratories.

J. Ground(ing): more appropriately "Bonding" (or earthing), connecting metallic items together to reduce voltage potential to reduce injury and/or damage.

K. IEC: International Electrotechnical Commission.

L. IEEE: Institute of Electrical and Electronics Engineers.

M. ISO: International Standards Organization.

N. LAN: Local area network.

O. NEMA: National Electrical Manufacturers Association.

P. NFPA: National Fire Protection Association.

Q. NRTL: Nationally Recognized Testing Laboratory: A testing and labeling laboratory acceptable to the Authority Having Jurisdiction (examples include U.L and ETL)

R. OSP: Outside Plant

S. SIA: Security Industry Association

T. U.L.: Underwriter's Laboratories, Inc.

U. UTP: Unshielded twisted pair.

V. WAN: Wide Area Network.

1.4 STANDARDS, Referenced in various Division 28 Documents:

A. Client Standard and Requirements.

B. Electrical Code and Edition referenced in Codes Section of Documents.

C. AG-01, Architectural Graphics for Security Standard.

D. ANSI/SIA CP-01-2019. Control Panel Standard – Features for False Alarm Reduction.

E. ANSI/SIA MSD-01-2000, Mobile Security Devices Standard – Monitoring Practices for False Dispatch Prevention.

F. ANSI/SIA OSIPS-01:2008, Open Systems Integration and Performance Standards – Framework.

G. ANSI/SIA OSIPS-DVI-01:2008, Open, Systems Integration and Performance Standards – Digital Video Interface Data Model.

H. ANSI/SIA PIR-01-2000, Passive Infrared Motion Detector Standard – Features for Enhancing False Alarm Immunity Standard.

I. ANSI/TIA-1179-B, Healthcare Facility Telecommunications Infrastructure Standard

J. ANSI/TIA-5017, Telecommunications Physical Network Security

K. BICSI; Telecommunications Distribution Methods Manual (TDMM), 14th Edition

L. BICSI; Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition

M. DC-01-1988 (R2001.04), DCS Computer Interface (CIS-1) Technical Report.DC-02-1992.02 (R2000.05), DCS Generic Protocols Technical Report.

N. DC-03-2017, DCS SIA Format Standard.

O. DC-04-2000.05, DCS SIA 2000 Standard.

P. DC-05-2016-DCS Ademco, Ademco Contact ID Protocol – Alarm System Communications.

Q. DC-07-2001.04, Receiver-to-Computer Interface Protocol (Type2) – for Central Station Equipment Communications.

R. DC-09-2021, SIA DCS-Internet Protocol Event Reporting.

S. GB-01-2014, Acoustic Glass break Detector Standard – Features for Optimizing False Alarm Reduction and Detection.

T. GB-02-2014, Acoustic Glass break Sensor.

U. ISO/IEC 14443-3:2011 – Identification Cards.

V. NESC: National Electrical Safety Code.

W. OSDP v2.2, Open Supervised Device Protocol Standard Version 2.2.

X. OSDP v2.17, Open Supervised Device Protocol Standard Version 2.1.7.

Y. SIA AC-01-1996.10, Access Control Standard Protocol for the 26-BIT Wiegand Reader Interface.

Z. SIA AC-03-2000.06, Access Control Guideline – Dye Sublimation Printing practices for PVC Access Control Cards.

AA. SAI AV-01-2014, Protocol for Audio Verification and Two-Way Voice – Monitoring Service Command Set.

BB. SAI BIO-01-1993.02 (R2000.06), Biometric Standard – Vocabulary for Testing.

CC. SIA PID-01-1995.12 (2000.06), SIA Point Identification Multiplex Protocol – Security and Life Safety Applications – Addressable.

DD. SIA RF-01-2014, On-Premises RF Products – Technical Report – Terminology for Use in Specifying Product Parameters.

EE. SIA TVAC-01-2001.04, CCTV to Access Control Standard – Message Set for System Integration.

FF. UL 294, Standard for Access Control System Units.

1.5 SUBMITTALS

A. Current Certifications for:

1. Installation Supervisor.
2. Installer(s).
3. Testing Supervisor.
4. Installer(s) as a “Manufacturer’s Certified Contractor.”

B. Firm demonstration of a minimum of 5 years’ experience installing security systems of the same or similar type and occupancy.

C. Reference list of 5 previous successful projects of similar size and scope including:

1. Name of project
2. Location of Project.
3. Description of work.
4. Time of Completion.
5. Clint’s name (an individual) as reference.
6. Contact information of Refence.

1.6 COORDINATION

A. Coordinate arrangement, mounting, and support of security system equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope,
4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 REFER TO OTHER DIVISION 27 SPECIFICATIONS FOR SPECIFIC PRODUCT REQUIREMENTS

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give way to piping systems installed at a required slope.

E. Code and Standards Compliance: All work of this division shall be in accordance with the referenced codes and standards.

3.2 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 280005

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 27 - Specifications for Communications Cabling

C. Division 27- Specifications for Communications Grounding and Bonding

D. Division 28 - Special Conditions for Safety and Security Systems.

E. Division 28 - Pathways for Electronic Safety and Security

1.2 SUMMARY

A. Section Includes:

1. RS-232 cabling.
2. RS-485 cabling.
3. Low-voltage control cabling.
4. Control-circuit conductors.
5. Fire alarm wire and cable.
6. Identification products.

1.3 DEFINITIONS AND STANDARDS

A. Refer to Section 280005, Special Conditions for Safety and Security Systems.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, receive and store cables on site in accordance with manufacturer’s recommendations.

1.7 FIELD CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at manufacturer's recommended environmental levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: All cable, except fire rated cables, shall be Plenum rated; and tested by a NRTL. Identify products with appropriate markings of applicable testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a NRTL, and marked for intended location and application.

2.2 UTP CABLE

A. UTP cable shall comply with Division 27 Specifications.

2.3 UTP CABLE HARDWARE

A. UTP Cable hardware shall comply with Division 27 Specifications.

2.4 OPTICAL FIBER CABLE

A. Optical fiber cable shall comply with Division 27 Specifications.

2.5 RS-485 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.6 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.7 COMPOSITE ACCESS CONTROL CABLE – WEIGAND CONNECTION

A. Plenum-Rated, Jacketed Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 22 AWG, shielded, tinned copper conductors, white jacket.
2. Four conductor, No. 18 AWG, shielded, tinned copper conductors, gray jacket.
3. Four conductor, No. 22 AWG, shielded, tinned copper conductors, blue jacket.
4. Three pair, twisted, No. 22 AWG, shielded, tinned copper conductors, orange jacket.
5. No overall shield.
6. Overall CMP rated jacket
7. Flame Resistance: Comply with NFPA 262.

B. Plenum-Rated, Un-jacketed Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 22 AWG, shielded, tinned copper conductors, white jacket.
2. Four conductor, No. 18 AWG, shielded, tinned copper conductors, gray jacket.
3. Four conductor, No. 22 AWG, shielded, tinned copper conductors, blue jacket.
4. Three pair, twisted, No. 22 AWG, shielded, tinned copper conductors, orange jacket.
5. No overall shield.
6. Bundled but unjacketed
7. Flame Resistance: Comply with NFPA 262.

2.8 COMPOSITE ACCESS CONTROL CABLE – OSDP CONNECTION

A. Plenum-Rated, Jacketed Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 24, shielded & one pair #18 AWG, tinned copper conductors, orange jacket.
2. Four conductor, No. 18 AWG, shielded, tinned copper conductors, gray jacket.
3. Four conductor, No. 22 AWG, shielded, tinned copper conductors, blue jacket.
4. One pair, twisted, No. 22 AWG, shielded, tinned copper conductors, white jacket.
5. No overall shield.
6. Overall CMP rated jacket
7. Flame Resistance: Comply with NFPA 262.

B. Plenum-Rated, Un-jacketed Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 24, shielded & one pair #18 AWG, tinned copper conductors, orange jacket.
2. Four conductor, No. 18 AWG, shielded, tinned copper conductors, gray jacket.
3. Four conductor, No. 22 AWG, shielded, tinned copper conductors, blue jacket.
4. One pair, twisted, No. 22 AWG, shielded, tinned copper conductors, white jacket.
5. No overall shield.
6. Bundled but unjacketed
7. Flame Resistance: Comply with NFPA 262.

2.9 DOOR CONNECTION CABLES

A. OSDP Reader, plenum-rated cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 22 AWG, shielded, & one pair #18, tinned copper conductors, orange jacket.

B. Weigand Reader, plenum-rated cable: NFPA 70, Type CMP.

1. Three pair, twisted, No. 22 AWG, shielded, tinned copper conductors, orange jacket.

C. Lock power, plenum-rated cable: NFPA 70, Type CMP.

1. Four conductor, No. 18 AWG, shielded, tinned copper conductors, gray jacket.

D. Request to exit, plenum-rated cable: NFPA 70, Type CMP.

1. Four conductor, No. 22 AWG, shielded, tinned copper conductors, blue jacket.

E. Door contact, plenum-rated cable: NFPA 70, Type CMP.

1. One pair, No. 22 AWG, shielded, tinned copper conductors, white jacket.
2.

2.10 Flame Resistance: Comply with NFPA 262CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway, power-limited cable, complying with UL 83, concealed in building finishes, or power-limited tray cable, complying with UL 83, in cable tray.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.11 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Marmon Industrial Energy & Infrastructure - Vitalink.
2. Southwire - Genesis Cable Products.
3. Prysmian Group, Draka cable products
4. West Penn Wire.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 16 AWG or size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

2.12 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Worldwide, Inc.
2. HellermannTyton North America.
3. Kroy LLC.
4. Panduit Corp..

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Division 26 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

3.2 WIRING METHOD

A. Install wiring in concealed metal pathways and wireways, except as noted otherwise.

1. Minimum conduit size shall be 3/4 inch (21 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
4. Install conductors parallel with or at right angles to sides and back of enclosure.
5. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks.
6. Mark each terminal according to system's wiring diagrams.
7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. General Requirements for Cabling:

1. Comply with TIA/EIA-568.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
9. Label all cables inside pull boxes and junction boxes.

D. UTP Cable Installation: Install using techniques, practices, and methods described in Division 27 that ensure performance of completed and linked signal paths, end to end.

E. Open-Cable Installation, where indicated:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1525 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Installation of Cable Routed Exposed under Raised Floors, where indicated:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 72 inches (1830 mm) long shall be neatly coiled not less than 12 inches (300 mm) in diameter below each feed point.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569 recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in accordance with Division 28 Fire Alarm Section.

C. Risers: Install vertical cable risers as indicated on drawings.

3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

B. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.6 FIRESTOPPING

A. Comply with requirements in Division 07 "Penetration Firestopping."

B. Comply with TIA-569, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.7 GROUNDING

A. For communications wiring, comply with J-STD-607 and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low voltage wiring and cabling, comply with requirements in Division 27 "Grounding and Bonding for Communication Systems."

3.8 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606. Comply with requirements for identification specified in Division 26 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling in accordance with Division 27 Category Cable Specifications.
4. Optical Fiber Cable Tests:

    a. Test in accordance with Division 27 Optical Cable Specifications.

B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, transfer the data from the instrument to the computer memory device, save as pdf files, print, and submit.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 281307 - ACCESS CONTROL AND ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Security access controllers connected to the existing FIT Access Control System.
2. System modifications and additions shall be provided by Linear Tech
3. Network connecting all access control controllers, control station, and workstations.
4. Security access control devices.
5. Connection wiring between access controller(s) and access control devices.

1.3 DEFINITIONS AND STANDARDS

A. Refer to Section 280005, Special Conditions for Safety and Security Systems.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Diagrams for cable management system.
2. System labeling schedules, including SAMPLE(S) of labeling schedules.
3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics.
4. Battery and charger calculations for central station, workstations, and controllers.

C. Samples: For each exposed product and for each color and texture specified.

D. Other Action Submittals:

1. Project planning documents as required by Client Standard.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in division 01--"Operation and Maintenance Data," include the following:

1. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
2. System installation and setup guides with data forms to plan and record options and setup decisions.

1.6 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 of all kinds, power and electronic, equal to [**10**] percent of amount installed for each size used, but no fewer than three units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain controllers, Identifier readers, and all software through one source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a NRTL, and marked for intended location and application.

D. Comply with NFPA 70, "National Electrical Code."

E. Comply with SIA DC-01, SIA DC-03 and SIA DC-07.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Controllers:

1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature and humidity in accordance with manufacturer’s recommendations.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components, except the central-station control unit, installed in temperature-controlled indoor environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.
2. Indoor, Uncontrolled Environment: NEMA 250, Type 4X enclosures. System components installed in non-temperature-controlled indoor environments shall be rated for continuous operation in ambient conditions of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.
3. Outdoor Environment: NEMA 250, NEMA 250, Type 4X enclosures. System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 85 mph (137 km/h) and snow cover up to 24 inches (610 mm) thick.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: For system components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, provide NEMA 250, Type 4X enclosures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by:

1. Linear Technologies, Edgar Fermin, efermin@lineartech.com, 212.376.7665.

2.2 DESCRIPTION

A. Security Access System: PC-based central station based system, with field-installed controllers, connected by a high-speed electronic-data transmission network.

1. The Access Control System at client site is an existing System.
2. Devices and controllers shall be fully functional with the existing system.

B. System Software: Based on central-station, workstation operating system, server operating system, and application software:

1. Provide all licenses required for devices and for system modifications

C. Network connecting the central station and workstations shall be a LAN using TCP/IP.

D. Network(s) connecting PCs and controllers shall consist of one or more of the following:

1. Local area, IEEE 802.3 Fast Ethernet Gigabit-Ethernet, star topology network based on TCP/IP.

2.3 OPERATION

A. The existing system modifications shall operate without interruption as it currently exists.

B. Door Hardware Interface:

1. Electrical characteristics of controllers shall match the signal and power requirements of door hardware.

2.4 APPLICATION SOFTWARE

A. Controller Software:

1. Controllers shall operate as autonomous, intelligent processing units.

   a. Controllers shall make decisions about access control, alarm monitoring, linking functions, and door-locking schedules for their operation, independent of other system components.
   b. Controllers shall be part of a fully distributed processing-control network.
   c. The portion of the database associated with a controller, and consisting of parameters, constraints, and the latest value or status of points connected to that controller, shall be maintained in the controller.

2. The following functions shall be fully implemented and operational within each controller:

   a. Monitoring inputs.
   b. Controlling outputs.
   c. Automatically reporting alarms to the central station.
   d. Reporting of sensor and output status to the central station on request.
   e. Maintaining real time, automatically updated by the central station at least once a day.
   f. Communicating with the central station.
   g. Executing controller resident programs.
   h. Diagnosing.
   i. Downloading and uploading data to and from the central station.

3. Controller Operations at a Location:

   a. In the event of communication failure between the central station and a Location, there shall be no degradation in operations at the controllers at that Location. Controllers at each Location shall be connected to a memory buffer with a capacity to store up to 10,000 events; there shall be no loss of transactions in system history files until the buffer overflows.
   b. Buffered events shall be handled in a first-in-first-out mode of operation.

4. Individual Controller Operation:

a. Controllers shall transmit alarms, status changes, and other data to the central station when communications circuits are operable. If communications are not available, controllers shall function in a stand-alone mode; operational data, including the status and alarm data normally transmitted to the central station, shall be stored for later transmission to the central station. Storage capacity for the latest 1024 events shall be provided at each controller.
b. Card-reader ports of a controller shall match the current Reader connectivity standard of client

B. Alarm Monitoring: Monitor sensors, controllers, and DTS circuits and notify operators of an alarm condition, in the format currently used by the client system.

C. Monitor Display: Display text and graphic maps in the format currently used by the client System.

D. Anti-Passback:

1. Controllers shall have anti-passback feature, selectable by opening. System shall support hard and soft anti-passback.

2.5 SYSTEM DATABASE

A. Database Operations:

1. System data management shall be in the format and arrangement currently used by the client system.

2.6 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections as recommended by manufacturer for type of line being protected.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.7 CONTROLLERS

A. Controllers: Shall be fully compatible with the existing Access Control System.

B. Entry-Control Controller:

1. Function: Provide local entry-control functions including one- and two-way communications with access-control devices such as card readers, keypads, biometric personnel identity-verification devices, door strikes, magnetic latches, gate and door operators, and exit push buttons.

a. Operate as a stand-alone portal controller using the downloaded database during periods of communication loss between the controller and the field-device network.

2.8 CARD READERS, CREDENTIAL CARDS, AND KEYPADS

A. Card-Reader Shall be MultiTech reader capable of reading mag stripe, smart card and mobile device, HID Reader RMP40.

2.9 PUSH-BUTTON SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by:

1. Securitron Magnalock Corporation; an ASSA ABLOY Group company.

B. Push-Button Switches: Momentary-contact back-lighted push buttons with stainless-steel switch enclosures.

C. Electrical Ratings:

1. Minimum continuous current rating of 10 A at 120-V ac or 5 A at 240-V ac.
2. Contacts that will make 720 VA at 60 A and that will break at 720 VA at 10 A.

D. Enclosures: Flush or surface mounting. Push buttons shall be suitable for flush mounting in the switch enclosures.

E. Enclosures shall additionally be suitable for installation in the following locations:

1. Indoors, controlled environment.
2. Indoors, uncontrolled environment.
3. Outdoors.

F. Power: Push-button switches shall be powered from their associated controller, using dc control.

2.10 REQUEST TO EXIT MOTION DETECTORS

1. Shall be Bosch DS-160i.
2. Shall provide a means to bypass the Door Module Switch and/or the unlocking of the controlled door upon exiting.
3. The built-in sounder shall alarm upon forced entry or held door position.

4. Shall connect to the ACM or RM-4 module.

2.11 EXTERIOR DOOR CONTACTS

A. Provide balanced high security contacts at all exteriors and doors indicated on the plans.

2.12 Exit Device, DOOR AND GATE HARDWARE INTERFACE

A. Exit Device with Alarm: Operation of the exit device shall generate an alarm and annunciate a local alarm. Exit device and alarm contacts are specified in Section 087100 "Door Hardware."

B. Exit Alarm: Operation of a monitored door shall generate an alarm. Exit devices and alarm contacts are specified in Section 087100 "Door Hardware."

C. Electric Door Strikes: Use end-of-line resistors to provide power-line supervision. Signal switches shall transmit data to controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and they shall report a forced entry. Power and signal shall be from the controller. Electric strikes are specified in Section 087100 "Door Hardware."

D. Electromagnetic Locks: Where specifically approved by client shall include end-of-line resistors shall provide power-line supervision. Lock status sensing signal shall positively indicate door is secure. Power and signal shall be from the controller. Electromagnetic locks are specified in Section 087100 "Door Hardware."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA/EIA 606, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.

1. Record setup data for control station and workstations.
2. For each Location, record setup of controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
9. Develop screen layout formats.
10. Propose setups for guard tours and key control.
11. Discuss badge layout options; design badges.
12. Complete system diagnostics and operation verification.
13. Prepare a specific plan for system testing, startup, and demonstration.
14. Develop acceptance test concept and, on approval, develop specifics of the test.
15. Develop cable and asset-management system details; input data from construction documents. Include system schematics and Visio Technical Drawings in electronic format.

D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.3 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install cables and wiring according to requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."

3.4 GROUNDING

A. Comply with Division 26 "Grounding and Bonding for Electrical Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

3.5 INSTALLATION

A. Push Buttons: Where multiple push buttons are housed within a single switch enclosure, they shall be stacked vertically with each push-button switch labeled with 1/4-inch- (6.4-mm-) high text and symbols as required. Push-button switches shall be connected to the controller associated with the portal to which they are applied, and shall operate the appropriate electric strike, electric bolt, or other facility release device.

B. Install card readers, keypads, push buttons, and biometric readers.

3.6 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Division 26 "Identification for Electrical Systems" and with TIA/EIA 606.

B. Using software specified in "Cable and Asset Management Software" Article, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.7 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license(s) to client.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 6A tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA 568, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA 568.
2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.10 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured with an activated burglar alarm and access-control system reporting to a central station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

END OF SECTION 281307

SECTION 284600 – FIRE ALARM SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Existing fire alarm and detection system to be modified.
2. Fire alarm notification appliances.

B. Related Requirements:

1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables".
2. Section 260533 "Raceways and Boxes for Electrical Systems".

1.3 DEFINITIONS

A. AHJ: Authorities having jurisdiction.

B. DACT: Digital alarm communicator transmitter.

C. FAA: Fire alarm annunciator unit with integral firefighters' microphone.

D. FACP / FACU: Fire alarm control panel / unit.

E. NAC: Notification appliance circuit.

F. NICET: National Institute for Certification in Engineering Technologies.

G. SLC: Signaling line circuit.

H. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

1.4 SPECIAL CONDITIONS

A. Provide an approved fire watch service under conditions in which the existing facility is occupied while the existing fire alarm system is out of service during construction. Fire watch service shall be provided until the fire alarm system is returned to service.

B. This section includes all labor, material, equipment, and related services necessary to supply, to install, to connect, to upgrade and to program the existing fire alarm system to provide a complete and operational system with all required hardware, components, devices, wiring connections, and programming.

C. Extend the existing system to serve existing and new areas. Include all necessary provision for scope of work indicated in this specification and on the Drawings in this contract. New devices shall be compatible with existing fire alarm system (see manufacturer below). Furnish only new devices and components under this contract.

D. Visit the site to determine existing conditions prior to bidding. Verify all requirements needed to provide a complete and functioning interface between the new fire alarm system and the existing fire alarm system in accordance with these contract documents. Upon completion of this contract work, both the existing and new systems shall be capable of functioning as independent systems, while monitoring the alarm status of the other fire alarm system.

1. This contract shall include the provisions necessary to readily expand the new fire alarm system (at a future date—not under this contract) to serve the portions of the existing building that will remain connected to the existing fire alarm system under this contract.
2. For both the existing and new systems, provide auxiliary control modules/relays (dry contacts) that are activated upon general alarm, and monitoring modules to monitor the status of the “alarm” contacts of the other system. All circuiting shall be supervised by the fire alarm control panel to which it is connected.

E. Equipment Removal: After acceptance of new fire alarm system, remove existing disconnected fire alarm equipment and wiring. Work: Existing fire alarm system components that are removed by this contractor and not reinstalled, including control equipment, devices, and cabling, shall remain to be the property of the Owner, unless specific items are relinquished to the contractor for disposal or recycling. All items shall be handled carefully and stored in a secure place. Coordinate exact requirements directly with the Owner.

1.5 SPECIAL BIDDING REQUIREMENTS

1. Unit Prices: Indicate unit pricing amounts on the Bid Form for various system components as listed. For each item, include 100 feet of cabling with cabling support as applicable and the additional scope of work necessary to provide a complete and functional system in accordance with these specifications.

1.6 ACTION SUBMITTALS

A. Submittals shall be combined into the fewest possible submittals, as opposed to each portion being submitted separately.

B. Approved Permit Submittal: Submittals must be approved by authorities having jurisdiction prior to submitting them to Architect/Engineer.

1. In addition to distribution requirements for submittals specified in Division 01 Section “Submittal Procedures,” provide an identical submittal to the AHJ. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. Upon receipt of comments from the AHJ, send submittal to Architect/Engineer for review.

C. Project Information:

1. Documentation of Installer Qualifications:

a. Trained and certified by manufacturer in fire alarm system design.
b. Fire alarm certified by NICET, minimum Level III.

2. Project Title Sheet with Contact Information:

a. Project name and address.
b. Contractor’s name, address, and telephone number.
c. Installer’s name, address, and telephone number.
d. Manufacturer’s name, address, and telephone number.
e. Date submitted.

D. Product Data: For each type of product, including furnished options and accessories.

1. Specifically indicate complete model number for each system component/device. Information and options not included shall be crossed out
2. Include construction details, material descriptions, dimensions, profiles, and finishes.
3. Include rated capacities, operating characteristics, and electrical characteristics.

E. Shop Drawings: For fire alarm system.

1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, and details, including details of attachments to other Work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations and identify spare capacity available.

a. Include power supply calculations and identify spare capacity available.
b. Include amplifier calculations and power loss calculations for notification appliances.

7. Include input/output operations matrix (sequence of operation per NFPA 72).

8. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Floor Plans:

    a. Submit drawings produced and plotted via electronic means (not hand drafted) for review. See Division 01 Section, "CAD Electronic Media Transfer Agreement" for obtaining AutoCAD files from the Architect and for associated request form and fees.
    b. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
    c. Show room names that indicate actual room use and actual number designations.
    d. Show the locations of all system panels and devices, including monitor modules, control modules, and relays.
    e. Show the designated address of each addressable device.
    f. Show the cabling pathways between control panel(s), supervising station/annunciator panels, voice command, and shared communications equipment.
    g. Show the general routing of cabling to each fire alarm device/notification appliance.
    h. Show typical mounting height elevations for wall-mounted devices and appliances.
    i. Indicate the selected candela rating for each visual (strobe) device.

F. Delegated Design Submittal: For notification appliances, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by a NICET certified professional who meets the qualifications listed below under the article titled "Quality Assurance".

1. Drawings showing location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of device.

    a. Include designation of acoustically distinguishable spaces and method for testing intelligibility and audibility levels. In each room where voice notification is required indicate the value of the minimum required sound pressures to achieve code compliance.

2. Design Calculations: Calculate requirements for selecting spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.7 CLOSEOUT SUBMITTALS

A. Field quality-control reports.

B. Record Drawings:

1. Include record documents (as-built drawings) that accurately reflect the actual completed installation, actual devices, actual room names, and actual locations within each room. Revise, update, and edit all Pre-Installation Documents as defined above, including updated riser diagrams.
2. Electronic files shall be shared via electronic media and recorded on two (2) flash-drives. Hardcopies shall be as indicated above for shop drawings.

C. Operation and Maintenance Data: For fire alarm systems and components to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Record copy of site-specific software.
g. Manufacturer's required maintenance related to system warranty requirements.

D. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media and approved online or cloud solution.
3. Device address list.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Strobe Units: Quantity equal to five percent (5%) of amount installed, but no fewer than one unit.
2. Audible and Visual Notification Appliances: One of each type installed.
3. Fuses: Two (2) of each type installed in system. Provide in box or cabinet with compartments marked with fuse types and sizes.

B. Include a list of extra materials—confirmed and signed by Owner’s representative—in the Operation and Maintenance Manuals.

1.9 QUALITY ASSURANCE

A. Installer Qualifications:

1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
2. Installation must be by personnel certified by NICET as fire alarm Level II or Level III technician.
3. Obtain certification by NRTL in accordance with NFPA 72.
4. Licensed or certified by authorities having jurisdiction.
5. Supplier/Service Provider: Must confirm and maintain an authorized service representative within 90 miles travel distance from the location of the installation.

B. Compliance with Local Codes and Ordinances: Comply with all applicable building codes, local ordinances, regulations, and the all the requirements of the AHJ.

C. Electrical wiring and equipment, including circuits controlled and powered by the fire alarm system: Compliance with NFPA 70.

D. This contract shall include all hardware, firmware, software, programming, electric power, cabling pathways/raceways, electrical boxes, cabling, outside plant (if applicable), and all system components to be supplied and installed for a complete and functional turnkey system—without exception. To achieve this, this contractor and subcontractors shall be responsible under this contract for determining—prior to submitting bids—any existing equipment or field conditions as applicable, complete requirements for new work and the delineation of all work amongst qualified installers and technicians necessary for a fully functional and professional installation.

1. FIELD CONDITIONS

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace fire alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.

1. Special Extended Warranty Period: Shall <u>exceed</u> four (4) years starting from the date of Substantial Completion.

a. If the manufacturer's warranty commences upon the date that materials are delivered, then the manufacturer's warranty period shall be at least five (5) years to meet the requirement stated above.

2. Warranty shall cover repair or replacement of such parts determined defective upon inspection, including the full cost of related materials and labor. Additionally, there shall be no expense to the Owner due to "other-than-normal" working hours.

a. Warranty shall not cover any labor expended or materials used to repair any equipment without manufacturer's prior written authorization.

b. Warranty does not cover any product or part of a product subject to accident, negligence, alteration, abuse or misuse. Warranty does not cover any accessories or parts not supplied under this contract.

3. A service contract shall be offered to the Owner proposing regular or ongoing factory-authorized service of the installed system.

PART 2 - PRODUCTS

2.1 EXISTING FIRE ALARM SYSTEM TO BE MODIFIED

A. Source Limitations for Fire alarm System and Components: Components must be compatible with, and operate as extension of, existing system. Provide system manufacturer's certification that components provided have been tested as, and will operate as, a system.

B. Refer to “SPECIAL CONDITIONS” above.

2.2 FIRE ALARM NOTIFICATION APPLIANCES

A. Fire Alarm Voice/Tone Speaker Notification Appliances:

1. Description: Notification appliances capable of outputting voice evacuation messages.
2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 1480.

b. General Characteristics:

1) Speakers for Voice Notification: Locate speakers for voice notification to provide intelligibility requirements of "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
2) High-Range Units: Rated 2 to 15 W.
3) Low-Range Units: Rated 1 to 2 W.
4) Matching Transformers: Tap range matched to acoustical environment of speaker location.
5) Mounting: Factory finished faceplate, wall-mount or ceiling-mount as indicated on the Drawings; semi-recessed, except where identified as surface mounted on the Drawings; bidirectional, where indicated on the Drawings.
6) Colors:

a) Wall-mounted notification devices shall be white or off-white with red lettering.

b) Ceiling-mounted notification devices shall be white or off-white with red lettering.

c. Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

d. Wet or Damp Location Devices: Provide devices designed for wet and damp location applications or exterior applications wherever devices might be subjected to moisture, such as locker rooms, dishwashing rooms, outdoors, etc.

B. Fire Alarm Visible Notification Appliances:

1. Description: Strobe device with polycarbonate lens mounted on aluminum faceplate:

a. Fire Alarm Notification: Clear polycarbonate lens.

2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 1971.

b. Synchronization: All strobes within a common area must be synchronized.

c. General Characteristics:

1) Rated Light Output:

a) Initial setting shall be assumed to be 110 cd.
b) 15/30/75/110 cd, selectable in field by contractor based upon actual area of required coverage.

2) For units with guards to prevent physical damage, light output ratings must be determined with guards in place.
3) Flashing must be in temporal pattern, synchronized with other units.
4) Strobe Leads: Factory connected to screw terminals.
5) Mounting: Factory finished faceplate, wall-mount or ceiling-mount as indicated on the Drawings; semi-recessed, except where identified as surface mounted on the Drawings.
6) Colors: Match same requirements specified for speaker notification appliances above.

d. Combination Devices: Factory-integrated audible and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

2.3 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. All cabling and wiring associated with the fire alarm system shall be plenum-rated.

C. All cabling and wiring associated with the fire alarm system shall be installed in conduit, unless it is supported open above accessible ceilings entirely concealed from all viewing angles below.

D. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.

E. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multiconductor Armored Cable: NFPA 70 Type MC, copper conductors, TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, UL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EXISTING SYSTEMS

A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document equipment or components not functioning as designed.

B. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

C. Existing Fire alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. When new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire alarm equipment "NOT IN SERVICE" until removed from building.

D. Interruption of Existing Fire alarm Service: Do not interrupt fire alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service in accordance with requirements indicated:

1. Notify Construction Manager and Owner no fewer than seven days in advance of proposed interruption of fire alarm service.
2. Do not proceed with interruption of fire alarm service without Construction Manager's and Owner’s written permission.

3.3 INSTALLATION OF EQUIPMENT

A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire alarm equipment. Install electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before other trades have completed cleanup must be replaced.
2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.

B. Connecting to Existing Equipment: Verify that existing fire alarm system is operational before making changes or connections.

1. Connect new equipment to existing control panel in existing part of building.
2. Connect new equipment to existing monitoring equipment at supervising station.
3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to new points. New components must be capable of merging with existing configuration without degrading performance of either system.

C. Manual Fire Alarm Pull Stations:

1. Install manual fire alarm pull stations in normal path of egress within 5’-0” of exit doorway.
2. Mount manual fire alarm pull station on background of contrasting color.
3. Operable part of manual fire alarm pull station must be between 42- and 48-inches above floor level. Devices must be mounted at same height unless otherwise indicated.

D. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.

E. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

F. Audible Alarm-Indicating Devices: Install wall-mounted devices not less than 6-inches below ceiling. Install devices on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.

G. Visible Alarm-Indicating Devices: Install wall-mounted devices adjacent to audible notification device and at least 6-inches below ceiling. Install devices at same height unless otherwise indicated.

H. Ceiling-Mounted Voice/Tone Notification Speakers: Devices installed in a ceiling grid shall be recessed and positioned at the center of the ceiling tile. Corridor devices shall be mounted in a straight row, unless otherwise indicated.

I. Device Location-Indicating Lights: Locate in public space near device they monitor.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate must be laminated acrylic or melamine plastic signs with black background and engraved white letters at least 1/2-inch high.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

3.6 INSTALLATION OF WIRE AND CABLE

A. Install wiring according to the following:

1. NECA 1.
2. TIA/EIA 568-A.

B. General Requirements:

1. Install cables within raceways per Division 26.
2. Install all cabling within raceways in areas with exposed structure.
3. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
4. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and junction boxes; and terminal cabinets. Cables may not be spliced.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used.

C. System devices and wiring shall be installed in accordance with NEC 110.3(B), 300.11(A), 300.15, and 300.16, including conductors that are terminated, spliced, or interrupted—in which case a junction box or conduit body is required. Wherever a device is mounted in or onto an accessible ceiling, provide a recessed junction box supported by the ceiling grid—not the ceiling tile. The box shall be securely fastened to steel bracing that is designed/listed/labeled to bridge the ceiling grid. Boxes must be provided with cable protection bushings at all open knockouts (NEC 300.16). Cables and raceways shall be supported neither by ceiling grids nor their support wires. Listed and labeled equipment, including all system devices, shall be installed in accordance with instructions included in the listing or labeling (NEC 110.3(B)).

D. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled such that removal of the device is not required to identify the EOL device.

E. Wiring Method: Install wiring in metal raceway according to Division 26 Section “Raceway and Boxes for Electrical Systems.”

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable
2. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
3. Fire-Rated Cables: Use of 2-hour fire-rated fire alarm cables, NFPA 70 Types MI and CI, is permitted.
4. All systems and system components listed to UL864 Control Units for Fire Protective Signaling Systems may be installed within a common conduit raceway system, in accordance with the manufacturer’s recommendations. System components not listed to

the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.

5. Fiber Optic Cable: Only glass filament cable permitted. Plastic filament fiber optic cables are not acceptable. LC connectors shall be used at all equipment terminations.
6. Concrete floors shall be X-rayed prior to core drilling on post tension slabs. Verify with Owner on type of slab prior to bid.

F. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

G. Cables and raceways shall be supported neither by ceiling grids nor their support wires.

H. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

I. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

J. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACU and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 GROUNDING

A. Ground shielded cables at control panel location only. Insulate shield at device location.

3.9 FIELD QUALITY CONTROL

A. Contractor shall confirm whether field tests must be witnessed by the AHJ prior to performing tests.

1. Start-up and certification testing shall be performed by a NICET certified fire alarm technician. State name of technician and certification number on all test reports.

B. Administrant for Tests and Inspections:

1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
2. Administer and perform tests and inspections with assistance of factory-authorized service representative.

C. Tests and Inspections:

1. Testing shall be provided in accordance with NFPA – Chapter 7. Provide reports and documentation per section 7-5.
2. Visual Inspection: Conduct visual inspection prior to testing.

   a. Inspection must be based on completed record drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
   b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.

3. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
4. Test audible appliances for public operating mode in accordance with manufacturer's written instructions. Perform test using portable sound-level meter complying with Type 2 requirements in ASA S1.4 Part 1/IEC 61672-1.
5. Test audible appliances for private operating mode in accordance with manufacturer's written instructions.
6. Test and record voice intelligibility and audibility levels throughout each room or space. Wherever sound levels and intelligibility levels fail to meet or exceed code requirements, make all corrections, and describe measures taken to achieve code compliance.
7. Test visible appliances for public operating mode in accordance with manufacturer's written instructions.
8. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.

E. Fire alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. Annual Test and Inspection: One year after date of Substantial Completion, test fire alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three (3) visits to Project outside normal occupancy hours for this purpose for each building. Include a minimum of 12 hours of on-site labor designated for this purpose plus all necessary travel time and expenses.

B. Annual Test and Inspection: Through the first year after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, semiannual, and annual periods. Use forms developed for initial tests and inspections.

3.11 MAINTENANCE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service must include 12 months of full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies must be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections in accordance with "Visual Inspection Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in "Test Methods" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per "Testing Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.

END OF SECTION 284600

EXHIBIT D: DRAWINGS

Addendum No. 3

HAFT - INTERIOR RENOVATIONS

FASHION INSTITUTE OF TECHNOLOGY

243 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651

01/23/2025

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PROJECT DESCRIPTION

SCOPE: ALTERATIONS TO THE HAFT AUDITORIUM, LOBBY, DRESSING ROOMS, AND PROJECTION ROOM LOCATED IN BUILDING "C" OFTHE F.I.T. CAMPUS

WORK: THE WORK INCLUDES ALTERATIONS TO EXISTING MECHANICAL, ELECTRICAL, AUDIOVISUAL AND FIRE ALARM SYSTEMS AS WELL AS ACCESSIBILITY IMPROVEMENTS, AND REPLACEMENT OF SEATING AND INTERIOR FINISHES. THERE ARE NO CHANGES TO USE GROUP, OCCUPANCY OR MEANS OF EGRESS.

ZONING NOTE: ALL PROPOSED ALTERATIONS WILL BE WITHIN THE BUILDING ENVELOPE.
THERE ARE NO PROPOSED CHANGES TO FLOOR AREA, HEIGHT, SETBACKS, LOT COVERAGE, OPEN SPACE, YARDS, PARKING OR LOADING.

OCCUPANCY CLASSIFICATION

THE HAFT AUDITORIUM IS A PLACE OF ASSEMBLY, CLASSIFIED AS F-1A BY THE 1968 BUILDING CODE OF THE CITY OF NEW YORK. THE AUDITORIUM IS IN AN EDUCATIONAL BUILDING, CLASSIFIED AS G BY THE 1968 CODE OF THE CITY OF NEW YORK. BOTH OCCUPANCY CLASSIFICATIONS ARE GIVEN A FIRE INDEX RATING OF 1 BY TABLE 3-1.

PROJECT CODE REFERENCES

NOTE: THIS IS AN EXISTING BUILDING. PER BC-28-101, THE PROJECT WILL REFERENCE THE 1968 BUILDING CODE OF NEW YORK CITY EXCEPT THAT THE FOLLOWING WILL COMPLY WITH THE CODE.

1. ADMINISTRATION. INCLUDING: FEES, APPROVAL OF CONSTRUCTION DOCUMENTS, ISSUANCE OF PERMITS, ISSUANCE OF CERTIFICATE OF OCCUPANCY, SPECIAL INSPECTIONS, USE OF MATERIALS.
2. ENFORCEMENT, VIOLATIONS, FINES, PENALTIES
3. SAFETY OF PUBLIC AND PROPERTY DURING CONSTRUCTION.
4. MECHANICAL WORK.
5. FIRE PROTECTION WORK.
6. ELEVATORS, CONVEYORS AND AMUSEMENT.

NOTE: THIS PROJECT WILL NOT ALTER THE OCCUPANCY OF THE BUILDING OR ANY PART THEREOF. THE PROJECT DOES NOT INCLUDE ANY PLUMBING OR FUEL GAS WORK AND DOES NOT INCLUDE ANY ENCROACHMENTS INTO THE PUBLIC RIGHT OF WAY.

ADMINISTRATION: THE NEW YORK CITY BUILDING CODE OF THE AND THE 1968 BUILDING CODE OF NEW YORK CITY

BUILDING:
THE NEW YORK CITY BUILDING CODE AND THE 1968 BUILDING CODE BUILDING CODE OF NEW YORK CITY.

MECHANICAL:
THE NEW YORK CITY MECHANICAL CODE,

ELECTRICAL:
THE NEW YORK CITY ELECTRICAL CODE,

ENERGY:
ENERGY CONSERVATION CONSTRUCTION CODE OF NEW YORK STATE; ASHREA 90.1-2007

FIRE PROTECTION:
THE NEW YORK CITY BUILDING CODE (CHAPTER 9) AND THE 1968 BUILDING CODE, NFPA 13, NFPA 13D, NFPA 13R, NFPA 14, NFPA 72

ACCESSIBILITY CODE:
ICC/ANSI A117.1-2003 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES; AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG)

PROJECT DATA

ADDRESS:

FASHION INSTITUTE OF TECHNOLOGY
207 WEST 27TH STREET
NEW YORK, NY 10001-592

PUBLIC ASSEMBLY PERMIT: 104634665
JOB TYPE: ALTERATION TYPE II

INSPECTIONS AND TESTS

PROGRESS INSPECTIONS

-FIRE-RESISTANCE RATED CONSTRUCTION BC 109.3.4
-ENERGY CODE COMPLIANCE BC 109.3.5

FINAL INSPECTIONS

-FIRESTOP, DRAFTSTOP, AND FIREBRICK SYSTEMS BC 1704.25
-FINAL PER DIR14.

NOTES: - TR-1, TR-2 AND TR-7 REQUIRE REPORTS

HAZARDOUS MATERIALS

THE CONTRACTOR SHALL NOTE THAT BOTH ASBESTOS CONTAINING MATERIALS AND SUSPECT ASBESTOS CONTAINING MATERIALS HAVE BEEN IDENTIFIED IN THE VICINITY OF WORK FOR THIS PROJECT. THESE MATERIALS WILL BE REMOVED PRIOR TO THE START OF CONSTRUCTION AND ARE NOT ANTICIPATED TO BE FURTHER IMPACTED BY THE SCOPE OF WORK. THE CONTRACTOR SHALL REFER TO THE REPORT BY EPM TITLED ASBESTOS MATERIAL LOCATION SCHEMATIC PLAN HAFT THEATER AUDITORIUM BUILDING 227 WEST 27TH STREET, NEW YORK, NY 10001 DATED SEPTEMBER 2024 FOR DETAILED INFORMATION FROM THIS HAZARDOUS MATERIALS INVESTIGATION.THE CONTRACTOR SHALL CONTACT EPM-ENVIRONMENTAL PLANNING & MANAGEMENT, INC FOR MORE INFORMATION.

TOM ZABRANSKY, CIEC
TZABRANSKY@EPMCO.COM
516-328-1194 (OFFICE

FIRE SEPARATION(S)

PENETRATIONS OF EXISTING CONSTRUCTION ELEMENTS SHALL BE FIREPROOFED IN ACCORDANCE WITH THE FIRE SEPARATION AND THE CONSTRUCTION CLASSIFICATION TABLES OF THE 1968 BUILDING CODE.

TABLE 5-1 FIRE SEPARATIONS

Key: Fire-resistance ratings are given in hours. For Table 5-1, read above heavy line. For Table 5-2, read below heavy line.
NR—No Requirement

OCCU-PANCY	A	B-1	B-2	C	D-1	D-2	E	F-1a	F-1b	F-2	F-3	F-4	G	H-1	H-2	J-1	J-2	J-3
A	4	4	4	4	4	4	4[a]	4	4	4	4	4	4	4	4	4	4	4
B-1	4	3	NR	1[bc]	NR	NR	1[bc]	1[c]	1[c]	—	1[c]	1[c]	1[c]	1½[c]	1½[c]	1[c]	1[c]	1[c]
B-2	4	3	2	NR	NR	NR	NR	NR	NR	—	NR	NR	NR	NR	NR	NR	NR	NR
C	4	3	2	2	1	NR	NR	NR	NR	—	NR	NR	NR	1	1	1	1	1
D-1	4	3	3	3	3	NR	1[B]	1	1	—	1	1	1	1½	1½	1	1	1
D-2	4	3	2	2	3	2	NR	NR	NR	—	NR	NR	NR	NR	NR	NR	NR	NR
E	4	3	2	2	3	2	2	NR	NR	—	NR	NR	NR	1[B]	1[B]	1[B]	1[B]	1[B]
F-1a	4	3	2	2	3	2	2	2	NR	—	NR	NR	NR	1	1	1	1	1
F-1b	4	3	2	2	3	2	2	2	2	—	NR	NR	NR	1	1	1	1	1
F-2	4	3	2	2	3	2	2	2	2	2	—	—	—	—	—	—	—	—
F-3	4	3	2	2	3	2	2	2	2	2	2	NR	NR	1	1	1	1	1
F-4	4	3	2	2	3	2	2	2	2	2	2	2	NR	1½	1½	1	1	1
G	4	3	2	2	3	2	2	2	2	2	2	2	2	NR	NR	NR	NR	NR
H-1	4	3	2	2	3	2	2	2	2	2	2	2	2	2	NR	1	1	1
H-2	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	1	1	1
J-1	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	NR	NR
J-2	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	NR
J-3	4	3	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2

TABLE 5-2 FIRE DIVISIONS

ENERGY CODE COMPLIANCE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE ENERGY COMPLIANCE CONSTRUCTION CODE OF NEW YORK STATE.

PLEASE NOTE:
1. THE ENERGY ANALYSIS IS INCLUDED ON SHEET E-703.00 SUPPORTING DOCUMENTATION IS AVAILABLE UPON REQUEST

CONSTRUCTION CLASSIFICATION

ARTICLE 15: CONSTRUCTION GROUP I-NONCOMBUSTIBLE
27-277 CONSTRUCTION CLASS I-C.
INCLUDES BUILDINGS AND SPACES IN WHICH THE BEARING WALLS AND OTHER STRUCTURAL ELEMENTS ARE GENERALLY OF TWO-HOUR FIRE RESISTANCE RATING.

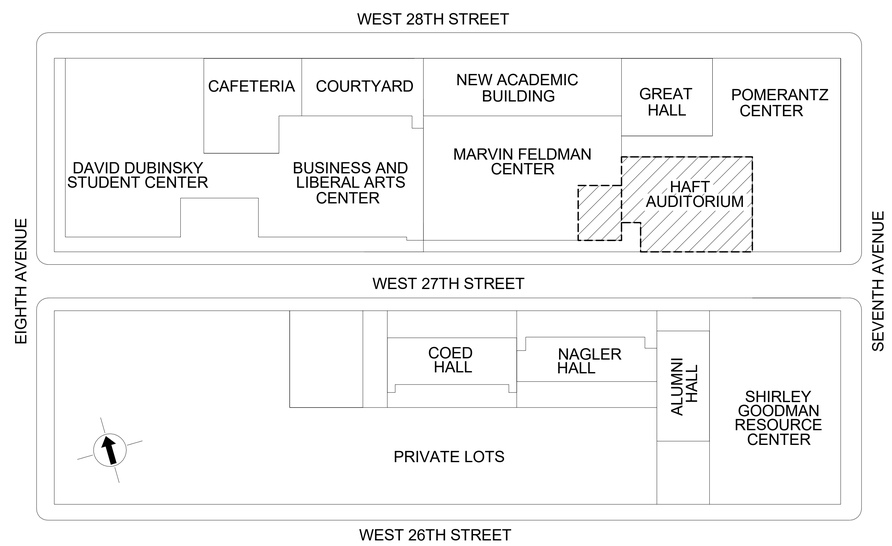
TABLE 3-4 OF THE 1968 BUILDING CODE PROVIDES CLASSIFICATIONS BY COMPONENT AND EXPOSURE.

TABLE 3-4

†TABLE 3-4 CONSTRUCTION CLASSIFICATIONS	CONSTRUCTION ELEMENT		CLASS I-A Rating in Hrs.	CLASS I-A Ext.[a,b] Open'g.	CLASS I-B Rating in Hrs.	CLASS I-B Ext.[a,b] Open'g.	CLASS I-C Rating in Hrs.	CLASS I-C Ext.[a,b] Open'g.	CLASS I-D Rating in Hrs.	CLASS I-D Ext.[a,b] Open'g.	CLASS I-E Rating in Hrs.	CLASS I-E Ext.[a,b] Open'g.
CONSTRUCTION GROUP 1 NONCOMBUSTIBLE	Exterior Walls with in Exterior Separation of: 3'-0" or less	Bearing	4	N.P.	3	N.P.	2	N.P.	2	N.P.	2	N.P.
		Non-bearing[f]	2	—	2	—	2	—	2	—	2	—
	More than 3'-0" but less than 15'-0"	Bearing	4	3 1/3 %	3	3 1/3 %	2	3 1/3 %	2	3 1/3 %	2	6 2/3 %
		Non-bearing[f]	2	protected	2	protected	2	protected	2	protected	2	protected
	15'-0" or more but less than 30'-0"	Bearing	4	3 1/3 %	3	3 1/3 %	2	3 1/3 %	1	3 1/3 %	0	N.L.
		Non-bearing[f]	1½		1½		1		0		0	
	30'-0" or more	Bearing	4	N.L.	3	N.L.	2	N.L.	1	N.L.	0	
		Non-bearing[f]	0		0		0		0		0	
Required fire-resistance ratings of construction elements in hours, based on the test procedures of reference standard RS 3-1.	Interior bearing walls and bearing partitions.		4		3		2		1		0[g,i]	
	[j]Enclosure of vertical ecds[e], exit passageways, hoistways[m] and shafts.		2		2		2		2		2	
	Fire divisions and fire separations.		See Article 5									
Key: N.P.—Not permited N.L.—No limit	Columns[h], girders, trusses (other than roof trusses) and framing.	Supporting one floor	3		2		1½		1		0[g,i]	
		Supporting more than one floor[k]	4		3		2		1		0[g,i]	
	Structural members supporting a wall.		Same as required fire resistance of wall supported, but not less than rating required for member by the class of construction.									
	Floor construction including beams		3		2		1½		1		0[g,i]	
Noncombustible Materials	Roof construction, including beams, trusses and framing, including arches, domes, shells, cable supported roofs and roof decks[l].	1'-9" or less in ht. above floor to lowest member	2		1½		1[c]		1[c]		0[g,i]	
		1'-9" to 20'-0" in ht. above floor to lowest member	2[c] or 1[d,i]		1½[c] or 1[d,i]		1[c]		1[c]		0[g,i]	
		20'-0" or more in ht. above floor to lowest member	2[c] or 0[d,g,i]		1½[c] or 0[d,g,i]		1[c] or 0[d,g,i]		1[c] or 0[d,g,i]		0[g,i]	

SITE PLAN

SCALE: 1/64" = 1'-0"



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GENERAL ABBREVIATIONS

#	NUMBER
&	AND
@	AT
ADA	AMERICANS WITH DISABILITY ACT
ADDN	ADDITION OR ADDITIONAL
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
ALT	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
BLDG	BUILDING
BSMT	BASEMENT
CL	CENTER LINE
CLG	CEILING
CM	CENTIMETER
CONC	CONCRETE
CONN(S)	CONNECTION(S)
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACT(OR)
CTR	CENTER
D	DEPTH
DEG	DEGREE
DEMO	DEMOLISH OR DEMOLITION
DIA	DIAMETER
DIM	DIMENSION
DIV	SPECIFICATION DIVISION
DN	DOWN
DTL	DETAIL
DWG(S)	DRAWING(S)
E	EAST
EA	EACH
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ELEC	ELECTRICAL
ENG	ENGINEER
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
EXST	EXISTING
EXT	EXTERIOR
FIN	FINISHED
FL	FLOOR
FT	FEET
FUT	FUTURE
GC	GENERAL CONTRACTOR
GOVT	GOVERNMENT
H	HEIGHT
HORIZ	HORIZONTAL
HT	HEIGHT
i.e.	THAT IS
IBC	INTERNATIONAL BUILDING CODE
IN	INCH
INT	INTERIOR
LB(S)	POUND(S)
M	METER
MAX	MAXIMUM
MC	MECHANICAL CONTRACTOR
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MM	MILLIMETER
N	NORTH
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OC	ON CENTER
OPP	OPPOSITE
OVHD	OVERHEAD
PAR	PARALLEL
PENT	PENTHOUSE
PLYWD	PLYWOOD
QTY	QUANTITY
REQ(D)	REQUIRE(D)
REV	REVISION(S)
RM	ROOM
RND	ROUND
S	SOUTH
SCHED	SCHEDULE
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SPEC	SPECIFICATION(S)
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SYM	SYMETRICAL
TEMP	TEMPORARY
TYP	TYPICAL
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
W	WEST
W/	WITH
W/O	WITHOUT

ARCHITECTURAL ABBREVIATIONS

A/E	ARCHITECT/ENGINEER
AB	AIR BARRIER
ABS	ASBESTOS
ACC	ADA ACCESSIBLE
ACR	ACRYLIC
ACT	ACOUSTIC CEILING TILE
AD	ACCESS DOOR
ADJ	ADJUSTABLE
ADJT	ADJACENT
ADMIN	ADMINISTRATION
AEC	AUTOMATED EXTERNAL DEFIBRILLATORS
AL	ALUMINUM
ALUM	ALUMINUM
AP	ACCESS PANEL
APC	ACOUSTIC PANEL CEILING
ASPH	ASPHALT
AUTO	AUTOMATIC
AVG	AVERAGE
AWP	ACOUSTIC WALL PANEL
B.O.	BOTTOM OF
BCS	BABY CHANGING STATION
BD	BOARD
BLK	BLOCK
BLKG	BLOCKING
BLKHD	BULKHEAD
BM(S)	BEAM(S)
BOT	BOTTOM
BRDG	BRIDGING
BRG	BEARING
BRKT	BRACKET
BT	BATHTUB
BTWN	BETWEEN
CAB	CABINET
CBD	CHALKBOARD
CER	CERAMIC
CF	CUBIC FEET
CFCI	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
CFMF	COLD-FORMED METAL FRAMING
CG	CLEAR FLOAT GLASS
CGD	CORNER GUARD
CI	CAST IRON
CIG	CLEAR INSULATING GLASS
CIP	CAST IN PLACE
CJ	CONTROL JOINT
CJA	CONTROL JOINT ABOVE
CLO	CLOSET
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
COM	COMMON
COMB	COMBINATION
COMM	COMMUNICATIONS
COMPR	COMPRESSIBLE
CONF	CONFERENCE
CONFIG	CONFIGURATION
CORR	CORRIDOR
CP	COVER PLATE
CPT	CARPET
CR	CHAIR RAIL
CS	COUNTERSINK
CSTJ	CONSTRUCTION JOINT
CSWK	CASEWORK
CT	CERAMIC TILE
CTG	CLEAR TEMPERED FLOAT GLASS
CTIG	CLEAR TEMPERED INSULATING GLASS
CU	COPPER
CU	COMBINATION UNIT
CV	CONDOM VENDOR
CY	CUBIC YARD
CYL	CYLINDER
DB	DECIBEL
DBL	DOUBLE
DC	DUST COLLECTOR
DEPR	DEPRESS(ION)(ED)
DEPT	DEPARTMENT
DET	DETENTION
DF	DRINKING FOUNTAIN
DG	DOOR GRILLE
DIAG	DIAGONAL
DPFG	DAMPROOFING
DR	DOOR
DSN	DOWNSPOUT NOZZLE
DW	DISHWASHER
DWL(S)	DOWEL(S)
DWR	DRAWER
EB	EXPANSION BOLT
EE	EACH END
EEW	EMERGENCY EYE WASH
EEWS	EMERGENCY EYE WASH SHOWER
EFF	EFFICIENCY
EJ	EXPANSION JOINT
ELAS	ELASTOMERIC
ELEV	ELEVATOR
EMER	EMERGENCY
ENCL	ENCLOSURE
ENTR	ENTRANCE
ERF	EPOXY RESIN FLOORING
EUI	ENERGY USE INTENSITY
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EXP	EXPANSION
EXP	EXPOSED
F	FABRIC
F.O.	FACE OF
FAB	FABRICATE(D)
FB	FACE BRICK
FD	FLOOR DRAIN
FDN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF	FINISH FLOOR
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FIG	FIGURE
FIX	FIXTURE
FLASH	FLASHING
FLEX	FLEXIBLE
FLG	FLOORING
FLM	FULL LENGTH MIRROR
FLUOR	FLUORESCENT
FO	FINISH OPENING
FOC	FACE OF CONCRETE
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUD
FOW	FACE OF WALL
FP	FIREPROOFING
FR	FIRE RESISTANT
FRP	FIBERGLASS REINFORCED PANEL
FRT	FIRE RESISTANCE TREATED
FS	FLOOR SINK
FSS	FOLDING SHOWER SEAT
FTG	FOOTING
FVC	FIRE VALVE CABINET
FWC	FABRIC WALL COVERING
G	GROUT
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRAB BAR
GD	GARBAGE DISPOSAL
GEN	GENERAL

GFA	GROSS FLOOR AREA
GL	GLUE LAMINATED
GL	GLASS
GMP	GUARANTEED MAXIMUM PRICE
GR	GUARD RAIL
GR	GRADE
GRS	GALVANIZED RIGID STEEL
GWB	GYPSUM WALL BOARD
GYP	GYPSUM
HC	HOLLOW CORE
HD	HAND DRYER
HDF	HIGH DENSITY FIBERBOARD
HDR	HEADER
HDWD	HARDWOOD
HDWR	HARDWARE
HM	HOLLOW METAL
HR	HOUR
HR	HANDRAIL
HS	HARDWARE SET
HSS	HOLLOW STRUCTURAL SHAPE
HVAC	HEATING VENTILATING AND AIR CONDITIONING
IAW	IN ACCORDANCE WITH
ID	INSIDE DIAMETER
IF	INSIDE FACE
IIP	INSULATED INFILL PANEL GLASS
IJ	ISOLATION JOINT
IJS	IN JOIST SPACE
INC	INCLUDE(ING)
INSUL	INSULATION
JAN	JANITOR
JBE	JOIST BEARING ELEVATION
JBX	JUNCTION BOX
JCT	JUNCTION
JFB	JOINT FILLER BOARD
JST	JOIST
JT	JOINT
KCJ	KEYED CONSTRUCTION JOINT
KD	KNOCKDOWN
KH	KITCHEN HOOD
KIT	KITCHEN
L	ANGLE
LAB	LABORATORY
LAM	LAMINATED
LAV	LAVATORY
LBR	LUMBER
LDG	LOADING
LF	LINEAR FOOT
LG	LENGTH (LONG)
LG	LAMINATED GLASS
LIN	LINEAR
LINO	LINOLEUM
LKR	LOCKER
LOC	LOCATION
LONG	LONGITUDINAL
LSC	LIFE SAFETY CODE
LTG	LIGHTING
LV	LOUVER
LVT	LUXURY VINYL TILE
MAG	MAGNETIC
MAINT	MAINTENANCE
MAN	MANUAL
MAS	MASONRY
MATL	MATERIAL
MB	MOP BASIN
MBD	MARKER BOARD
MBH	MOP/BROOM HOLDER
MC	MEDICINE CABINET
MEMB	MEMBRANE
MH	MANHOLE
MR/S	MIRROR WITH SHELF
MTD	MOUNTED
MTG	MOUNTING
MUL	MULLION
NC	NOISE CRITERIA
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NOM	NOMINAL
O to O	OUT TO OUT
OA	OVERALL
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFF	OFFICE
OFOI	OWNER FURNISHED OWNER INSTALLED
OH	OPPOSITE HAND
OPG(S)	OPENING(S)
OSHA	OPERATIONAL SAFETY AND HEALTH ADMINISTRATION
OTB	OPEN TO BELOW
OVFL	OVERFLOW
P	PAINT
PAN B	PANIC BOLT
PB	PARTICLE BOARD
PC	PRECAST CONCRETE
PCD	PAPER CUP DISPENSER
PCT	PORCELAIN CERAMIC TILE
PD	PANIC DEVICE
PERF	PERFORATED
PERP	PERPENDICULAR
PG	PATTERN GLASS
PIC	PORTABLE INSTRUMENT CONNECTION
PIG	PATTERN INSULATING GLASS
PL	PLATE
PL	PROPERTY LINE
PL	PLASTIC LAMINATE
PLAM	PLASTIC LAMINATE
PLBG	PLUMBING
PR	PAIR
PREFAB	PREFABRICATED
PROJ	PROJECT(OR) (ION)
PS	PROJECTION SCREEN
PT	POINT
PT	POINT OF TANGENCY
PTD	PAPER TOWEL DISPENSER
PTD/R	COMBINATION TOWEL DISPENSER/RECEPTACLE
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PWL	SOUND POWER LEVEL
QGV	QUAD GAS VALVE
QT	QUARRY TILE
QTR RND	QUARTER ROUND
R	RISER
RAD	RADIUS
RB	RUBBER BASE
RC	REMOTE CONTROL
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
REF	REFERENCE
REFL	REFLECTED
REM	REMOVABLE
RESIL	RESILIENT
RF	RESILIENT FLOORING
RF	RUBBER FLOOR
RFM	RECESSED FLOOR MAT
RH	ROBE HOOK
RI&C	ROUGH IN AND CONNECT
S	SINK
SAT	SPRAYED ACOUSTIC TREATMENT
SAW	SOUND ABSORBING WALL UNITS
SB	SPLASH BLOCK
SC	SOLID CORE
SC	SHOWER CURTAIN
SCD	SEAT COVER DISPENSER

SCH	SHOWER CURTAIN HOOK
SCR	SHOWER CURTAIN ROD
SCT	STRUCTURAL CLAY TILE
SD	SOAP DISPENSER
SECY	SECRETARY
SF	SQUARE FEET
SG	SPANDREL GLASS
SG	SPECIALTY GLASS
SGL	SINGLE
SGV	SINGLE GAS VALVE
SH	SHOWER
SHM	SECURITY HOLLOW METAL
SLNT	SEALANT
SM	SHEET METAL
SND	SANITARY NAPKIN DISPOSAL
SNV	SANITARY NAPKIN VENDOR
SO	SENSOR OPERATED
SPL	SOUND PRESSURE LEVEL
SQ	SQUARE
SR	SURFACE MOUNTED ELECTRICAL RACEWAY
SS	SOLID SURFACE
SSA	STORM SHELTER AREA
SSM	SOLID SURFACE
SSS	STAINLESS STEEL SHELF
SST	STAINLESS STEEL
ST	STONE
ST	STAIR
STAG'D	STAGGERED
STC	SOUND TRANSMISSION CLASS
STGR	STRINGER
SUBFL	SUBFLOOR
SUL	SULPHUR
SURF	SURFACE
SUSP	SUSPENDED
SVF	SHEET VINYL FLOORING
SVF	SERVICE FIXTURE
SVG	SERVICE FIXTURE GROUP
T	TREAD
T&G	TONGUE AND GROOVE
T.O.	TOP OF
TAN	TANGENT
TB	TOWEL BAR
TBD	TACK BOARD
TCP	TOILET COMPARTMENT PARTITION
TERR	TERRAZZO
TFG	TINTED FLOAT GLASS
TG	TEMPERED GLASS
TH	THRESHOLD
THK	THICK(NESS)
TI	TENANT IMPROVEMENT
TIG	TINTED INSULATING GLASS
TMR	TILT MIRROR UNIT
TOIL	TOILET
TOP	TOP OF PAVING
TRANS	TRANSVERSE
TT	TERRAZZO TILE
TTD	TOILET TISSUE DISPENSER
TTG	TINTED TEMPERED FLOAT GLASS
TTIG	TINTED TEMPERED INSULATING GLASS
TW	TACK WALL
UL	UNDERWRITERS LABORATORIES
UR	URINAL
US	UTILITY SHELF
UTIL	UTILITY
VB	VAPOR BARRIER
VB	VINYL BASE
VCB	VENTED COVE BASE
VF	VINYL FLOOR
VOC	VOLITILE ORGANIC COMPOUND
VOL	VOLUME
VP	VENEER PLASTER
VT	VINYL TILE
VWC	VINYL WALL COVERING
W	WIDE
WB	WALL BASE
WC	WATER CLOSET
WC	WALL COVERING
WCL	WATER CLOSET/LAVATORY COMBINATION
WD	WOOD
WDF	WOOD FLOORING
WDW	WINDOW
WG	POLISHED WIRE GLASS
WI	WROUGHT IRON
WOM	WALK OFF MAT
WR	WASTE RECEPTACLE
WRB	WEATHER RESISTANT BARRIER
WW	WARM WHITE
WWF	WELDED WIRE FABRIC
YD	YARD

ARCHITECTURAL SYMBOLS

Symbol	Description
? / ???	DETAIL NUMBER CROSS REFERENCE SHEET NUMBER
XX / XX A12.X XX / XX	INTERIOR ELEVATION
? / ??? SIM	SIMILAR OR TYPICAL REFERENCE WALL SECTION
? / ???	DETAIL REFERENCE
X	SHEET NOTE
?	COLUMN GRID LINE
ROOM NAME ???	ROOM NUMBER/NAME
XXX-XX	REVISION NUMBER
LEVEL XX XXX'-XX"	LEVEL ELEVATION
APC-1 — CEILING TYPE 9' - 0" — CEILING HEIGHT	CEILING TYPE
#	PLAN KEYED NOTE
CPT VCT	FLOOR FINISH TRANSITION
	FLOOR MATERIAL DIRECTION
XX-01	FINISH MATERIAL TAG
XX-01	EXTENT OF WALL FINISH, SEE INTERIOR ELEVATION FOR ADDITIONAL INFORMATION
OS	OCCUPANCY SENSOR, SEE ELECTRICAL DRAWINGS
VS	VACANCY SENSOR, SEE ELECTRICAL DRAWINGS
P	FIRE ALARM DEVICE SEE ELECTRICAL DRAWINGS
F	FIRE ALARM DEVICE SEE ELECTRICAL DRAWINGS
	EXIT SIGN, ARROW DENOTES DIRECTION SEE ELECTRICAL DRAWINGS
	SPEAKER SEE AUDIOVISUAL DRAWINGS
AP	24" X 24" ACCESS PANEL

#2

HATCH KEY

- CONCRETE
- STEEL
- CONCRETE MASONRY UNIT
- WOOD (CONTINUOUS BLOCKING)
- WOOD (NON-CONTINUOUS BLOCKING)
- GLASS
- GYPSUM WALL BOARD
- CARPET (LARGE SCALE)
- ACOUSTIC TILE (LARGE SCALE)
- TILE (LARGE SCALE)
- AREA NOT IN CONTRACT (NIC)

GENERAL NOTES

A. GENERAL NOTES APPLY TO ALL SHEETS.
B. DIMENSIONS ARE ACTUAL AND ARE TO FACE OF STUDS, FACE OF CONCRETE WALLS, FACE OF CMU WALLS, FACE OF FRAMES, OR CENTERLINE OF COLUMNS, UNLESS NOTED OTHERWISE.
C. THE OWNER SHALL FURNISH AND INSTALL THE FOLLOWING ITEMS: 1.???, 2. ???
D. INCLUDE ALL OWNER-FURNISHED AND INSTALLED ITEMS AND OWNER-FURNISHED AND CONTRACTOR-INSTALLED ITEMS IN THE CONSTRUCTION SCHEDULE, AND SHALL COORDINATE WITH THE OWNER TO ACCOMMODATE THESE ITEMS.
E. COORDINATE ALL MECHANICAL CHASE SIZES WITH THE MECHANICAL CONTRACTOR.
F. ARCHITECTURAL FINISH FLOOR ELEVATION 0'-0" EQUALS ACTUAL SITE REFERENCE ELEVATION OF FINISH FLOOR ????? FEET.
G. SEE SHEET XX.X FOR LOCATION OF WALLS OF FIRE-RESISTANCE-RATED CONSTRUCTION. ALL WALLS OF FIRE-RESISTANCE-RATED CONSTRUCTION SHALL EXTEND TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE.
H. ALL PENETRATIONS THROUGH WALLS SHALL BE SEALED WITH PENETRATION FIRE STOPPING MATERIAL AS REQUIRED TO ACHIEVE THE RESPECTIVE FIRE-RESISTANCE RATING AND SMOKE STOPPAGE. SEE SPECIFICATION SECTION 078413.
I. COORDINATE WITH MECHANICAL AND ELECTRICAL CONTRACTORS THE SIZE AND LOCATION OF EQUIPMENT PADS SHOWN ON PLANS.
J. FIRE-RESISTANCE-RATED ENCLOSURES AROUND ALL STEEL COLUMNS SHALL BE CONTINUOUS FROM FLOOR TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE FOR EACH LEVEL.
K. CONSTRUCTION DOCUMENTS ARE COMPLEMENTARY. SEE DRAWING FOR QUANTITIES AND LOCATION OF WORK. SEE SPECIFICATIONS FOR QUALITIES AND CONDITIONS OF WORK.
L. WORK: ALL ASPECTS OF THE WORK AND ITEMS NOT SPECIFICALLY MENTIONED, BUT NECESSARY TO MAKE A COMPLETE WORKING INSTALLATION, SHALL BE INCLUDED AND INDICATED IN THE CONTRACTOR'S BID.
M. SHEET NOTES ONLY APPLY TO PARTICULAR DRAWING OR SERIES OF DRAWINGS.
N. NO ASBESTOS OR PCB CONTAINING MATERIALS SHALL BE USED ON THIS PROJECT.
O. DO NOT SCALE DRAWINGS. DIMENSIONS NOTED PREVAIL. NOTIFY ARCHITECT IN CASE OF DISCREPANCY.
P. HORIZONTAL AND VERTICAL DIMENSIONS ARE MINIMUM DIMENSIONS. CLEARANCES ARE GIVEN TO FINISH SURFACES. GC TO VERIFY ALL CLEARANCES. NOTIFY ARCHITECT IN CASE OF DISCREPANCY.

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HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651

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GENERAL NOTES, SYMBOLS AND ABBREVIATIONS

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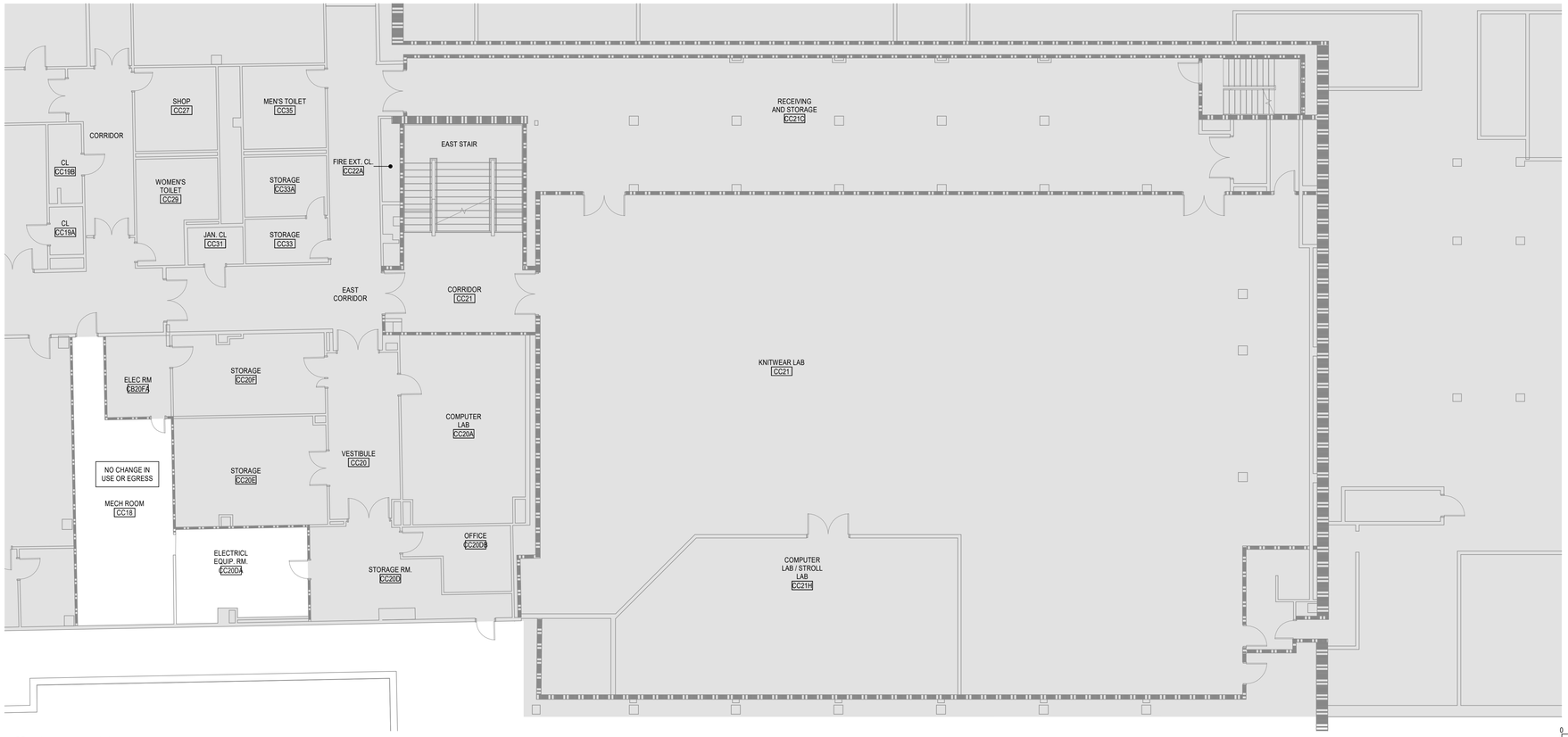
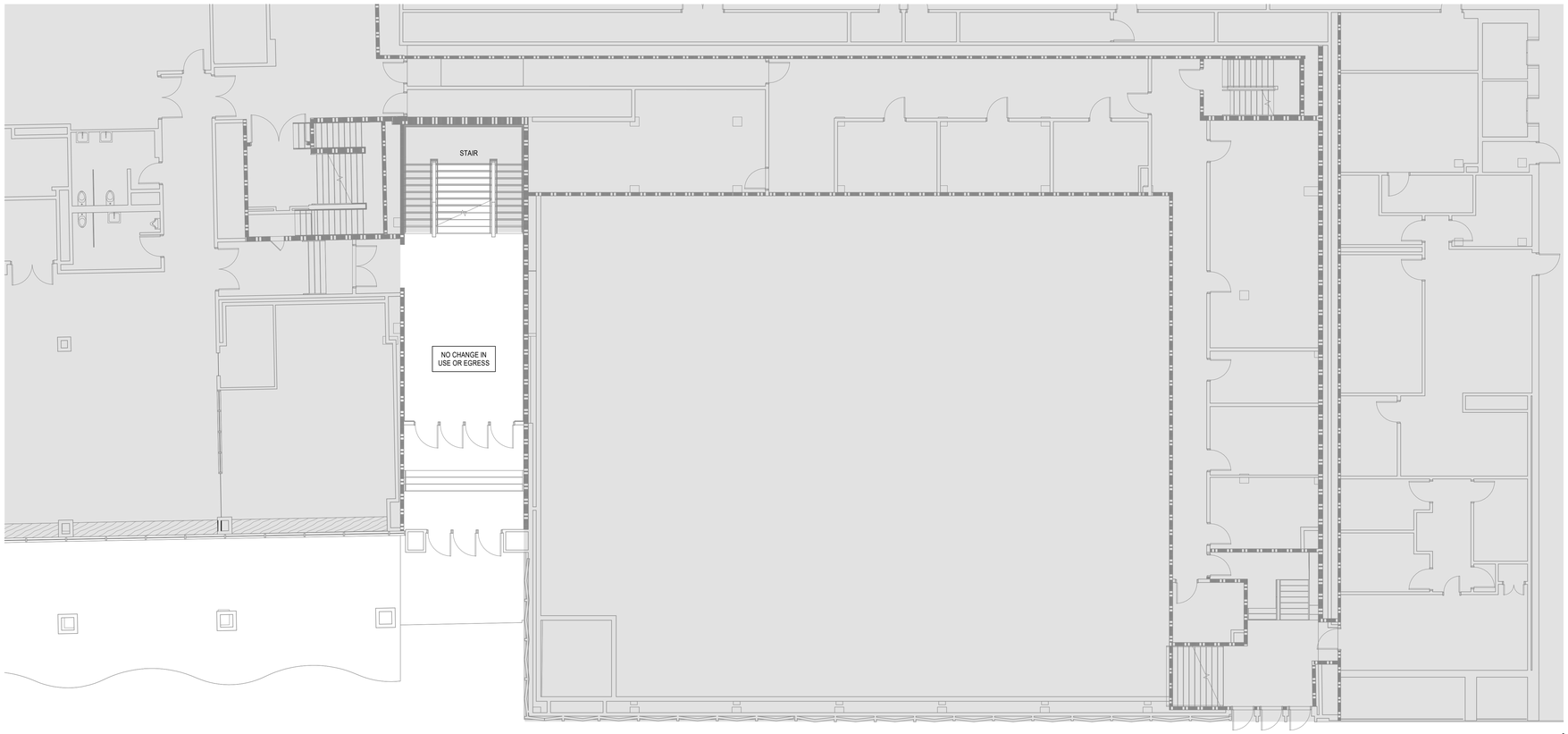


1 CELLAR - CODE PLAN
CP.101.00 SCALE: 1/8" = 1'-0"

0 5 10 20
SCALE: 1/8" = 1'=0"



2 FIRST FLOOR - CODE PLAN
CP.101.00 SCALE: 1/8" = 1'-0"

0 5 10 20
SCALE: 1/8" = 1'=0"

SEPARATION LEGEND

HOURLY RATING
0 = 0 HOUR
.5 = 1/2 HOUR
1 = 1 HOUR
2 = 2 HOUR
3 = 3 HOUR
4 = 4 HOUR
SP = SMOKE PARTITION

CODE PLAN SYMBOLS

PANIC DEVICE AT DOOR
-DOOR FIRE RATING
PD
XX MIN

EXIT SIGN
-ARROW INDICATES DIRECTION

EXIT ACCESS TRAVEL DISTANCE
MAX TRAVEL = Length

COMMON PATH OF EGRESS TRAVEL DISTANCE
MAX CP = Length

MAX OVERALL DIAGONAL DIM OF AREA SERVED
MAX DIAG DIM = X'-X"
1/3 DIAG = X'-X"

MIN EXIT SEPARATION
MIN SEPARATION
DISTANCE = X'-X"

OCCUPANT LOAD TAG
- SEE PATTERN FOR APPLIED LOAD FACTOR
- SELECT FUNCTION OF SPACE FOR AREA
- INPUT CALCULATED OCCUPANT LOAD

Area name		XXXX SF
Space Function		
XXX OCC	XXX SF/OCC	G

OCCUPANT LOAD TAG
- SEE PATTERN FOR APPLIED LOAD FACTOR
- SELECT FUNCTION OF SPACE FOR AREA
- INPUT OCCUPANT LOAD

ROOM NUMBER
###
XXXX SF — AREA (SF)
XXX — OCCUPANT LOAD

OCCUPANT LOAD TAG
- SEE PATTERN FOR APPLIED LOAD FACTOR
- SELECT FUNCTION OF SPACE FOR AREA
- INPUT OCCUPANT LOAD

ROOM NAME
NAME
XXXX SF — AREA (SF)
XXX — OCCUPANT LOAD

EXIT TAG - CUMULATIVE OCCUPANT LOAD & EGRESS CAPACITY

REQUIRED OCCUPANT LOAD
REQUIRED WIDTH FOR OCCUPANT LOAD (INCHES)
1" 0
0" 0
CAPACITY OF EGRESS COMPONENT (WIDTH IN INCHES)
CAPACITY OF EGRESS COMPONENT (OCCUPANTS)
EGRESS CAPACITY FACTOR (INCHES/OCCUPANT)
- WHEN CAPACITY FACTOR TRIANGLE IS FILLED - THIS IS TOTAL OCCUPANT LOAD AT THIS EXIT FROM THIS STORY

OCCUPANCY GROUP PLANS

SINGLE USE OCCUPANCY GROUP TAG
- TAG USED TO INDICATE OCCUPANCY GROUP AND GROSS BUILDING AREA PER STORY IN SF

X-X
150 SF

MIXED-USE OCCUPANCY GROUP TAG
- TAG SEPARATED, NON-SEPARATED, AND ACCESSORY USES

ASSIGNED OCCUPANCY GROUP
OPTIONS:
SEP = SEPARATED
NON = NON-SEPARATED
ACC = ACCESSORY
SEP
X-X
150 SF
PRIMARY OCCUPANCY GROUP FOR NON OR ACC OCCUPANCIES
GROSS BUILDING AREA PER STORY IN SF

OCCUPANCY GROUP PATTERNS

A-1 ASSEMBLY
A-2
A-3
A-4
A-5
B BUSINESS
E EDUCATIONAL
F-1 FACTORY
F-2
H-1 HIGH-HAZARD
H-2
H-3
H-4
H-5
I-1 INSTITUTIONAL
I-2
I-3
I-4
M MERCANTILE
R-1 RESIDENTIAL
R-2
R-3
R-4
S-1 STORAGE
S-2
U UTILITY & MISC

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REGISTERED ARCHITECT
STATE OF NEW YORK

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS

57-23140-00

LEVEL 00 & 01 - CODE PLANS

CP.101.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_AR_24.rvt
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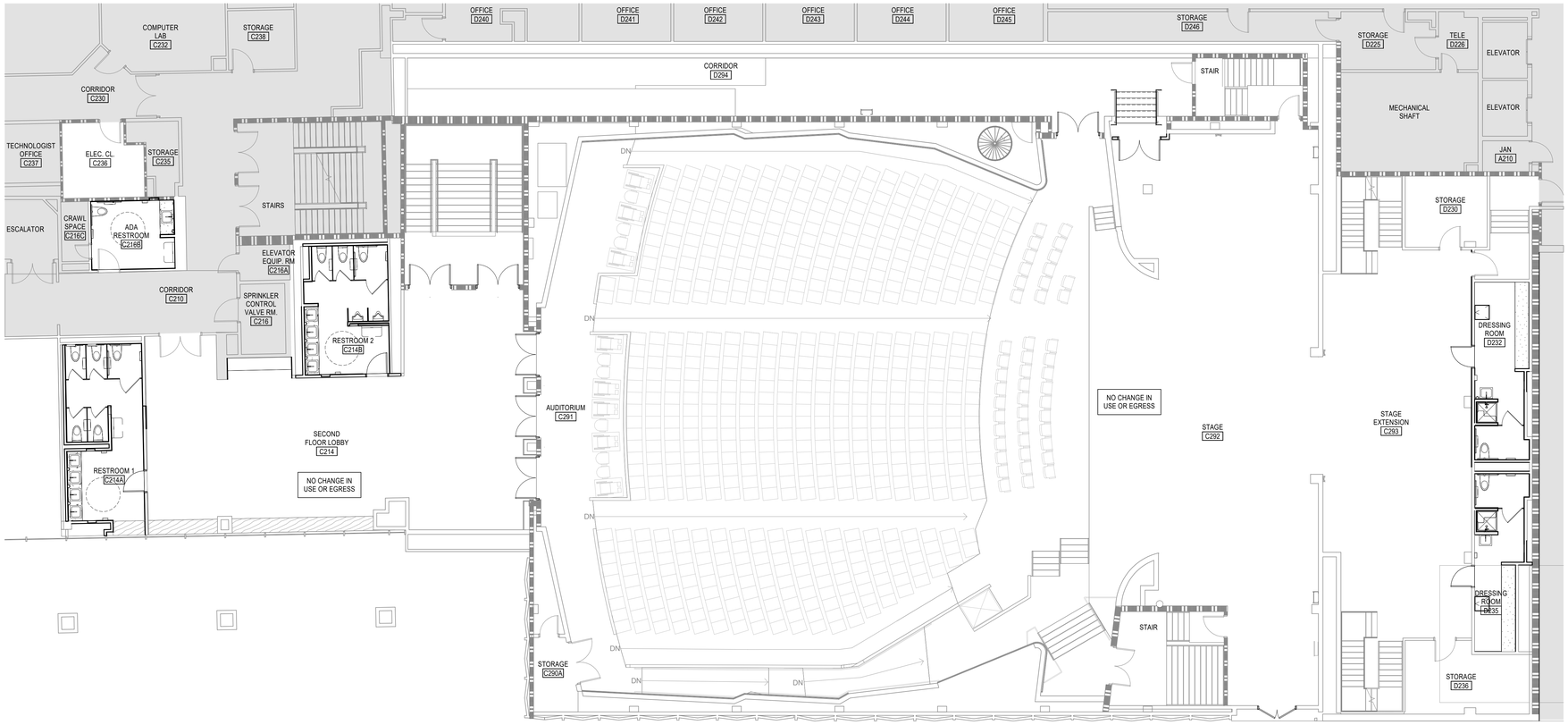

1 SECOND FLOOR - CODE PLAN
CP.102.00 SCALE: 1/8" = 1'-0"

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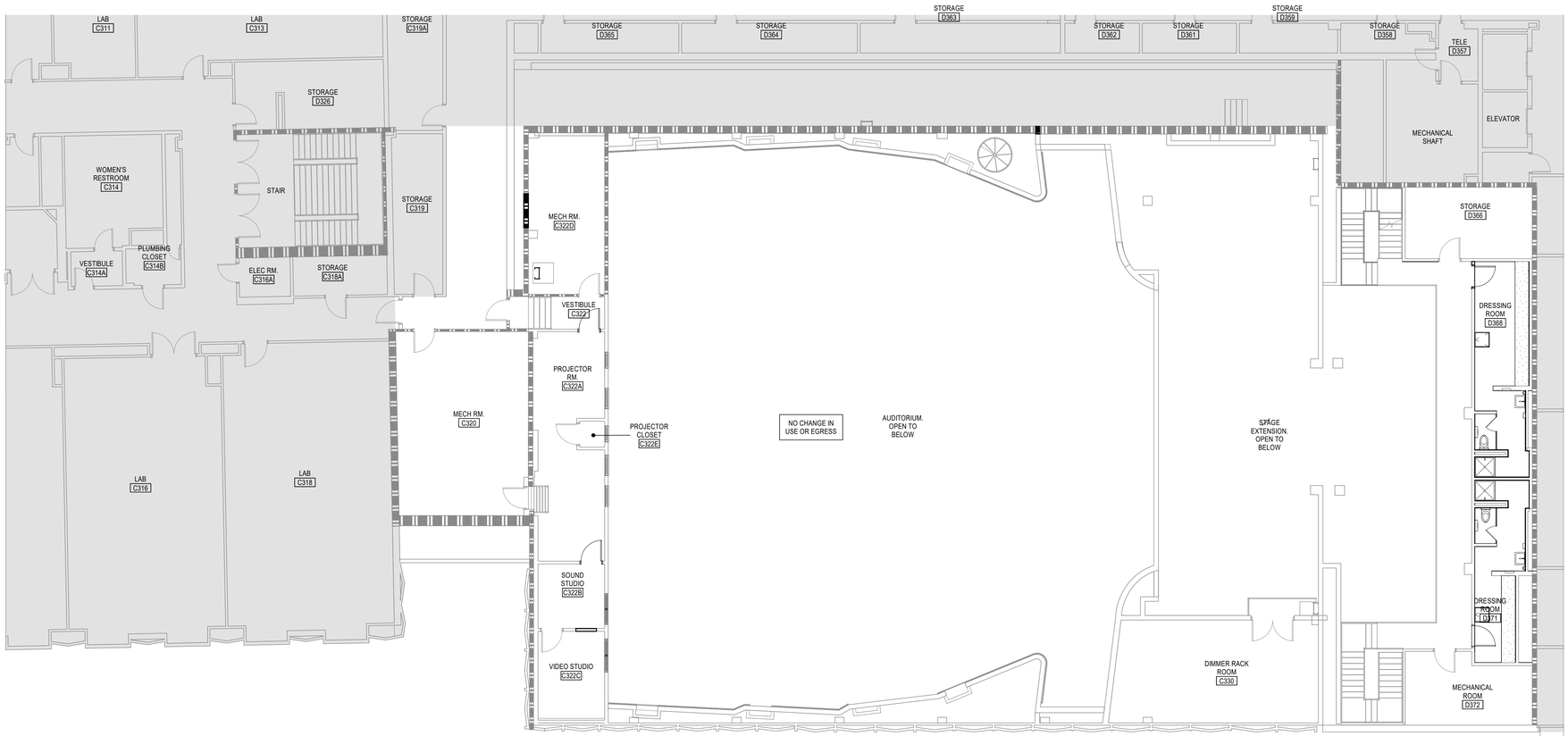
SCALE: 1/8" = 1'=0"



2 THIRD FLOOR - CODE PLAN
CP.102.00 SCALE: 1/8" = 1'-0"

0 5 10 20
SCALE: 1/8" = 1'=0"

SEPARATION LEGEND

HOURLY RATING
0 = 0 HOUR
5 = 1/2 HOUR
1 = 1 HOUR
2 = 2 HOUR
3 = 3 HOUR
4 = 4 HOUR
SP = SMOKE PARTITION

CODE PLAN SYMBOLS

PANIC DEVICE AT DOOR
-DOOR FIRE RATING
PD
XX MIN

EXIT SIGN
-ARROW INDICATES DIRECTION

EXIT ACCESS TRAVEL DISTANCE
MAX TRAVEL = Length

COMMON PATH OF EGRESS TRAVEL DISTANCE
MAX CP = Length

MAX OVERALL DIAGONAL DIM OF AREA SERVED
MAX DIAG DIM = X'-X"
1/3 DIAG = X'-X"

MIN EXIT SEPARATION
MIN SEPARATION DISTANCE = X'-X"

OCCUPANT LOAD TAG
- SEE PATTERN FOR APPLIED LOAD FACTOR
- SELECT FUNCTION OF SPACE FOR AREA
- INPUT CALCULATED OCCUPANT LOAD

Area name		XXXX SF
Space Function		
XXX OCC	XXX SF/OCC	G

OCCUPANT LOAD TAG
- SEE PATTERN FOR APPLIED LOAD FACTOR
- SELECT FUNCTION OF SPACE FOR AREA
- INPUT OCCUPANT LOAD

ROOM NUMBER

XXXX SF — AREA (SF)
XXX — OCCUPANT LOAD

OCCUPANT LOAD TAG
- SEE PATTERN FOR APPLIED LOAD FACTOR
- SELECT FUNCTION OF SPACE FOR AREA
- INPUT OCCUPANT LOAD

ROOM NAME
NAME
XXXX SF — AREA (SF)
XXX — OCCUPANT LOAD

EXIT TAG - CUMULATIVE OCCUPANT LOAD & EGRESS CAPACITY

REQUIRED OCCUPANT LOAD
REQUIRED WIDTH FOR OCCUPANT LOAD (INCHES)
1" 0
0" 0
CAPACITY OF EGRESS COMPONENT (WIDTH IN INCHES)
CAPACITY OF EGRESS COMPONENT (OCCUPANTS)
EGRESS CAPACITY FACTOR (INCHES/OCCUPANT)
- WHEN CAPACITY FACTOR TRIANGLE IS FILLED - THIS IS TOTAL OCCUPANT LOAD AT THIS EXIT FROM THIS STORY

OCCUPANCY GROUP PLANS

SINGLE USE OCCUPANCY GROUP TAG
- TAG USED TO INDICATE OCCUPANCY GROUP AND GROSS BUILDING AREA PER STORY IN SF
X-X
150 SF

MIXED-USE OCCUPANCY GROUP TAG
- TAG SEPARATED, NON-SEPARATED, AND ACCESSORY USES

ASSIGNED OCCUPANCY GROUP
OPTIONS:
SEP = SEPARATED
NON = NON-SEPARATED
ACC = ACCESSORY
SEP
X-X
150 SF
PRIMARY OCCUPANCY GROUP FOR NON OR ACC OCCUPANCIES
GROSS BUILDING AREA PER STORY IN SF

OCCUPANCY GROUP PATTERNS

A-1 ASSEMBLY
A-2
A-3
A-4
A-5
B BUSINESS
E EDUCATIONAL
F-1 FACTORY
F-2
H-1 HIGH-HAZARD
H-2
H-3
H-4
H-5
I-1 INSTITUTIONAL
I-2
I-3
I-4
M MERCANTILE
R-1 RESIDENTIAL
R-2
R-3
R-4
S-1 STORAGE
S-2
U UTILITY & MISC

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS

57-23140-00

LEVEL 02 & 03 - CODE PLAN

CP.102.00

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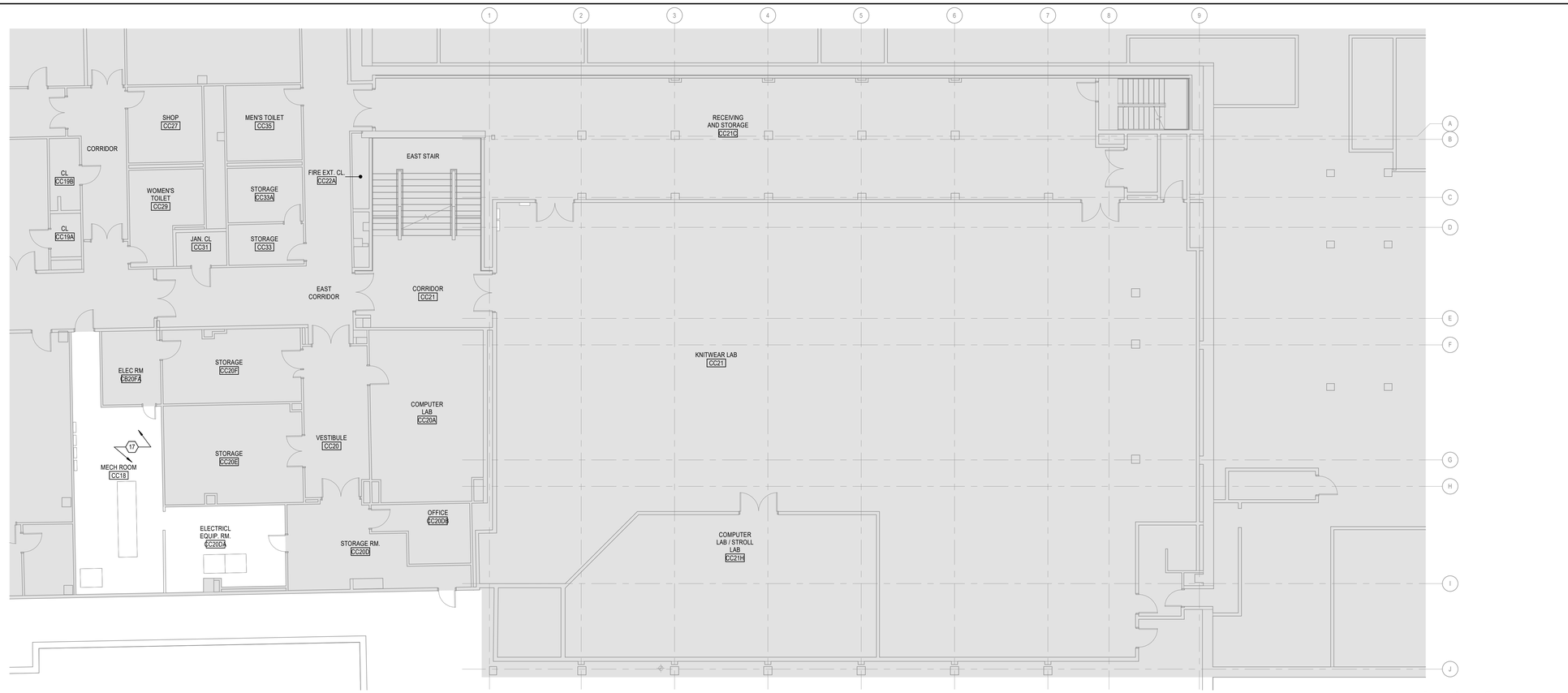
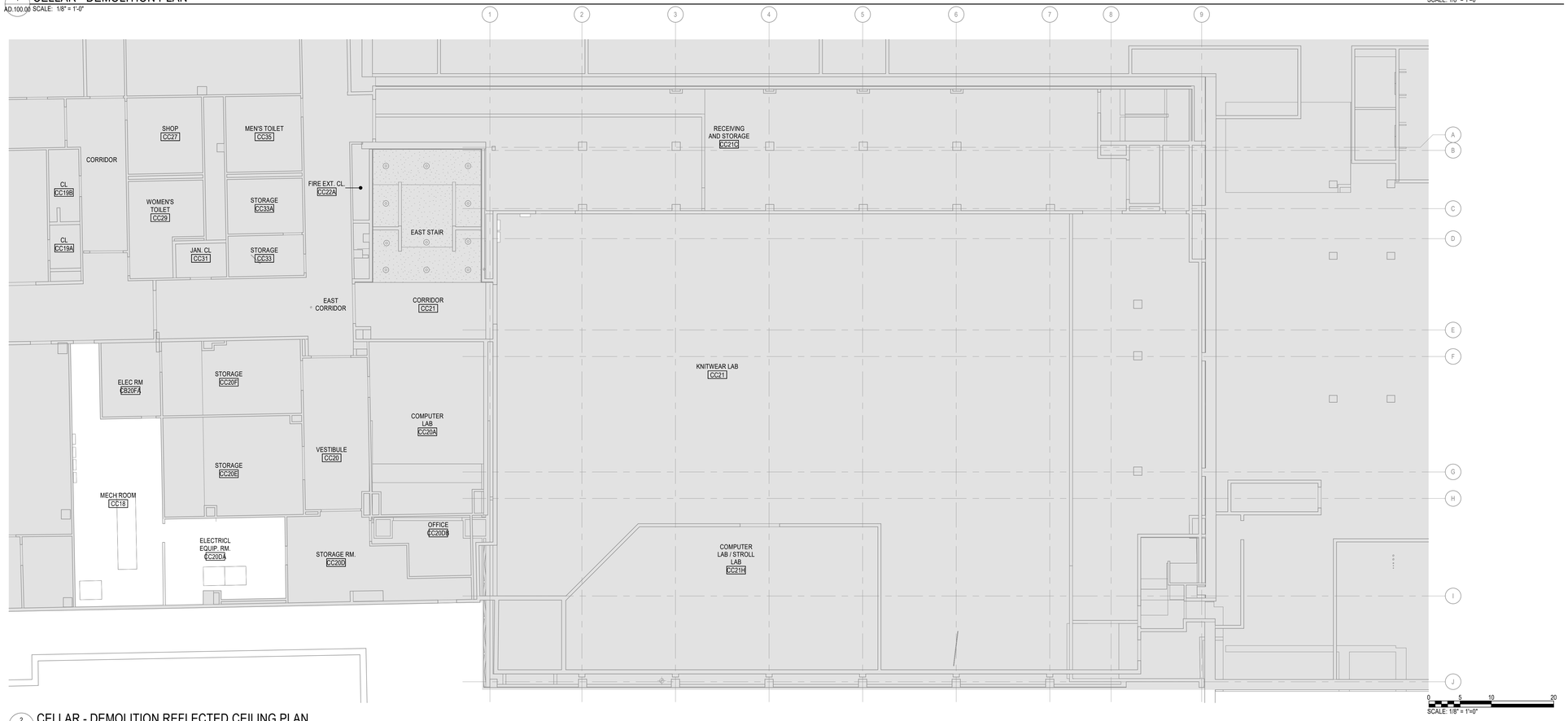


1 CELLAR - DEMOLITION PLAN
AD.100.00 SCALE: 1/8" = 1'-0"



2 CELLAR - DEMOLITION REFLECTED CEILING PLAN
AD.100.00 SCALE: 1/8" = 1'-0"

DEMOLITION GENERAL NOTES

DEMOLITION NOTES APPLY TO ALL DEMOLITION SHEETS.

THE CONTRACTOR SHALL:

A. COORDINATE ALL DEMOLITION AND PHASING EFFORTS WITH THE ARCHITECT AND OWNER'S REPRESENTATIVE. EVERY EFFORT SHALL BE MADE TO MINIMIZE DISRUPTION OF OWNER'S OPERATIONS. EXCESSIVE NOISE OR VIBRATION SHALL BE PRE-APPROVED AND COORDINATED WITH THE OWNER'S REPRESENTATIVE. IN ALL CASES, PROVISIONS SHALL BE MADE FOR USER'S SAFETY.
B. COORDINATE ANY DISRUPTION OF UTILITY SERVICES WITH THE OWNER AND AS SPECIFIED.
C. CONSTRUCT TEMPORARY CONSTRUCTION PARTITIONS WITHIN THE EXISTING BUILDING WHICH OFFER A ONE-HOUR ENCLOSURE TO ISOLATE ANY DEMOLITION/CONSTRUCTION WORK FROM THE GENERAL PUBLIC AND AS DEEMED NECESSARY BY THE OWNER AND CODE OFFICIAL HAVING JURISDICTION. COORDINATE LOCATIONS WITH THE OWNER AND MAINTAIN MEANS OF EGRESS THROUGHOUT THE WORK.
D. MAINTAIN A SECURE, WEATHER-TIGHT ENCLOSURE AT ALL TIMES.
E. VERIFY ALL EXISTING CONDITIONS, DIMENSIONS AND ELEVATIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES.
F. REMOVE IN THEIR ENTIRETY ALL EXISTING WALLS, DOORS, MILLWORK, PLUMBING FIXTURES, CEILINGS, SOFFITS, MARKERBOARDS, AND OTHER ITEMS, AS REQUIRED TO EXECUTE THE DEMOLITION/CONSTRUCTION WORK DESCRIBED BY THE DRAWINGS.
G. THE OWNER SHALL RESERVE THE RIGHT TO SALVAGE ANY MATERIALS.
H. PROVIDE PROTECTION FOR ALL EXISTING BUILDING MATERIALS AND EQUIPMENT FROM DAMAGE DUE TO ANY DEMOLITION OR CONSTRUCTION-RELATED INCIDENT PERFORMED UNDER THIS CONTRACT.
I. REPAIR OR REPLACE ITEMS THAT ARE DAMAGED AS A RESULT OF DEMOLITION OR CONSTRUCTION TO MATCH EXISTING FINISH AND/OR CONDITION.
J. EXISTING MATERIALS SHALL NOT BE REUSED UNLESS NOTED OTHERWISE OR AS AUTHORIZED BY ARCHITECT.
K. VERIFY AND MAINTAIN THE LOCATION OF EXISTING POWER, COMMUNICATION AND DATA CABLES TO PREVENT INTERRUPTION OF THEIR SERVICE.
L. PATCH FLOOR, WALL AND CEILING PENETRATIONS RESULTING FROM REMOVAL OR RE-ROUTING OF NEW OR EXISTING PIPING, DUCTWORK, CONDUIT, AND OTHER ITEMS, AS REQUIRED TO MAINTAIN FIRE-RESISTANCE-RATED SEPARATIONS. FINISH AS REQUIRED FOR NEW OR EXISTING ADJACENT SURFACES.
M. CAP ALL DISCONNECTED MECHANICAL PIPING LINES WITHIN THE WALL OR FLOOR. PATCH AND FINISH AS REQUIRED TO MATCH NEW OR EXISTING ADJACENT SURFACES.
N. SEE MECHANICAL AND ELECTRICAL DRAWINGS AND NOTES FOR FURTHER SEQUENCING AND SCOPE OF WORK.
O. AVOID ANY DISTURBANCE OF SOILS WITHIN THE ZONE OF INFLUENCE AROUND EXISTING FOOTINGS AND FLOOR SLABS AS DIRECTED BY GEOTECHNICAL ENGINEER.
P. WHERE CMU WALLS ARE INDICATED TO BE REMOVED, PREPARE ADJACENT WALLS TO RECEIVE NEW PATCH/FINISH BY REMOVING CMU IN TOOTH-IN PATTERN BOTH SIDES OF DEMOLITION FOR CONTRACTOR TO TOOTH-IN NEW CMU PATCHES.
Q. WHERE PLASTER/STUD WALLS ARE INDICATED TO BE REMOVED, PREPARE ADJACENT WALLS TO RECEIVE NEW PATCH/FINISH BY SAWCUTTING ADJACENT PLASTER FINISH A MINIMUM OF 1'-0" BEYOND DEMOLITION.

1A - FLOOR SHEET NOTES

17 SEE ELECTRICAL DRAWINGS FOR DEMOLITION WORK AT THE ELECTRICAL ROOM.

1B - RCP SHEET NOTES

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS

57-23140-00

LEVEL 00 - DEMOLITION PLAN

AD.100.00

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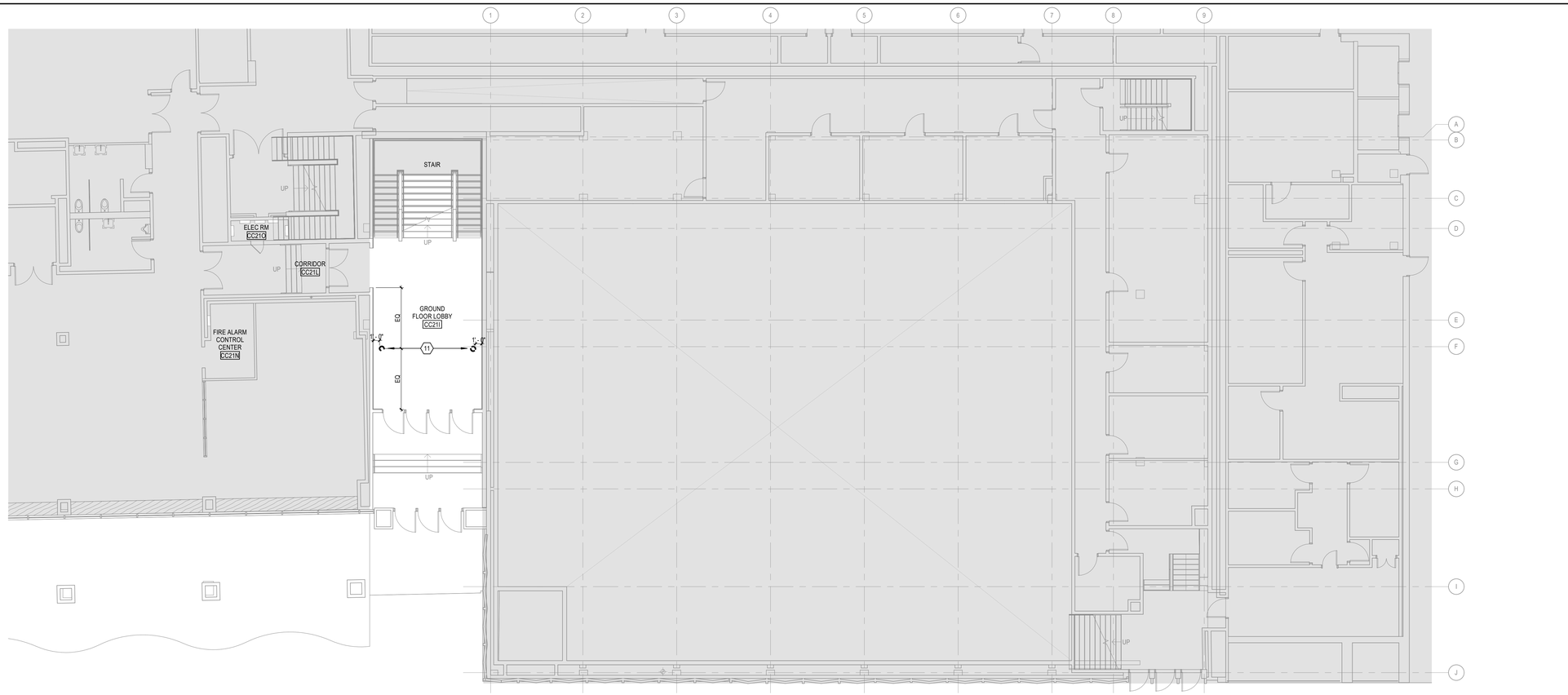
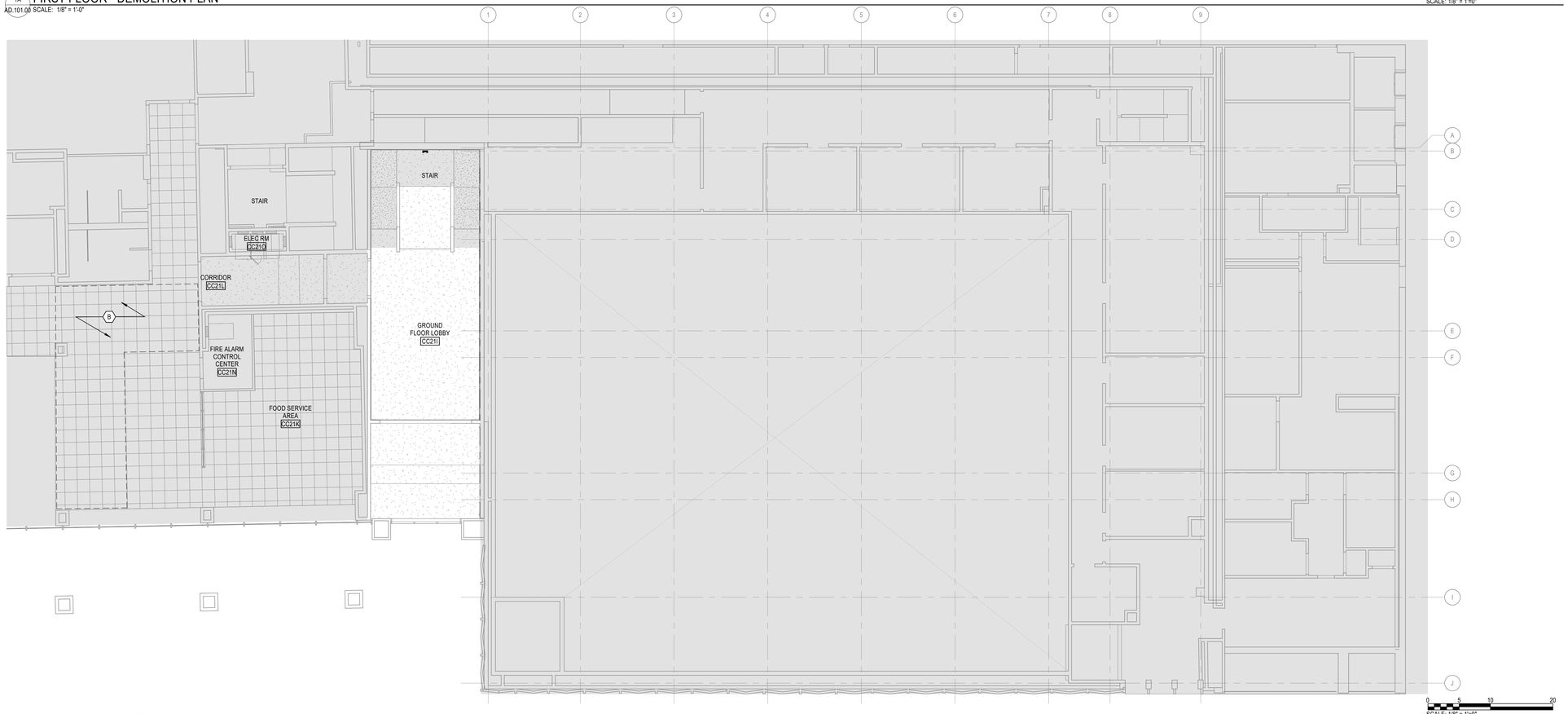


1A FIRST FLOOR - DEMOLITION PLAN
AD.101.00 SCALE: 1/8" = 1'-0"



1B FIRST FLOOR - REFLECTED CEILING DEMOLITION PLAN
AD.101.00 SCALE: 1/8" = 1'-0"

DEMOLITION GENERAL NOTES

DEMOLITION NOTES APPLY TO ALL DEMOLITION SHEETS.

THE CONTRACTOR SHALL:

A. COORDINATE ALL DEMOLITION AND PHASING EFFORTS WITH THE ARCHITECT AND OWNER'S REPRESENTATIVE. EVERY EFFORT SHALL BE MADE TO MINIMIZE DISRUPTION OF OWNER'S OPERATIONS. EXCESSIVE NOISE OR VIBRATION SHALL BE PRE-APPROVED AND COORDINATED WITH THE OWNER'S REPRESENTATIVE. IN ALL CASES, PROVISIONS SHALL BE MADE FOR USER'S SAFETY.
B. COORDINATE ANY DISRUPTION OF UTILITY SERVICES WITH THE OWNER AND AS SPECIFIED.
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D. MAINTAIN A SECURE, WEATHER-TIGHT ENCLOSURE AT ALL TIMES.
E. VERIFY ALL EXISTING CONDITIONS, DIMENSIONS AND ELEVATIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES.
F. REMOVE IN THEIR ENTIRETY ALL EXISTING WALLS, DOORS, MILLWORK, PLUMBING FIXTURES, CEILINGS, SOFFITS, MARKERBOARDS, AND OTHER ITEMS, AS REQUIRED TO EXECUTE THE DEMOLITION/CONSTRUCTION WORK DESCRIBED BY THE DRAWINGS.
G. THE OWNER SHALL RESERVE THE RIGHT TO SALVAGE ANY MATERIALS.
H. PROVIDE PROTECTION FOR ALL EXISTING BUILDING MATERIALS AND EQUIPMENT FROM DAMAGE DUE TO ANY DEMOLITION OR CONSTRUCTION-RELATED INCIDENT PERFORMED UNDER THIS CONTRACT.
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M. CAP ALL DISCONNECTED MECHANICAL PIPING LINES WITHIN THE WALL OR FLOOR. PATCH AND FINISH AS REQUIRED TO MATCH NEW OR EXISTING ADJACENT SURFACES.
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O. AVOID ANY DISTURBANCE OF SOILS WITHIN THE ZONE OF INFLUENCE AROUND EXISTING FOOTINGS AND FLOOR SLABS AS DIRECTED BY GEOTECHNICAL ENGINEER.
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1A - FLOOR SHEET NOTES

11	PROVIDE CORE DRILL OPENING FOR NEW BRASS POKE THROUGH OUTLET. SEE ELECTRICAL DRAWINGS FOR SIZE. GC TO GFR SCAN PRIOR TO CORE DRILLING. GC TO COORDINATE CORE DRILLING ACCESS AND TIME WITH OWNERSHIP

1B - RCP SHEET NOTES

B	REMOVE & REPLACE ACT TILE IN-KIND FOR PLUMBING COORDINATION. COORDINATE WORK AT LOBBY WITH OWNER. SEE PLUMBING DRAWINGS FOR MORE INFORMATION.

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

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LEVEL 01 - DEMOLITION PLAN

AD.101.00

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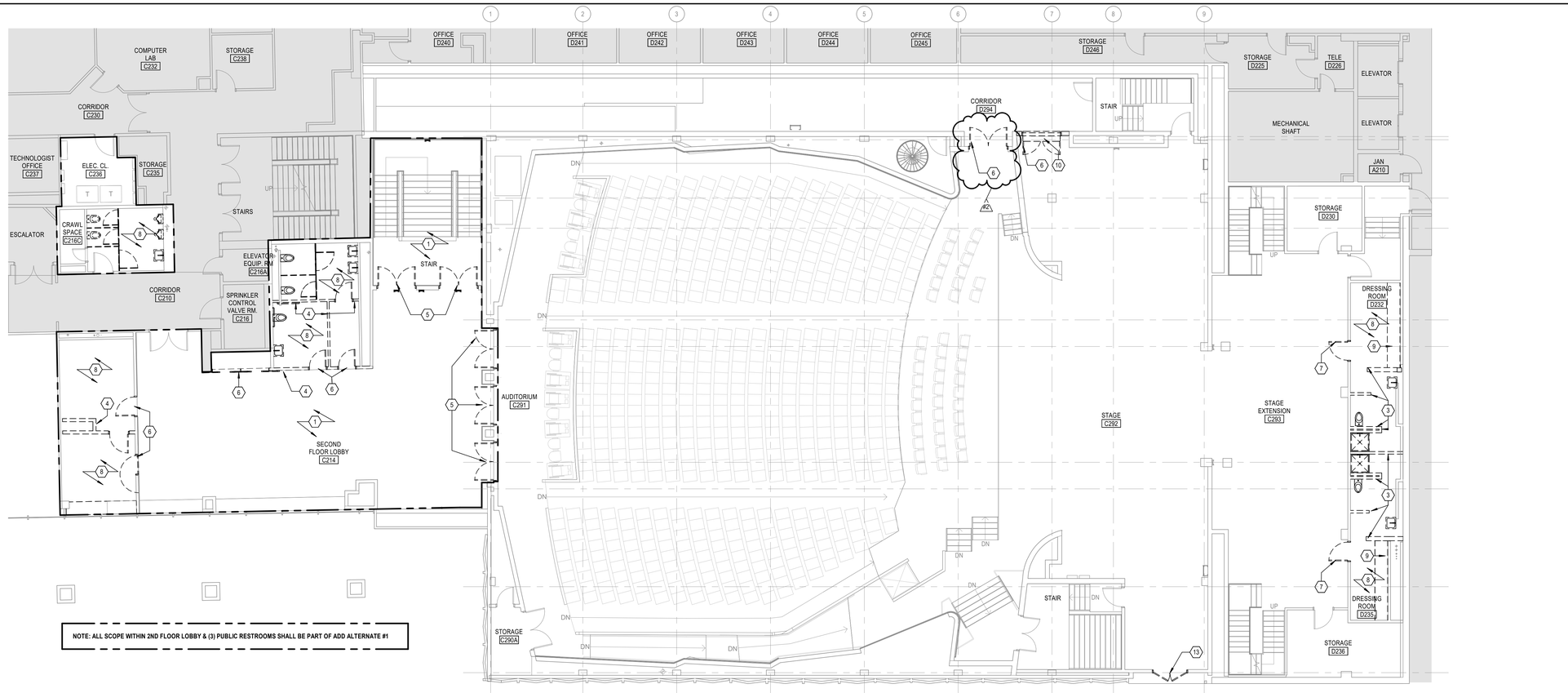
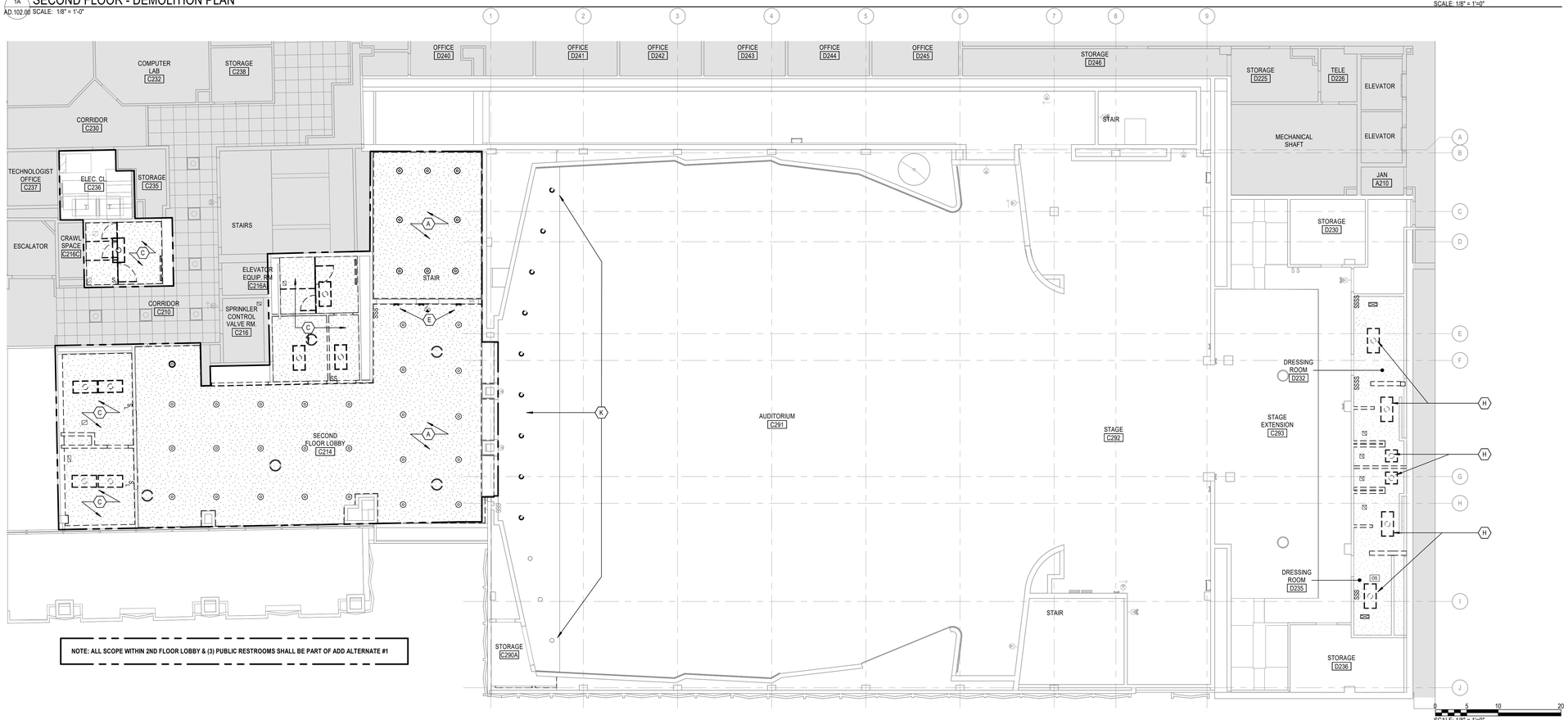


NOTE: ALL SCOPE WITHIN 2ND FLOOR LOBBY & (3) PUBLIC RESTROOMS SHALL BE PART OF ADD ALTERNATE #1

SCALE: 1/8" = 1'-0"

1A SECOND FLOOR - DEMOLITION PLAN
AD.102.00 SCALE: 1/8" = 1'-0"



NOTE: ALL SCOPE WITHIN 2ND FLOOR LOBBY & (3) PUBLIC RESTROOMS SHALL BE PART OF ADD ALTERNATE #1

SCALE: 1/8" = 1'-0"

1B SECOND FLOOR - REFLECTED CEILING DEMOLITION PLAN
AD.102.00 SCALE: 1/8" = 1'-0"

DEMOLITION GENERAL NOTES

DEMOLITION NOTES APPLY TO ALL DEMOLITION SHEETS.

THE CONTRACTOR SHALL:

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D. MAINTAIN A SECURE, WEATHER-TIGHT ENCLOSURE AT ALL TIMES.
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H. PROVIDE PROTECTION FOR ALL EXISTING BUILDING MATERIALS AND EQUIPMENT FROM DAMAGE DUE TO ANY DEMOLITION OR CONSTRUCTION-RELATED INCIDENT PERFORMED UNDER THIS CONTRACT.
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M. CAP ALL DISCONNECTED MECHANICAL PIPING LINES WITHIN THE WALL OR FLOOR. PATCH AND FINISH AS REQUIRED TO MATCH NEW OR EXISTING ADJACENT SURFACES.
N. SEE MECHANICAL AND ELECTRICAL DRAWINGS AND NOTES FOR FURTHER SEQUENCING AND SCOPE OF WORK.
O. AVOID ANY DISTURBANCE OF SOILS WITHIN THE ZONE OF INFLUENCE AROUND EXISTING FOOTINGS AND FLOOR SLABS AS DIRECTED BY GEOTECHNICAL ENGINEER.
P. WHERE CMU WALLS ARE INDICATED TO BE REMOVED, PREPARE ADJACENT WALLS TO RECEIVE NEW PATCH/FINISH BY REMOVING CMU IN TOOTH-IN PATTERN BOTH SIDES OF DEMOLITION FOR CONTRACTOR TO TOOTH-IN NEW CMU PATCHES.
Q. WHERE PLASTER/STUD WALLS ARE INDICATED TO BE REMOVED, PREPARE ADJACENT WALLS TO RECEIVE NEW PATCH/FINISH BY SAWCUTTING ADJACENT PLASTER FINISH A MINIMUM OF 1'-0" BEYOND DEMOLITION.

1A - FLOOR SHEET NOTES

1	ADD ALTERNATE #1 - LOBBY & PUBLIC RESTROOM SCOPE INFORMATION. SEE ENLARGED PLAN ON 01 / A.201.00 FOR MORE INFORMATION
3	DEMOLISH INTERIOR CMU WALLS AT DRESSING ROOM. PATCH CUT BLOCKS TO RECEIVE FRESH COAT OF PAINT. PROTECT ADJACENT CMU BLOCKS TO REMAIN. SEE CONSTRUCTION PLAN FOR WALLS TO REMAIN
4	DEMOLISH INTERIOR WALL. PROTECT ADJACENT WALLS TO REMAIN.
5	COORDINATE DEMOLITION AND REMOVAL OF A.C.M. HOLLOW METAL DOORS AND FRAME WITH OWNER'S ON-CALL CONTRACTOR. PREPARE OPENING TO RECEIVE NEW DOORS AND FRAME IN EXISTING OPENING. PROTECT WALLS TO REMAIN.
6	DEMOLISH HOLLOW METAL DOOR AND FRAME. PROTECT WALLS TO REMAIN.
7	HOLLOW METAL FRAME REMAIN. REMOVE DOOR. SEE CONSTRUCTION PLAN AND DOOR SCHEDULE FOR MORE INFORMATION.
8	GUT BATHROOM DEMOLITION. DEMOLISH RESTROOM FIXTURES, RESTROOM PARTITIONS AND ACCESSORIES. AT SECOND FLOOR, ROUGHINGS TO BE RELOCATED. SEE PLUMBING FOR MORE INFORMATION.
9	DEMOLISH VANITY MILLWORK AND LIGHT FIXTURES.
10	REMOVE (4) COURSES OF BRICK WALL BELOW DOOR SILL. SEE SECTION. SEE DETAIL 1 / A.802.00 FOR MORE INFORMATION
13	DEMOLISH EXTEROIR HOLLOW METAL DOORS AND FRAME FOR NEW EW DOORS AND FRAME IN EXISTING OPENING. PROTECT WALLS TO REMAIN.

1B - RCP SHEET NOTES

A	A.C.M. CEILING DEMOLITION BY OTHERS, INCLUSIVE OF STUDS, FRAMING, BLACK IRON, GYPSUM, LIGHT FIXUTRES, ETC. PROTECT EXISTING WALLS AND COLUMNS
C	REMOVE GYPSUM CEILING. DEMOLITION OF CEILING INCLUSIVE OF STUDS, FRAMING, BLACK IRON, GYPSUM, LIGHT FIXUTRES, DIFFUSERS, ETC. PROTECT EXISTING WALLS TO REMAIN..
E	DEMOLISH EXIT SIGN TO BE REPLACED WITH CEILING MOUNT GLASS BLADE SIGN. SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION.
H	REMOVE LIGHT FIXTURE AND MECHANICAL GRILLES IN DRESSING ROOM. GYPSUM CEILING AT LIGHT FIXTURE LOCATION TO BE PATCHED AND PAINTED. ALL OTHER CEILING AND FRAMING IN DRESSING ROOMS TO REMAIN TO FULLEST EXTENT.
K	CEILING TO REMAIN, FIXTURES TO BE REPLACED. SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION.

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

LEVEL 02 - DEMOLITION PLAN

AD.102.00

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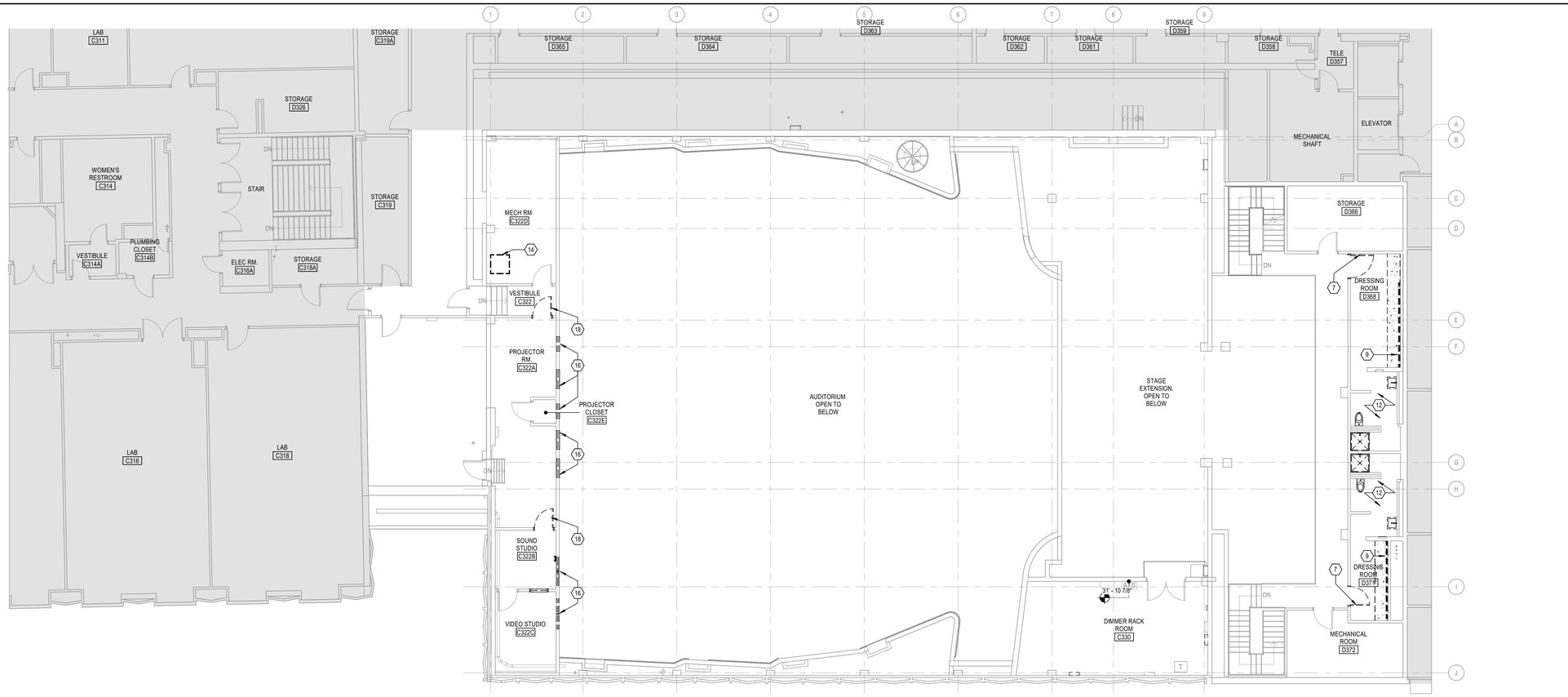
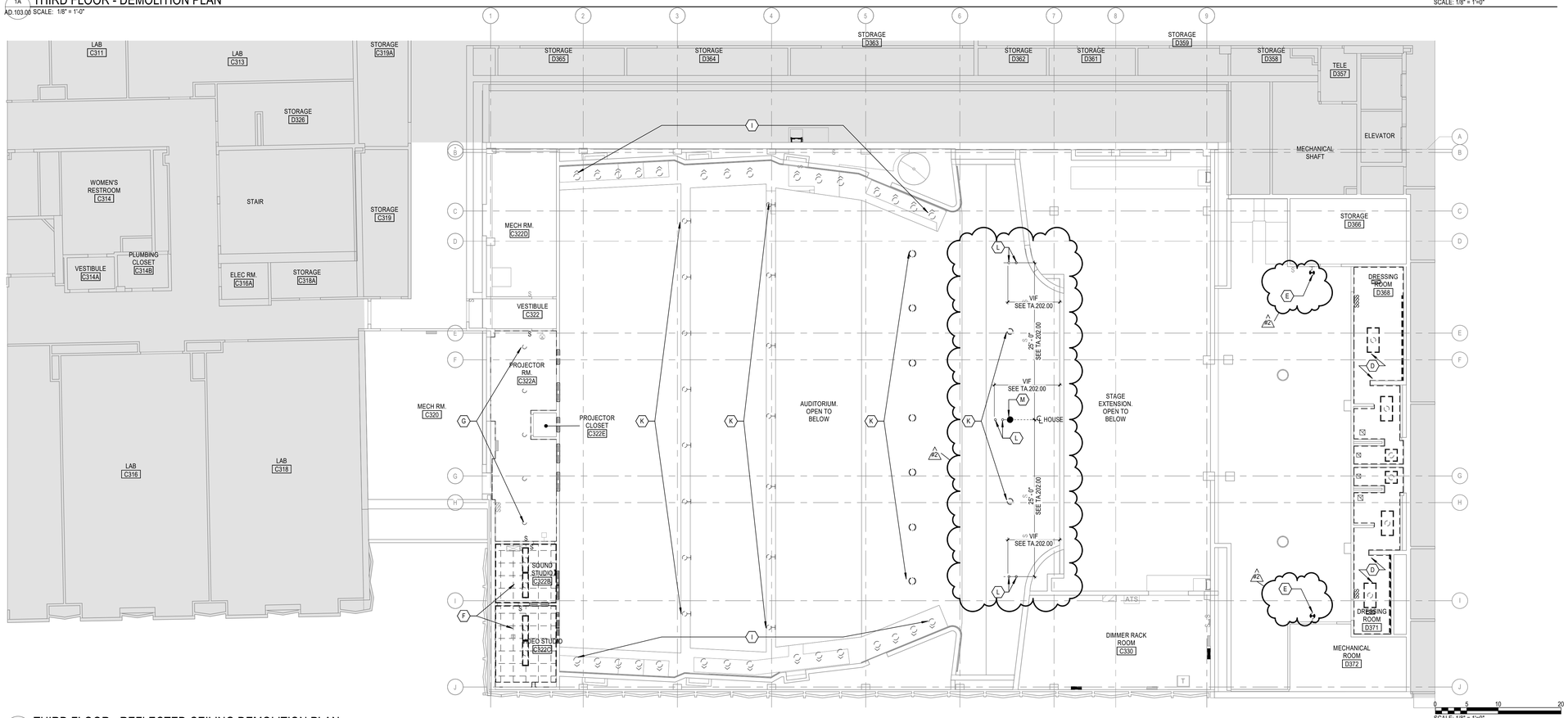


1A THIRD FLOOR - DEMOLITION PLAN
AD.103.00 SCALE: 1/8" = 1'-0"



1B THIRD FLOOR - REFLECTED CEILING DEMOLITION PLAN
AD.103.00 SCALE: 1/8" = 1'-0"

DEMOLITION GENERAL NOTES

DEMOLITION NOTES APPLY TO ALL DEMOLITION SHEETS.

THE CONTRACTOR SHALL:

A. COORDINATE ALL DEMOLITION AND PHASING EFFORTS WITH THE ARCHITECT AND OWNER'S REPRESENTATIVE. EVERY EFFORT SHALL BE MADE TO MINIMIZE DISRUPTION OF OWNER'S OPERATIONS. EXCESSIVE NOISE OR VIBRATION SHALL BE PRE-APPROVED AND COORDINATED WITH THE OWNER'S REPRESENTATIVE. IN ALL CASES, PROVISIONS SHALL BE MADE FOR USER'S SAFETY.
B. COORDINATE ANY DISRUPTION OF UTILITY SERVICES WITH THE OWNER AND AS SPECIFIED.
C. CONSTRUCT TEMPORARY CONSTRUCTION PARTITIONS WITHIN THE EXISTING BUILDING WHICH OFFER A ONE-HOUR ENCLOSURE TO ISOLATE ANY DEMOLITION/CONSTRUCTION WORK FROM THE GENERAL PUBLIC AND AS DEEMED NECESSARY BY THE OWNER AND CODE OFFICIAL HAVING JURISDICTION. COORDINATE LOCATIONS WITH THE OWNER AND MAINTAIN MEANS OF EGRESS THROUGHOUT THE WORK.
D. MAINTAIN A SECURE, WEATHER-TIGHT ENCLOSURE AT ALL TIMES.
E. VERIFY ALL EXISTING CONDITIONS, DIMENSIONS AND ELEVATIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES.
F. REMOVE IN THEIR ENTIRETY ALL EXISTING WALLS, DOORS, MILLWORK, PLUMBING FIXTURES, CEILINGS, SOFFITS, MARKERBOARDS, AND OTHER ITEMS, AS REQUIRED TO EXECUTE THE DEMOLITION/CONSTRUCTION WORK DESCRIBED BY THE DRAWINGS.
G. THE OWNER SHALL RESERVE THE RIGHT TO SALVAGE ANY MATERIALS.
H. PROVIDE PROTECTION FOR ALL EXISTING BUILDING MATERIALS AND EQUIPMENT FROM DAMAGE DUE TO ANY DEMOLITION OR CONSTRUCTION-RELATED INCIDENT PERFORMED UNDER THIS CONTRACT.
I. REPAIR OR REPLACE ITEMS THAT ARE DAMAGED AS A RESULT OF DEMOLITION OR CONSTRUCTION TO MATCH EXISTING FINISH AND/OR CONDITION.
J. EXISTING MATERIALS SHALL NOT BE REUSED UNLESS NOTED OTHERWISE OR AS AUTHORIZED BY ARCHITECT.
K. VERIFY AND MAINTAIN THE LOCATION OF EXISTING POWER, COMMUNICATION AND DATA CABLES TO PREVENT INTERRUPTION OF THEIR SERVICE.
L. PATCH FLOOR, WALL AND CEILING PENETRATIONS RESULTING FROM REMOVAL OR RE-ROUTING OF NEW OR EXISTING PIPING, DUCTWORK, CONDUIT, AND OTHER ITEMS, AS REQUIRED TO MAINTAIN FIRE-RESISTANCE-RATED SEPARATIONS. FINISH AS REQUIRED FOR NEW OR EXISTING ADJACENT SURFACES.
M. CAP ALL DISCONNECTED MECHANICAL PIPING LINES WITHIN THE WALL OR FLOOR. PATCH AND FINISH AS REQUIRED TO MATCH NEW OR EXISTING ADJACENT SURFACES.
N. SEE MECHANICAL AND ELECTRICAL DRAWINGS AND NOTES FOR FURTHER SEQUENCING AND SCOPE OF WORK.
O. AVOID ANY DISTURBANCE OF SOILS WITHIN THE ZONE OF INFLUENCE AROUND EXISTING FOOTINGS AND FLOOR SLABS AS DIRECTED BY GEOTECHNICAL ENGINEER.
P. WHERE CMU WALLS ARE INDICATED TO BE REMOVED, PREPARE ADJACENT WALLS TO RECEIVE NEW PATCH/FINISH BY REMOVING CMU IN TOOTH-IN PATTERN BOTH SIDES OF DEMOLITION FOR CONTRACTOR TO TOOTH-IN NEW CMU PATCHES.
Q. WHERE PLASTER/STUD WALLS ARE INDICATED TO BE REMOVED, PREPARE ADJACENT WALLS TO RECEIVE NEW PATCH/FINISH BY SAWCUTTING ADJACENT PLASTER FINISH A MINIMUM OF 1'-0" BEYOND DEMOLITION.

1A - FLOOR SHEET NOTES

7	HOLLOW METAL FRAME REMAIN. REMOVE DOOR. SEE CONSTRUCTION PLAN AND DOOR SCHEDULE FOR MORE INFORMATION.
9	DEMOLISH VANITY, MILLWORK AND LIGHT FIXTURES.
12	AT 3RD FLOOR DRESSING ROOM. DEMOLISH RESTROOM FIXTURES. ROUGHINGS TO REMAIN. DEMOLISH RESTROOM PARTITIONS AND ACCESSORIES. ALL WALLS TO REMAIN
14	PROVIDE 3'-0" X 3'-0" OPENING IN SLAB ABOVE FOR NEW CAGE LADDER AND HATCH. SEE DRAWING 6 / A.802.00 FOR MORE INFORMATION.
16	SHUTTER TO REMAIN. PREPARE OPENING TO RECEIVE NEW WINDOW. SEE A.303.00 FOR MORE INFORMATION.
18	HM FRAME REMAINS. REMOVE DOOR. SEE CONSTRUCITON PLAN, DOOR SCHEDULE, AND ACCESS CONTROL (TE) FOR NEW SECURITY DEVICES.

1B - RCP SHEET NOTES

D	REMOVE GYPSUM CEILING. DEMOLITION OF CEILING INCLUSIVE OF STUDS, FRAMING, BLACK IRON, GYPSUM, LIGHT FIXUTRES, DIFFUSERS, ETC. PROTECT EXISTING WALLS TO REMAIN. SEE SPRINKLER DRAWINGS FOR SPRINKLER HEADS
E	DEMOLISH EXIT SIGN TO BE REPLACED WITH CEILING MOUNT GLASS BLADE SIGN. SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION.
F	REMOVE CEMENTITOUS CEILING, FIXTURES, SMOKE ALARM & MECHANICAL GRILLES FOR NEW ACT CEILING. SEE MECHANICAL AND ELECTRICAL DRAWINGS FOR MORE INFORMATION.
G	REMOVE LIGHT FIXTURE IN PROJECTION ROOM TO BE REPLACED WITH NEW FIXTURES.
I	REMOVE WALL WASHER LIGHT FIXTURE FOR NEW FIXTURE, PROTECT PLYWOOD HOUSING AND CEILING BELOW TO REMAIN. SEE ELECTRICAL FOR NEW FIXTURE.
K	CEILING TO REMAIN, FIXTURES TO BE REPLACED. SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION.
L	REMOVE PORTION OF CEILING FOR NEW SPEAKER GROMMET. SEE TA.202.00 FOR LOCATION. SEE DETAIL #12 / A.801.00 FOR CEILING SCOPE.
M	FIXTURE TO BE REMOVED. SEE DETAIL #12 / A.801.00

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REGISTERED ARCHITECT
STEVEN M. HAFT
STATE OF NEW YORK
031920

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

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LEVEL 03 - DEMOLITION PLAN

AD.103.00

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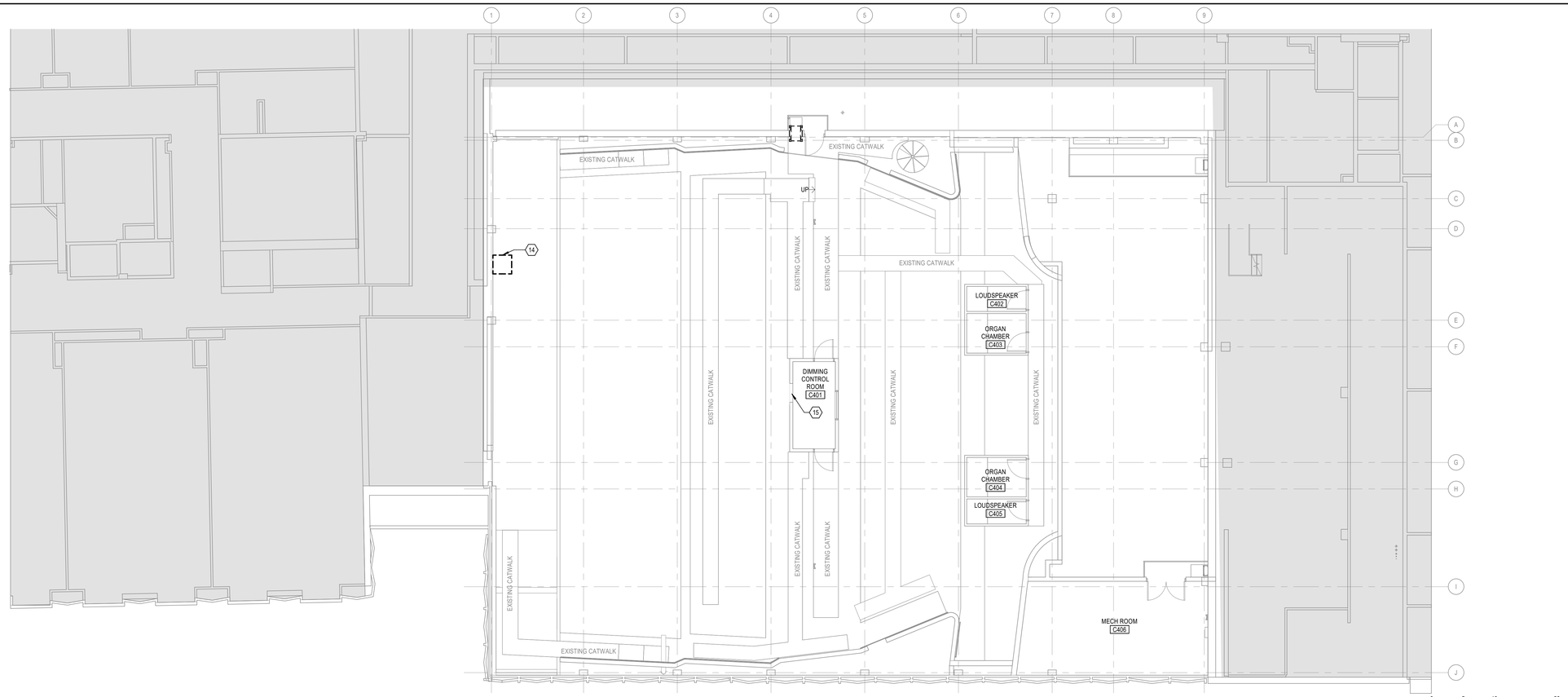

1 THIRD FLOOR MEZZANINE - DEMOLITION PLAN
AD.103M.00 SCALE: 1/8" = 1'-0"

DEMOLITION GENERAL NOTES

DEMOLITION NOTES APPLY TO ALL DEMOLITION SHEETS.

THE CONTRACTOR SHALL:

A. COORDINATE ALL DEMOLITION AND PHASING EFFORTS WITH THE ARCHITECT AND OWNER'S REPRESENTATIVE. EVERY EFFORT SHALL BE MADE TO MINIMIZE DISRUPTION OF OWNER'S OPERATIONS. EXCESSIVE NOISE OR VIBRATION SHALL BE PRE-APPROVED AND COORDINATED WITH THE OWNER'S REPRESENTATIVE. IN ALL CASES, PROVISIONS SHALL BE MADE FOR USER'S SAFETY.
B. COORDINATE ANY DISRUPTION OF UTILITY SERVICES WITH THE OWNER AND AS SPECIFIED.
C. CONSTRUCT TEMPORARY CONSTRUCTION PARTITIONS WITHIN THE EXISTING BUILDING WHICH OFFER A ONE-HOUR ENCLOSURE TO ISOLATE ANY DEMOLITION/CONSTRUCTION WORK FROM THE GENERAL PUBLIC AND AS DEEMED NECESSARY BY THE OWNER AND CODE OFFICIAL HAVING JURISDICTION. COORDINATE LOCATIONS WITH THE OWNER AND MAINTAIN MEANS OF EGRESS THROUGHOUT THE WORK.
D. MAINTAIN A SECURE, WEATHER-TIGHT ENCLOSURE AT ALL TIMES.
E. VERIFY ALL EXISTING CONDITIONS, DIMENSIONS AND ELEVATIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES.
F. REMOVE IN THEIR ENTIRETY ALL EXISTING WALLS, DOORS, MILLWORK, PLUMBING FIXTURES, CEILINGS, SOFFITS, MARKERBOARDS, AND OTHER ITEMS, AS REQUIRED TO EXECUTE THE DEMOLITION/CONSTRUCTION WORK DESCRIBED BY THE DRAWINGS.
G. THE OWNER SHALL RESERVE THE RIGHT TO SALVAGE ANY MATERIALS.
H. PROVIDE PROTECTION FOR ALL EXISTING BUILDING MATERIALS AND EQUIPMENT FROM DAMAGE DUE TO ANY DEMOLITION OR CONSTRUCTION-RELATED INCIDENT PERFORMED UNDER THIS CONTRACT.
I. REPAIR OR REPLACE ITEMS THAT ARE DAMAGED AS A RESULT OF DEMOLITION OR CONSTRUCTION TO MATCH EXISTING FINISH AND/OR CONDITION.
J. EXISTING MATERIALS SHALL NOT BE REUSED UNLESS NOTED OTHERWISE OR AS AUTHORIZED BY ARCHITECT.
K. VERIFY AND MAINTAIN THE LOCATION OF EXISTING POWER, COMMUNICATION AND DATA CABLES TO PREVENT INTERRUPTION OF THEIR SERVICE.
L. PATCH FLOOR, WALL AND CEILING PENETRATIONS RESULTING FROM REMOVAL OR RE-ROUTING OF NEW OR EXISTING PIPING, DUCTWORK, CONDUIT, AND OTHER ITEMS, AS REQUIRED TO MAINTAIN FIRE-RESISTANCE-RATED SEPARATIONS. FINISH AS REQUIRED FOR NEW OR EXISTING ADJACENT SURFACES.
M. CAP ALL DISCONNECTED MECHANICAL PIPING LINES WITHIN THE WALL OR FLOOR. PATCH AND FINISH AS REQUIRED TO MATCH NEW OR EXISTING ADJACENT SURFACES.
N. SEE MECHANICAL AND ELECTRICAL DRAWINGS AND NOTES FOR FURTHER SEQUENCING AND SCOPE OF WORK.
O. AVOID ANY DISTURBANCE OF SOILS WITHIN THE ZONE OF INFLUENCE AROUND EXISTING FOOTINGS AND FLOOR SLABS AS DIRECTED BY GEOTECHNICAL ENGINEER.
P. WHERE CMU WALLS ARE INDICATED TO BE REMOVED, PREPARE ADJACENT WALLS TO RECEIVE NEW PATCH/FINISH BY REMOVING CMU IN TOOTH-IN PATTERN BOTH SIDES OF DEMOLITION FOR CONTRACTOR TO TOOTH-IN NEW CMU PATCHES.
Q. WHERE PLASTER/STUD WALLS ARE INDICATED TO BE REMOVED, PREPARE ADJACENT WALLS TO RECEIVE NEW PATCH/FINISH BY SAWCUTTING ADJACENT PLASTER FINISH A MINIMUM OF 1'-0" BEYOND DEMOLITION.

1A - FLOOR SHEET NOTES

14	PROVIDE 3'-0" X 3'-0" OPENING IN SLAB ABOVE FOR NEW CAGE LADDER AND HATCH. SEE DRAWING 6 / A.802.00 FOR MORE INFORMATION.
15	REMOVE WALL AC UNIT. PREPARE CMU TO BE FILLED WITH NEW COURSES.

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

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LEVEL 03 MEZZANINE - DEMOLITION PLAN

AD.103M.00

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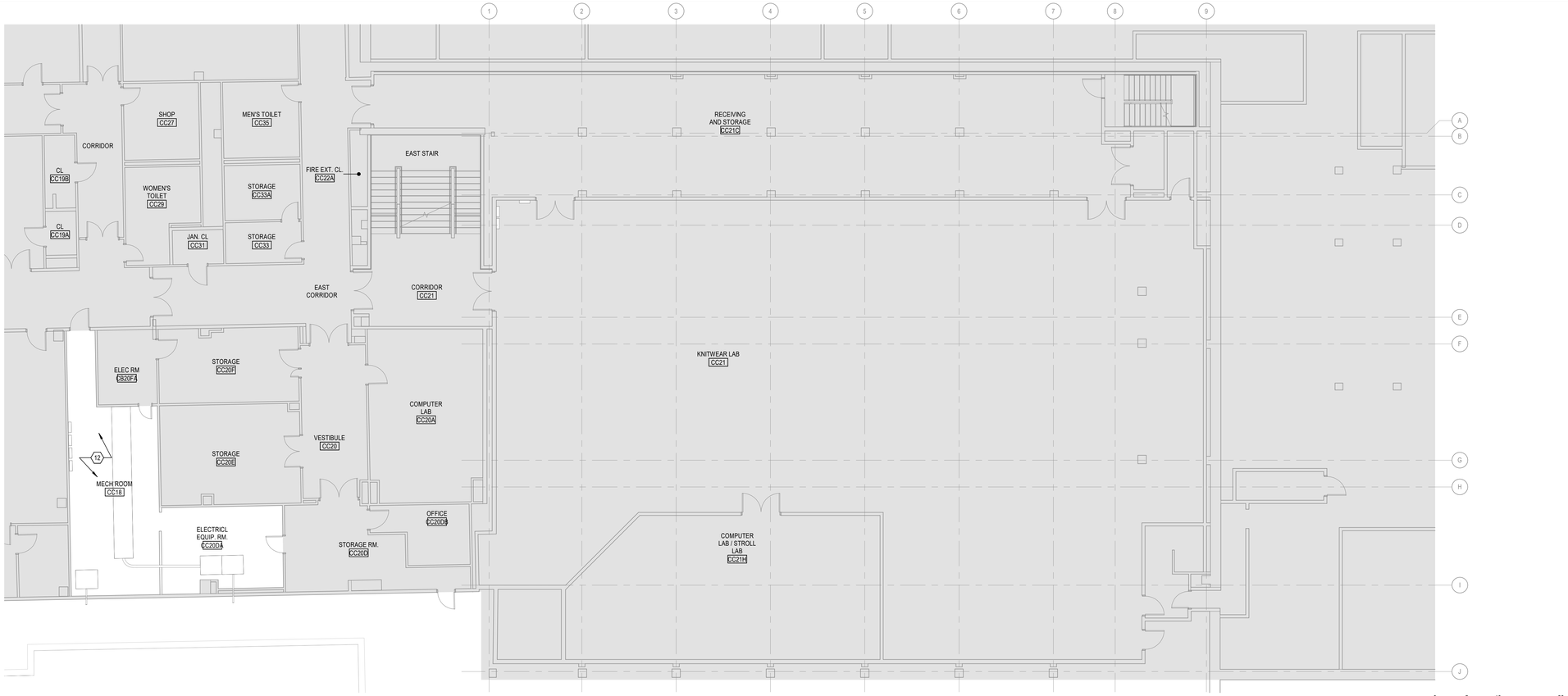
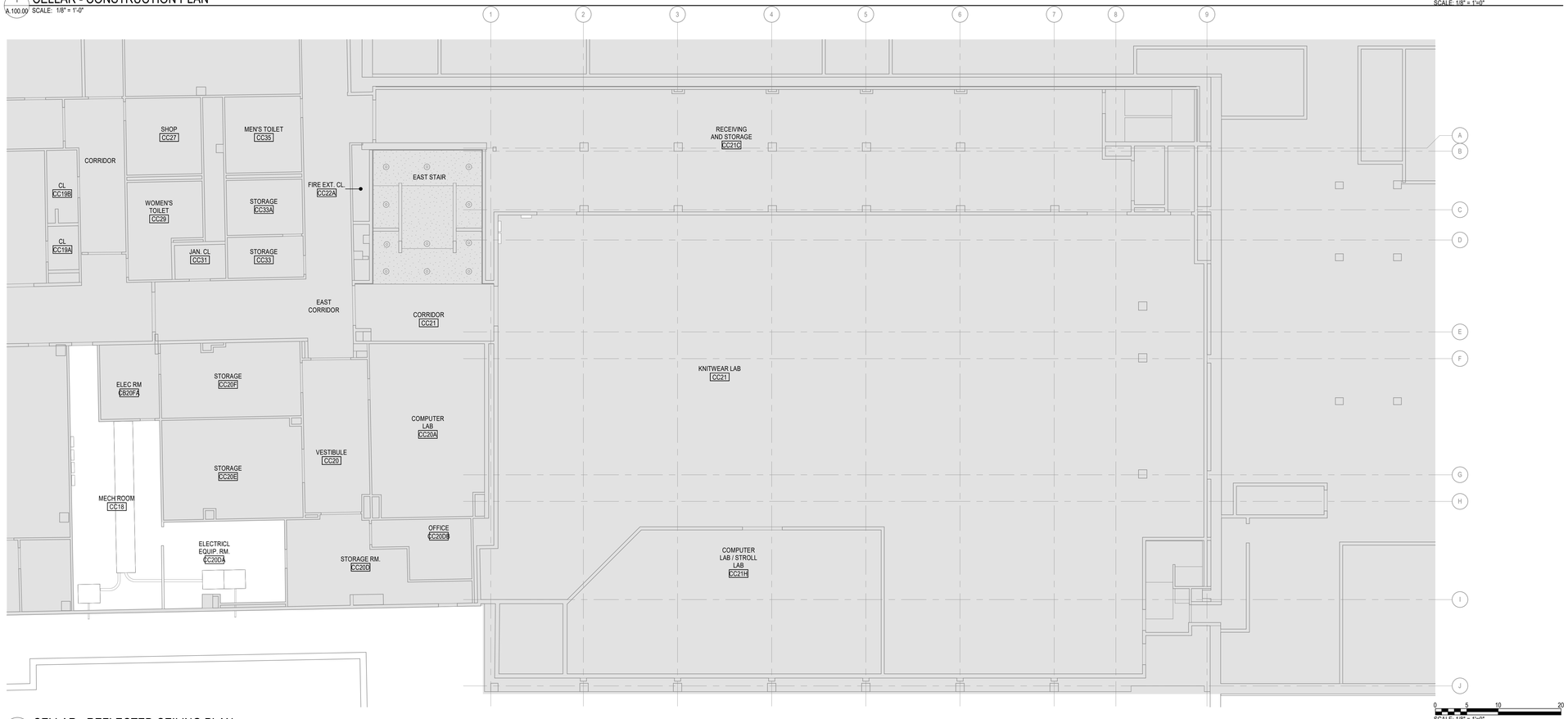


1 CELLAR - CONSTRUCTION PLAN
A.100.00 SCALE: 1/8" = 1'-0"



2 CELLAR - REFLECTED CEILING PLAN
A.100.00 SCALE: 1/8" = 1'-0"

GENERAL ARCHITECTURAL NOTES

1. ALL INTERIOR CMU WALLS SHALL BE 8 INCHES NOMINAL THICKNESS, UNLESS NOTED OTHERWISE.
2. PARTITION TYPES SHALL BE DESIGNATED ON FLOOR PLANS (XX.X.XX) THUS: SEE SHEET A.800.00 FOR TYPES. ALL INTERIOR PARTITIONS ARE TYPE XX.X.XX U.O.N.
3. ALL MASONRY WALLS AND INTERIOR STUD WALLS SHALL EXTEND TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE UNLESS NOTED OTHERWISE, PER PARTITION TYPE.
4. PROVISIONS SHALL BE MADE AT ALL FULL HEIGHT NON-BEARING WALLS FOR 1-INCH VERTICAL MOVEMENT OF THE BUILDING STRUCTURE WITHOUT TRANSFER OF COMPRESSIVE LOADS TO WALL. FILL IRREGULARITIES BETWEEN TOP OF WALL AND DECK ABOVE WITH MINERAL WOOL INSULATION OR FIRE STOPPING MATERIALS AS REQUIRED TO MEET FIRE RATING OF RESPECTIVE WALLS. SEE DETAILS ON SHEET A.800.00.
5. SEE STRUCTURAL DRAWINGS FOR BRACING OF NON-LOAD BEARING MASONRY WALLS.
6. FURNISH AND INSTALL FIRE-TREATED WOOD BLOCKING OR METAL BACKING PLATE IN METAL STUD PARTITIONS FOR THE PROPER ANCHORAGE OF ALL WALL ATTACHED ITEMS; I.E. TOILET ACCESSORIES, CASEWORK, MILLWORK, WALL-MOUNTED FIXTURES, MARKER BOARDS, TACK BOARDS, DOOR STOPS, AUDIO VISUAL BRACKETS, AND OTHER WALL ATTACHED ITEMS.
7. GYPSUM BOARD SURFACES SHALL BE ISOLATED WITH CONTROL JOINTS WHERE SHOWN ON DRAWINGS AND AS DESCRIBED IN THE SPECIFICATIONS.
8. MASONRY CONTROL JOINTS (CJ) AND CONTROL JOINTS ABOVE (CJA) SHALL BE LOCATED AS SHOWN ON THE FLOOR PLAN AND BUILDING ELEVATIONS, AND WHERE LARGE PLUMBING VENTS OR RISERS OCCUR IN SINGLE WYTHE MASONRY WALLS, AND WHERE MASONRY WALLS BEARING ON THE CONCRETE FLOOR SLAB ABUT MASONRY WALLS BEARING ON CONCRETE FOOTINGS OR AS INDICATED ON DRAWINGS.
9. EXTEND FURRING CHANNELS AND GYPSUM BOARD UP 4 INCHES ABOVE FINISHED CEILING ON CMU WALLS.
10. SCRIBE GYPSUM WALL BOARD OF WALLS AND PARTITIONS TO IRREGULARITIES OF DECK ABOVE. SEAL TIGHTLY AROUND ALL PENETRATIONS

REFLECTED CEILING PLAN GENERAL NOTES

A. REFLECTED CEILING PLAN GENERAL NOTES APPLY TO ALL REFLECTED CEILING PLAN SHEETS.
B. ALL CEILING GRIDS/PANELS SHALL BE CENTERED IN EACH ROOM UNLESS NOTED OTHERWISE.
C. CEILING HEIGHTS ARE NOTED ON THE REFLECTED CEILING PLANS ARE MEASURED FROM THE FINISH FLOOR OF THE ROOM.
D. ALL ELECTRICAL FIXTURES, SPEAKERS, SMOKE AND THERMAL DETECTORS, MECHANICAL GRILLES, SPRINKLER HEADS, AND OTHER CEILING MOUNTED DEVICES, SHALL BE CENTERED BETWEEN CEILING GRIDS UNLESS NOTED OTHERWISE. SPRINKLER HEADS SHALL BE WITHIN A 3-INCH RADIUS CENTERED BETWEEN CEILING GRIDS.
E. IN ACOUSTICAL CEILING PANELS WITH SCORE IN THE CENTER, CENTER DEVICES REFERENCE IN NOTE D IN ONE HALF OF THE TILE. DO NOT LOCATE ON THE SCORE. FOR ACP WITH MULTIPLE SCORED PATTERNS, COORDINATE LOCATION WITH THE ARCHITECT.
F. PROVIDE SUSPENSION SYSTEM AROUND ELECTRICAL FIXTURES, MECHANICAL GRILLES, DIFFUSERS, AND OTHER CEILING MOUNTED DEVICES. AT ACOUSTICAL PANEL CEILINGS.
G. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE ACTUAL AND ARE TO THE FOLLOWING UNLESS NOTED OTHERWISE:
   a. FACE OF FINISHED WALL
   b. FACE OF FINISHED BULKHEADS
   c. CENTERLINE OF COLUMNS
   d. CENTERLINE OF TEES
H. IN AREAS WITH EXPOSED STRUCTURE CEILINGS, COORDINATE EXACT LOCATIONS OF MECHANICAL GRILLES, DIFFUSERS, DUCTWORK AND ELECTRICAL FIXTURES WITH EACH REPRESENTATIVE SUBCONTRACTOR.
I. ALL WALLS EXTEND TO UNDERSIDE OF DECK EXCEPT THOSE SHOWN SHADED IN WHICH GYPSUM BOARD OR MASONRY EXTENDS MIN 4 INCHES ABOVE FINISHED CEILING. ALL METAL STUDS EXTEND TO UNDERSIDE OF FLOOR OR ROOF DECK.

1A - FLOOR SHEET NOTES

12 ALL PENETRATIONS IN RATED ASSEMBLIES SHALL BE FIRE STOPPED. SEE THE CODE PLAN FOR RATED WALLS. REFER TO DETAIL #7 / A.802.00 FOR FIRESTOPPING ASSEMBLY.

1B - RCP SHEET NOTES

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REGISTERED ARCHITECT
STATE OF NEW YORK

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

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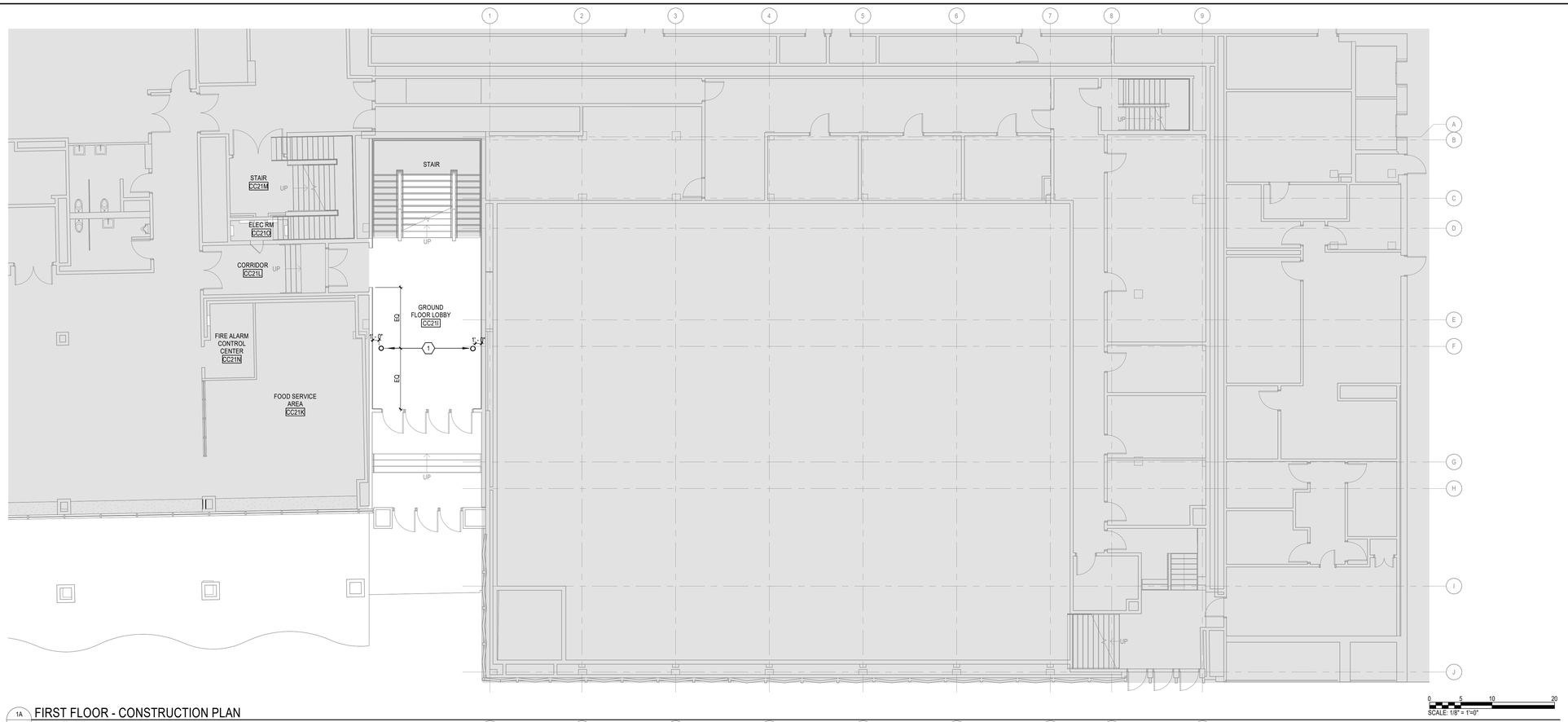
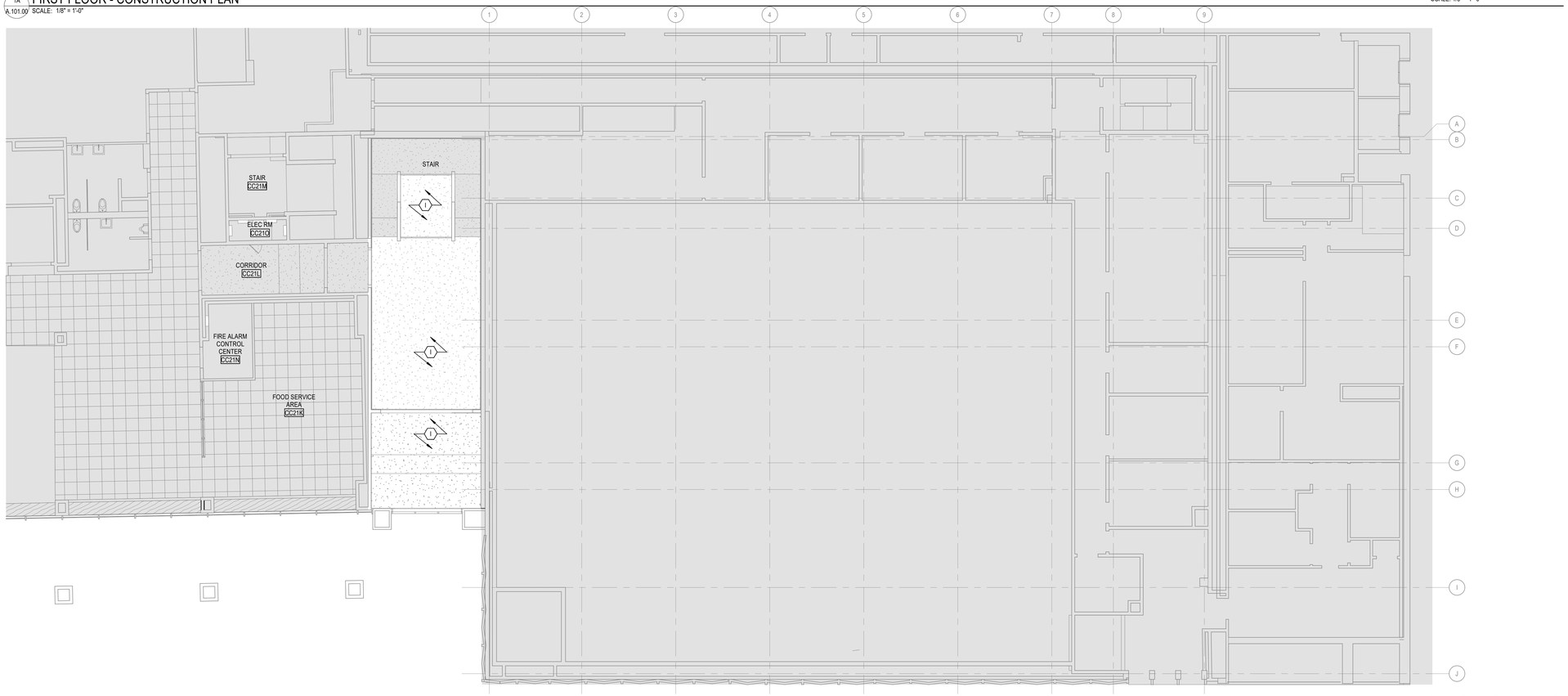


1A FIRST FLOOR - CONSTRUCTION PLAN
A.101.00 SCALE: 1/8" = 1'-0"



1B FIRST FLOOR - REFLECTED CEILING PLAN
A.101.00 SCALE: 1/8" = 1'-0"

GENERAL ARCHITECTURAL NOTES

1. ALL INTERIOR CMU WALLS SHALL BE 8 INCHES NOMINAL THICKNESS, UNLESS NOTED OTHERWISE.
2. PARTITION TYPES SHALL BE DESIGNATED ON FLOOR PLANS (XX.X.XX) THUS: SEE SHEET A.800.00 FOR TYPES. ALL INTERIOR PARTITIONS ARE TYPE XX.X.XX U.O.N.
3. ALL MASONRY WALLS AND INTERIOR STUD WALLS SHALL EXTEND TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE UNLESS NOTED OTHERWISE, PER PARTITION TYPE.
4. PROVISIONS SHALL BE MADE AT ALL FULL HEIGHT NON-BEARING WALLS FOR 1-INCH VERTICAL MOVEMENT OF THE BUILDING STRUCTURE WITHOUT TRANSFER OF COMPRESSIVE LOADS TO WALL. FILL IRREGULARITIES BETWEEN TOP OF WALL AND DECK ABOVE WITH MINERAL WOOL INSULATION OR FIRE STOPPING MATERIALS AS REQUIRED TO MEET FIRE RATING OF RESPECTIVE WALLS. SEE DETAILS ON SHEET A.800.00.
5. SEE STRUCTURAL DRAWINGS FOR BRACING OF NON-LOAD BEARING MASONRY WALLS.
6. FURNISH AND INSTALL FIRE-TREATED WOOD BLOCKING OR METAL BACKING PLATE IN METAL STUD PARTITIONS FOR THE PROPER ANCHORAGE OF ALL WALL ATTACHED ITEMS; I.E. TOILET ACCESSORIES, CASEWORK, MILLWORK, WALL-MOUNTED FIXTURES, MARKER BOARDS, TACK BOARDS, DOOR STOPS, AUDIO VISUAL BRACKETS, AND OTHER WALL ATTACHED ITEMS.
7. GYPSUM BOARD SURFACES SHALL BE ISOLATED WITH CONTROL JOINTS WHERE SHOWN ON DRAWINGS AND AS DESCRIBED IN THE SPECIFICATIONS.
8. MASONRY CONTROL JOINTS (CJ) AND CONTROL JOINTS ABOVE (CJA) SHALL BE LOCATED AS SHOWN ON THE FLOOR PLAN AND BUILDING ELEVATIONS, AND WHERE LARGE PLUMBING VENTS OR RISERS OCCUR IN SINGLE WYTHE MASONRY WALLS, AND WHERE MASONRY WALLS BEARING ON THE CONCRETE FLOOR SLAB ABUT MASONRY WALLS BEARING ON CONCRETE FOOTINGS OR AS INDICATED ON DRAWINGS.
9. EXTEND FURRING CHANNELS AND GYPSUM BOARD UP 4 INCHES ABOVE FINISHED CEILING ON CMU WALLS.
10. SCRIBE GYPSUM WALL BOARD OF WALLS AND PARTITIONS TO IRREGULARITIES OF DECK ABOVE. SEAL TIGHTLY AROUND ALL PENETRATIONS

REFLECTED CEILING PLAN GENERAL NOTES

A. REFLECTED CEILING PLAN GENERAL NOTES APPLY TO ALL REFLECTED CEILING PLAN SHEETS.
B. ALL CEILING GRIDS/PANELS SHALL BE CENTERED IN EACH ROOM UNLESS NOTED OTHERWISE.
C. CEILING HEIGHTS ARE NOTED ON THE REFLECTED CEILING PLANS ARE MEASURED FROM THE FINISH FLOOR OF THE ROOM.
D. ALL ELECTRICAL FIXTURES, SPEAKERS, SMOKE AND THERMAL DETECTORS, MECHANICAL GRILLES, SPRINKLER HEADS, AND OTHER CEILING MOUNTED DEVICES, SHALL BE CENTERED BETWEEN CEILING GRIDS UNLESS NOTED OTHERWISE. SPRINKLER HEADS SHALL BE WITHIN A 3-INCH RADIUS CENTERED BETWEEN CEILING GRIDS.
E. IN ACOUSTICAL CEILING PANELS WITH SCORE IN THE CENTER, CENTER DEVICES REFERENCE IN NOTE D IN ONE HALF OF THE TILE. DO NOT LOCATE ON THE SCORE. FOR ACP WITH MULTIPLE SCORED PATTERNS, COORDINATE LOCATION WITH THE ARCHITECT.
F. PROVIDE SUSPENSION SYSTEM AROUND ELECTRICAL FIXTURES, MECHANICAL GRILLES, DIFFUSERS, AND OTHER CEILING MOUNTED DEVICES. AT ACOUSTICAL PANEL CEILINGS.
G. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE ACTUAL AND ARE TO THE FOLLOWING UNLESS NOTED OTHERWISE:
   a. FACE OF FINISHED WALL
   b. FACE OF FINISHED BULKHEADS
   c. CENTERLINE OF COLUMNS
   d. CENTERLINE OF TEES
H. IN AREAS WITH EXPOSED STRUCTURE CEILINGS, COORDINATE EXACT LOCATIONS OF MECHANICAL GRILLES, DIFFUSERS, DUCTWORK AND ELECTRICAL FIXTURES WITH EACH REPRESENTATIVE SUBCONTRACTOR.
I. ALL WALLS EXTEND TO UNDERSIDE OF DECK EXCEPT THOSE SHOWN SHADED IN WHICH GYPSUM BOARD OR MASONRY EXTENDS MIN 4 INCHES ABOVE FINISHED CEILING. ALL METAL STUDS EXTEND TO UNDERSIDE OF FLOOR OR ROOF DECK.

1A - FLOOR SHEET NOTES

1 6" POKE THROUGH. PROVIDE (1) BRASS POKE THROUGH COVER PLATES AT EACH OUTLET (SEE EL-

1B - RCP SHEET NOTES

I PROVIDE PROTECTION TO EXISTING WALLS AND SPRAY PAINT EXISTING CEILING FLAT WHITE AT FIRST FLOOR AND UNDERSIDE OF STAIRS GOING UP. EXISTING CEILING HAS ACM, PAINT BRUSHES NOT ALLOWED.

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REGISTERED ARCHITECT
STEVEN A. MOSS
No. 023-026-1

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
NEW YORK, NY 10001

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LEVEL 01 - FLOOR PLAN

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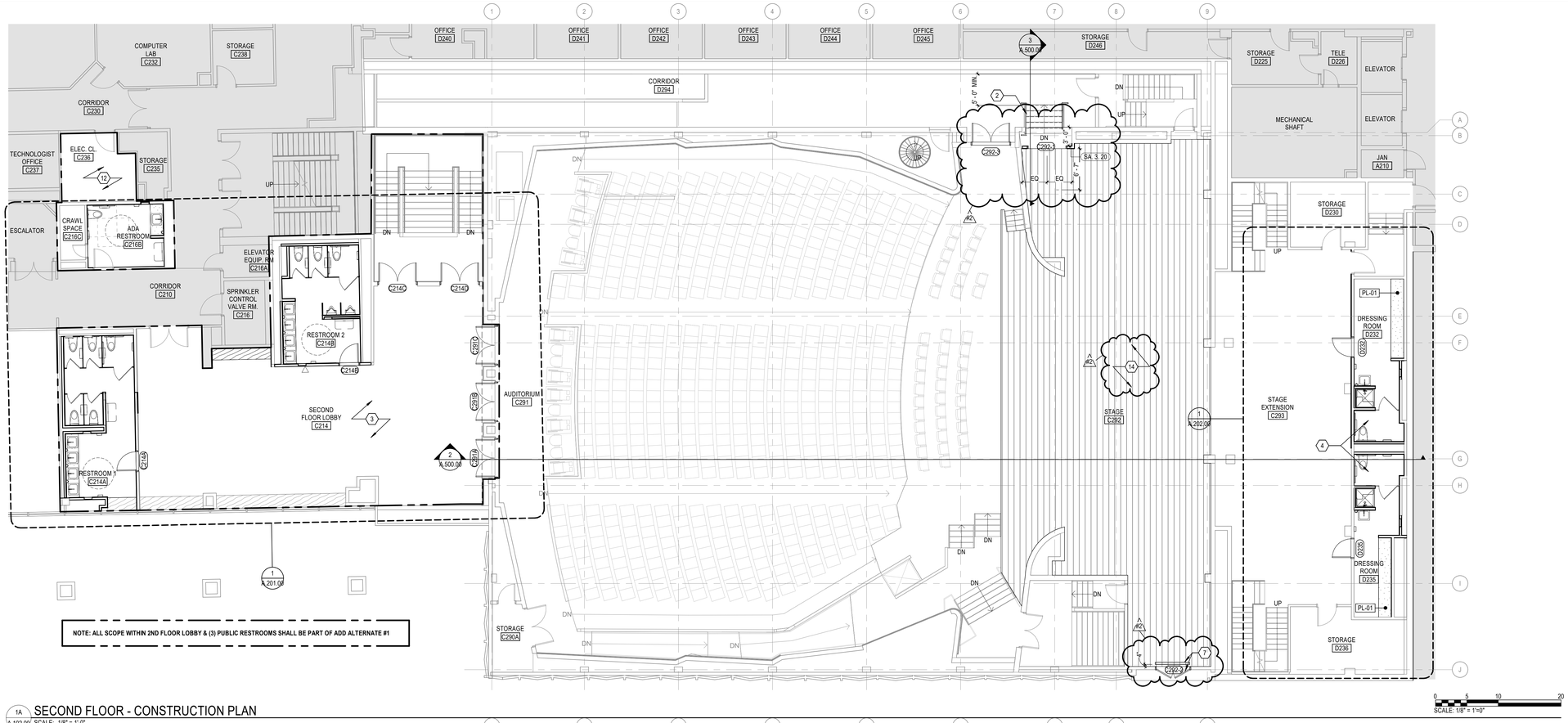
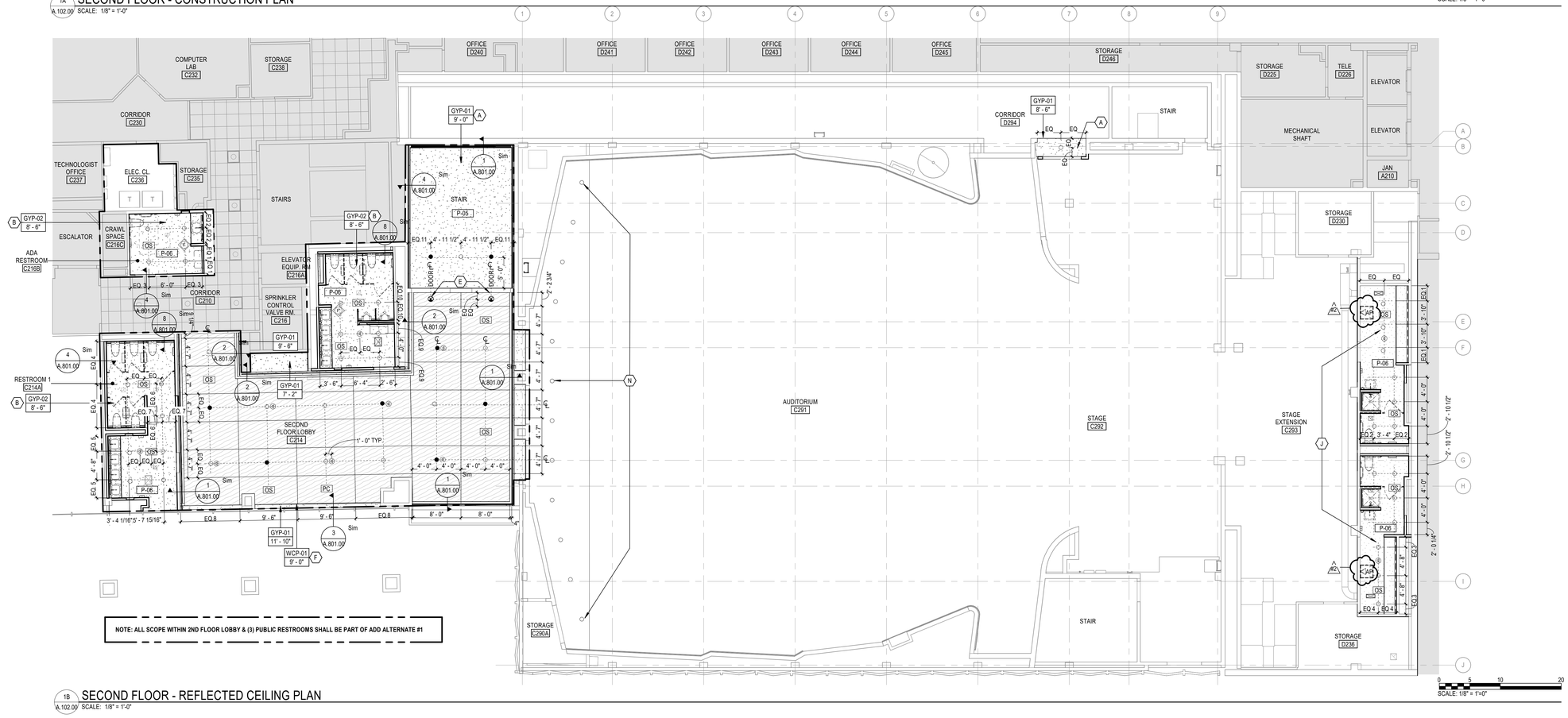


1A SECOND FLOOR - CONSTRUCTION PLAN
A.102.00 SCALE: 1/8" = 1'-0"



1B SECOND FLOOR - REFLECTED CEILING PLAN
A.102.00 SCALE: 1/8" = 1'-0"

GENERAL ARCHITECTURAL NOTES

1. ALL INTERIOR CMU WALLS SHALL BE 8 INCHES NOMINAL THICKNESS, UNLESS NOTED OTHERWISE.
2. PARTITION TYPES SHALL BE DESIGNATED ON FLOOR PLANS (XX.X.XX); THUS: SEE SHEET A.800.00 FOR TYPES. ALL INTERIOR PARTITIONS ARE TYPE XX.X.XX U.O.N.
3. ALL MASONRY WALLS AND INTERIOR STUD WALLS SHALL EXTEND TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE UNLESS NOTED OTHERWISE, PER PARTITION TYPE.
4. PROVISIONS SHALL BE MADE AT ALL FULL HEIGHT NON-BEARING WALLS FOR 1-INCH VERTICAL MOVEMENT OF THE BUILDING STRUCTURE WITHOUT TRANSFER OF COMPRESSIVE LOADS TO WALL. FILL IRREGULARITIES BETWEEN TOP OF WALL AND DECK ABOVE WITH MINERAL WOOL INSULATION OR FIRE STOPPING MATERIALS AS REQUIRED TO MEET FIRE RATING OF RESPECTIVE WALLS. SEE DETAILS ON SHEET A.800.00.
5. SEE STRUCTURAL DRAWINGS FOR BRACING OF NON-LOAD BEARING MASONRY WALLS.
6. FURNISH AND INSTALL FIRE-TREATED WOOD BLOCKING OR METAL BACKING PLATE IN METAL STUD PARTITIONS FOR THE PROPER ANCHORAGE OF ALL WALL ATTACHED ITEMS; I.E. TOILET ACCESSORIES, CASEWORK, MILLWORK, WALL-MOUNTED FIXTURES, MARKER BOARDS, TACK BOARDS, DOOR STOPS, AUDIO VISUAL BRACKETS, AND OTHER WALL ATTACHED ITEMS.
7. GYPSUM BOARD SURFACES SHALL BE ISOLATED WITH CONTROL JOINTS WHERE SHOWN ON DRAWINGS AND AS DESCRIBED IN THE SPECIFICATIONS.
8. MASONRY CONTROL JOINTS (CJ) AND CONTROL JOINTS ABOVE (CJA) SHALL BE LOCATED AS SHOWN ON THE FLOOR PLAN AND BUILDING ELEVATIONS, AND WHERE LARGE PLUMBING VENTS OR RISERS OCCUR IN SINGLE WYTHE MASONRY WALLS, AND WHERE MASONRY WALLS BEARING ON THE CONCRETE FLOOR SLAB ABUT MASONRY WALLS BEARING ON CONCRETE FOOTINGS OR AS INDICATED ON DRAWINGS.
9. EXTEND FURRING CHANNELS AND GYPSUM BOARD UP 4 INCHES ABOVE FINISHED CEILING ON CMU WALLS.
10. SCRIBE GYPSUM WALL BOARD OF WALLS AND PARTITIONS TO IRREGULARITIES OF DECK ABOVE. SEAL TIGHTLY AROUND ALL PENETRATIONS

REFLECTED CEILING PLAN GENERAL NOTES

A. REFLECTED CEILING PLAN GENERAL NOTES APPLY TO ALL REFLECTED CEILING PLAN SHEETS.
B. ALL CEILING GRIDS/PANELS SHALL BE CENTERED IN EACH ROOM UNLESS NOTED OTHERWISE.
C. CEILING HEIGHTS ARE NOTED ON THE REFLECTED CEILING PLANS ARE MEASURED FROM THE FINISH FLOOR OF THE ROOM.
D. ALL ELECTRICAL FIXTURES, SPEAKERS, SMOKE AND THERMAL DETECTORS, MECHANICAL GRILLES, SPRINKLER HEADS, AND OTHER CEILING MOUNTED DEVICES, SHALL BE CENTERED BETWEEN CEILING GRIDS UNLESS NOTED OTHERWISE. SPRINKLER HEADS SHALL BE WITHIN A 3-INCH RADIUS CENTERED BETWEEN CEILING GRIDS.
E. IN ACOUSTICAL CEILING PANELS WITH SCORE IN THE CENTER, CENTER DEVICES REFERENCE IN NOTE D IN ONE HALF OF THE TILE. DO NOT LOCATE ON THE SCORE. FOR ACP WITH MULTIPLE SCORED PATTERNS, COORDINATE LOCATION WITH THE ARCHITECT.
F. PROVIDE SUSPENSION SYSTEM AROUND ELECTRICAL FIXTURES, MECHANICAL GRILLES, DIFFUSERS, AND OTHER CEILING MOUNTED DEVICES. AT ACOUSTICAL PANEL CEILINGS.
G. ALL DIMENSIONS ON REFLECTED CEILING PLANS ARE ACTUAL AND ARE TO THE FOLLOWING UNLESS NOTED OTHERWISE:
   a. FACE OF FINISHED WALL
   b. FACE OF FINISHED BULKHEADS
   c. CENTERLINE OF COLUMNS
   d. CENTERLINE OF TEES
H. IN AREAS WITH EXPOSED STRUCTURE CEILINGS, COORDINATE EXACT LOCATIONS OF MECHANICAL GRILLES, DIFFUSERS, DUCTWORK AND ELECTRICAL FIXTURES WITH EACH REPRESENTATIVE SUBCONTRACTOR.
I. ALL WALLS EXTEND TO UNDERSIDE OF DECK EXCEPT THOSE SHOWN SHADED IN WHICH GYPSUM BOARD OR MASONRY EXTENDS MIN 4 INCHES ABOVE FINISHED CEILING. ALL METAL STUDS EXTEND TO UNDERSIDE OF FLOOR OR ROOF DECK.

1A - FLOOR SHEET NOTES

2 PROVIDE STREEL PREFRABRIATED STAIR. SEE DETAIL 1 / A.802.00
3 ADD ALTERNATE #1 - LOBBY & PUBLIC RESTROOM SCOPEE INFORMATION. SEE ENLARGED PLAN ON 01 / A.201.00 FOR MORE INFORMATION
4 SEE ENLARGED PLAN ON 01 / / A.202.00 FOR MORE INFORMATION
7 REPLACEMENT OF THE DOUBLE DOOR AND FRAME WITH A STC-51 RATED DOOR ASSEMBLY BY KRIEGER STEEL, NOISE BARRIERS, IAC, OR SIMILAR MANUFACTURER. THE LEAVES SHALL BE 2'-8" X 8'-4"WITH 2" HM FRAMES. STC ACCESSORIES SHALL INCLUDE HEAVY-DUTY SEALS, OVERLAPPING ASTRAGAL, AND TOTALLY CONCEALED FRAME INTO THE EXISTING OPENING. PROVIDE REMOVABLE GAURDRAIL 4" FROM FACE OF DOOR. SEE DETAIL #9 / A.802.00
12 ALL PENETRATIONS IN RATED ASSEMBLIES SHALL BE FIRE STOPPED. SEE THE CODE PLAN FOR RATED WALLS. REFER TO DETAIL #7 / A.802.00 FOR FIRESTOPPING ASSEMBLY.
14 SAND EXISTING WOOD STAGE. PAINT AND PROVIDE NEW BLACK PAINT, PT-10. PROVIDE ALLOWANCE OF 20 PLUG FOR HOLES IN THE FLOOR SMALLER THAN 36 SQ INCHES.

1B - RCP SHEET NOTES

A PROVIDE NEW FRAMING FOR 1/2" GYPSUM CEILING, PAINTED FLAT WHITE. PROVIDE 1/2" REGLET AT EXISTING WALL. PROTECT EXISTING WALLS TO REMAIN.
B PROVIDE NEW FRAMING FOR 1/2" MOLD RESISTANCE GYPSUM CEILING, PAINTED FLAT WHITE. PROVIDE 1/2" REGLET AT EXISTING WALL. PROTECT EXISTING WALLS TO REMAIN.
E PROVIDE NEW CEILING MOUNTED GLASS BLADE SIGN. (SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION)
F PROVIDE NEW FRAMING FOR ACOUSTICAL WOOD CEILING. SEE A.801 FOR CEILING DETAILS.
J EXISTING CEILING AND PATCHED AREAS TO RECEIVE FRESH COAT OF CEILING PAINT.
N CEILING TO REMAIN. FIXTURES TO BE REPLACED. SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION.

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HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

LEVEL 02 - FLOOR PLAN

A.102.00

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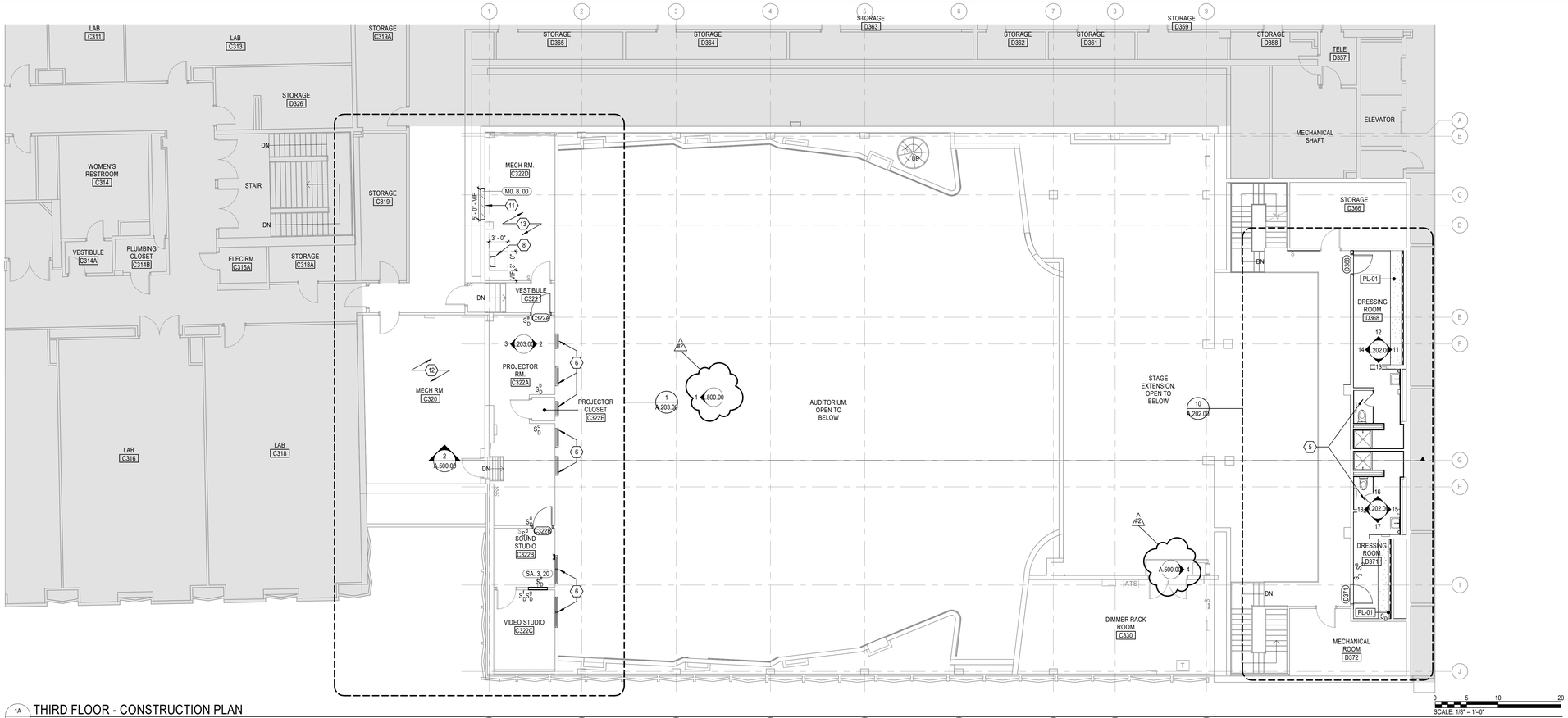
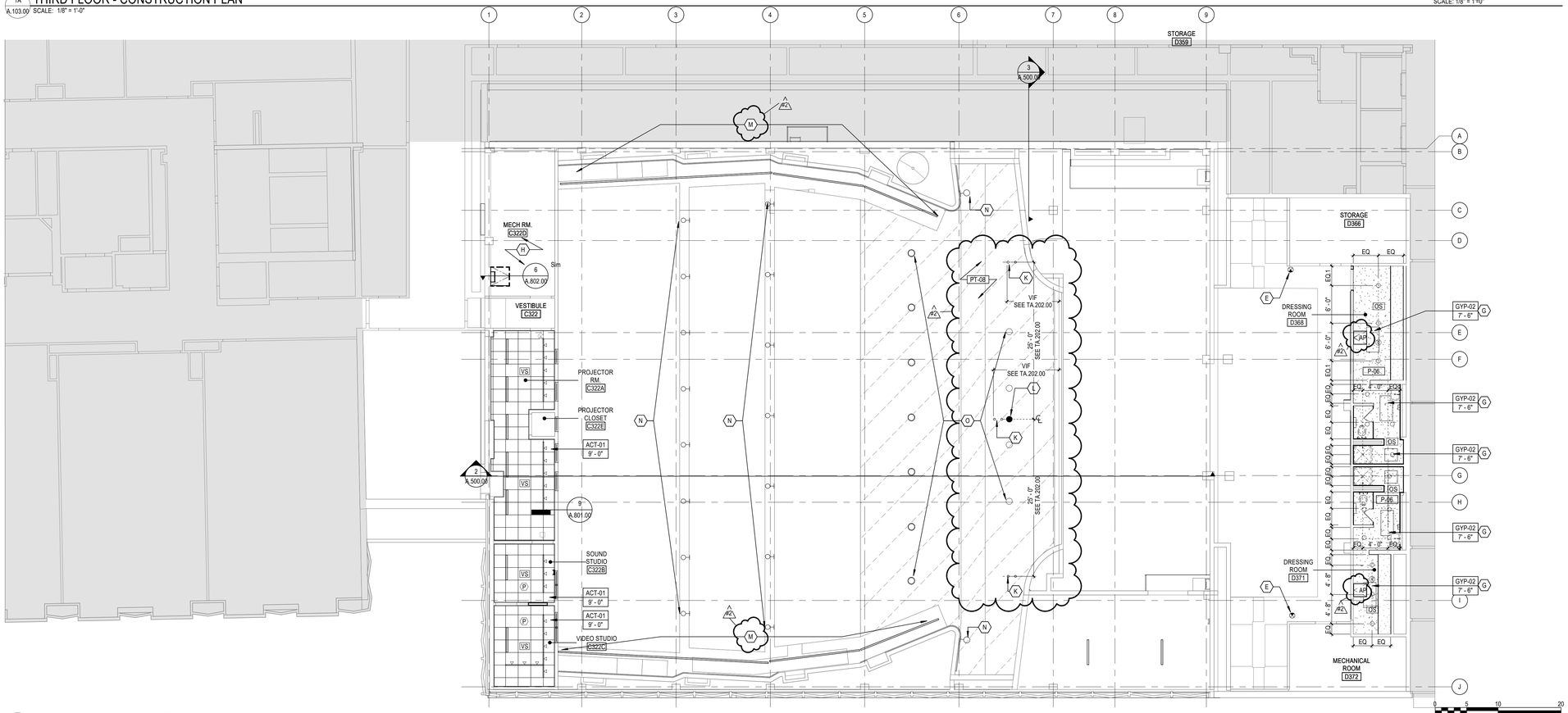


1A THIRD FLOOR - CONSTRUCTION PLAN
A.103.00 SCALE: 1/8" = 1'-0"



1B THIRD FLOOR - REFLECTED CEILING PLAN
A.103.00 SCALE: 1/8" = 1'-0"

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5. SEE STRUCTURAL DRAWINGS FOR BRACING OF NON-LOAD BEARING MASONRY WALLS.
6. FURNISH AND INSTALL FIRE-TREATED WOOD BLOCKING OR METAL BACKING PLATE IN METAL STUD PARTITIONS FOR THE PROPER ANCHORAGE OF ALL WALL ATTACHED ITEMS; I.E. TOILET ACCESSORIES, CASEWORK, MILLWORK, WALL-MOUNTED FIXTURES, MARKER BOARDS, TACK BOARDS, DOOR STOPS, AUDIO VISUAL BRACKETS, AND OTHER WALL ATTACHED ITEMS.
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E. IN ACOUSTICAL CEILING PANELS WITH SCORE IN THE CENTER, CENTER DEVICES REFERENCE IN NOTE D IN ONE HALF OF THE TILE. DO NOT LOCATE ON THE SCORE. FOR ACP WITH MULTIPLE SCORED PATTERNS, COORDINATE LOCATION WITH THE ARCHITECT.
F. PROVIDE SUSPENSION SYSTEM AROUND ELECTRICAL FIXTURES, MECHANICAL GRILLES, DIFFUSERS, AND OTHER CEILING MOUNTED DEVICES. AT ACOUSTICAL PANEL CEILINGS.
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1A - FLOOR SHEET NOTES

5 SEE ENLARGED PLAN ON 02 / A.202.00 FOR MORE INFORMATION
6 NEW WINDOW IN EXISTING OPENING. SEE A.303.00 FOR MORE INFORMATION
8 PROVIDE 3'-0" X 3'-0" HATCH AND 11 FOOT LENGTH FIXED RUNG LADDER. AT NEW OPENING. PROVIDE NEW C8X11.5 AROUND OPENING AND BEAM TO BEAM. GC TO COORDINATE LOCATION WITH OWNER. SEE DETAIL #6 / A.802.00 FOR MORE INFORMATION
11 PROVIDE 5'-0" X 4'-0" (VIF) OF 6" CMU TO INFIL EXISTING OPENING TO MAINTAIN RATING OF WALL. SEE CODE PLAN FOR RATING.
12 ALL PENETRATIONS IN RATED ASSEMBLIES SHALL BE FIRE STOPPED. SEE THE CODE PLAN FOR RATED WALLS. REFER TO DETAIL #7 / A.802.00 FOR FIRESTOPPING ASSEMBLY.
13 PROVIDE ALLOWANCE OF 10 EXISTING OPENINGS <8" IN DIAMETER TO BE FIRESTOPPED. SEE THE CODE PLAN FOR RATED WALLS. REFER TO DETAIL #7 / A.802.00 FOR FIRESTOPPING ASSEMBLY.

1B - RCP SHEET NOTES

E PROVIDE NEW CEILING MOUNTED GLASS BLADE SIGN. (SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION)
G PATCH 1/2" MOLD RESISTANCE GYPSUM CEILING AT OLD LIGHT FIXTURE LOCATIONS. PAINT ENTIRE DRESSING ROOM FLAT WHITE TO MATCH EXISTING. MATCH CEILING HEIGHT. PROTECT EXISTING CEILING, SPRINKLERS, & DUCTWORK TO REMAIN.
H PROVIDE ALLOWANCE OF 10 EXISTING OPENINGS <8" IN DIAMETER TO BE FIRESTOPPED. SEE THE CODE PLAN FOR RATED WALLS. REFER TO DETAIL #7 / A.802.00 FOR FIRESTOPPING ASSEMBLY.
K PROVIDE OPENING FOR SPEAKERS AT APRON CEILING. PATCH AND PAINT OPENING TO MATCH ADJACENT. SEE DETAIL #13 / A.801.00
L PATCH CEILING AT ABANDONED FIXTURE. SEE DETAIL #12 / A.801.00
M CEILING AND PLYWOOD HOUSING TO REMAIN. FIXTURES TO BE REPLACED WITH LINEAR. PLYWOOD TO BE COVERED AND EXISTING OPENING TO BE COORDINATED FOR MOUNTING LINEAR FIXTURE. SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION. SEE DRAWING #11 / A.801.00
N CEILING TO REMAIN, FIXTURES TO BE REPLACED. SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION.
O CEILING TO REMAIN, FIXTURES TO BE REPLACED. SEE ELECTRICAL DRAWINGS FOR MORE INFORMATION. PROSCENIUM, TO RECIEVE A FRESH COAT OF PAINT, PT-08

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REGISTERED ARCHITECT STATE OF NEW YORK

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25

REVISIONS
#3 01/23/25

57-23140-00

LEVEL 03 - FLOOR PLAN

A.103.00

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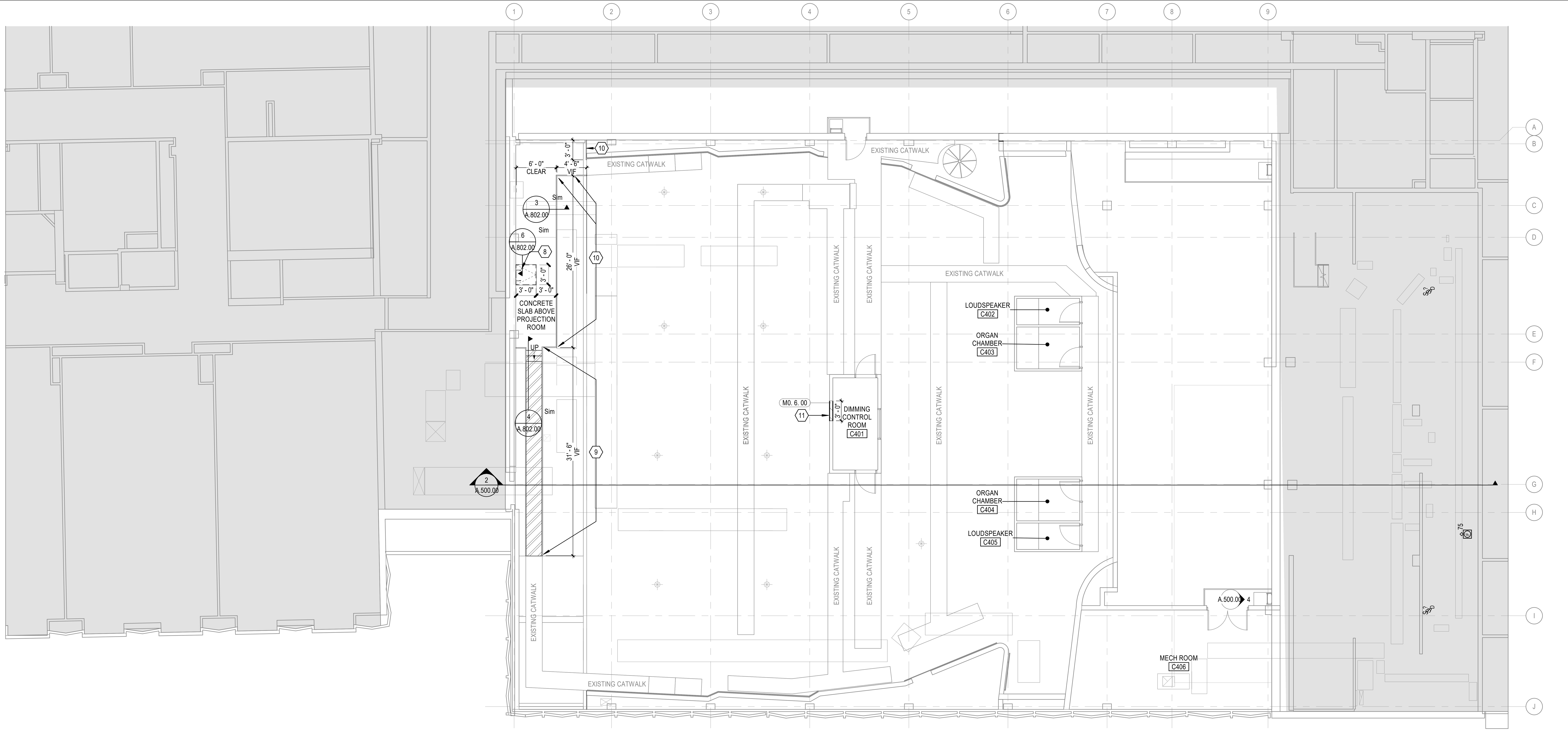

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A.103M.00

THIRD FLOOR MEZZANINE - CONSTRUCTION PLAN

SCALE: 1/8" = 1'-0"

0 5 10 20
SCALE: 1/8" = 1'=0"

GENERAL ARCHITECTURAL NOTES

1. ALL INTERIOR CMU WALLS SHALL BE 8 INCHES NOMINAL THICKNESS, UNLESS NOTED OTHERWISE.
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3. ALL MASONRY WALLS AND INTERIOR STUD WALLS SHALL EXTEND TO UNDERSIDE OF FLOOR OR ROOF DECK ABOVE UNLESS NOTED OTHERWISE, PER PARTITION TYPE.
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6. FURNISH AND INSTALL FIRE-TREATED WOOD BLOCKING OR METAL BACKING PLATE IN METAL STUD PARTITIONS FOR THE PROPER ANCHORAGE OF ALL WALL ATTACHED ITEMS; I.E. TOILET ACCESSORIES, CASEWORK, MILLWORK, WALL-MOUNTED FIXTURES, MARKER BOARDS, TACK BOARDS, DOOR STOPS, AUDIO VISUAL BRACKETS, AND OTHER WALL ATTACHED ITEMS.
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9. EXTEND FURRING CHANNELS AND GYPSUM BOARD UP 4 INCHES ABOVE FINISHED CEILING ON CMU WALLS.
10. SCRIBE GYPSUM WALL BOARD OF WALLS AND PARTITIONS TO IRREGULARITIES OF DECK ABOVE. SEAL TIGHTLY AROUND ALL PENETRATIONS

1A - FLOOR SHEET NOTES

8 PROVIDE 3'-0" X 3'-0" HATCH AND 11 FOOT LENGTH FIXED RUNG LADDER. AT NEW OPENING, PROVIDE NEW C8X11,5 AROUND OPENING AND BEAM TO BEAM. GC TO COORDINATE LOCATION WITH OWNER. SEE DETAIL #6 / A.802.00 FOR MORE INFORMATION

9 NEW METAL PLATFORM WALKWAY MOUNTED TO CONCRETE SLAB WITH RAILING ON BOTH SIDES. SEE DETAIL #4 & 5 / A.802.00

10 NEW METAL RAILING AT OUTER EDGE OF EXISTING SLAB ABOVE PROJECTION ROOM. MOUNT GURARDRAIL TO CONCRETE SLAB EDGE. SEE DETAIL#3 / A.802.00

11 PROVIDE 5'-0" X 4'-0" (VIF) OF 6" CMU TO INFIL EXISTING OPENING TO MAINTAIN RATING OF WALL. SEE CODE PLAN FOR RATING.

1B - RCP SHEET NOTES

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HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
343 WESTT 27TH STREET
NEW YORK, NY 10001

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57-23140-00

LEVEL 03M MEZZANINE - FLOOR PLAN

A.103M.00

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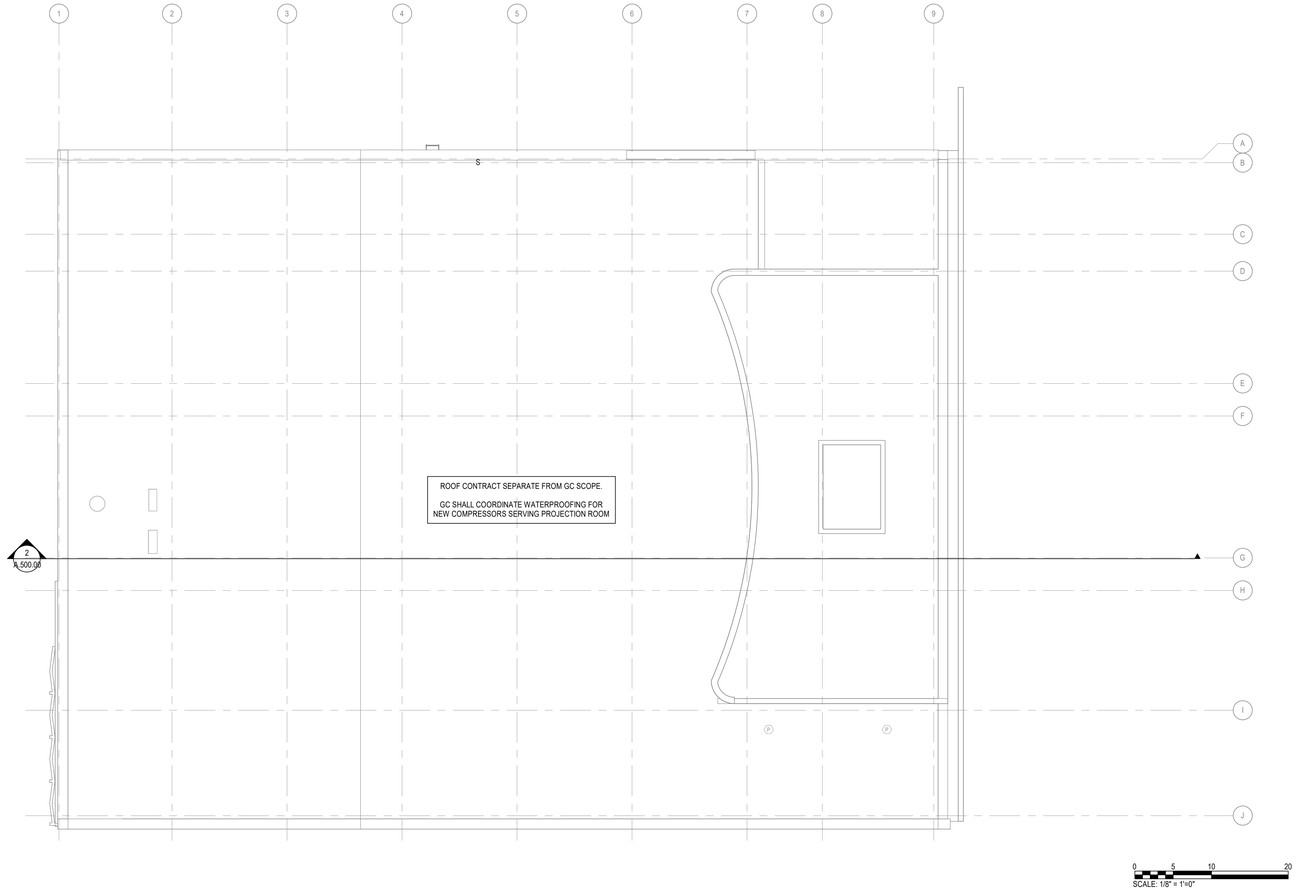

1 A.104.00 LEVEL 04 - ROOF PLAN
SCALE: 1/8" = 1'-0"

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REFERENCE KEYNOTES

1A - FLOOR SHEET NOTES

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REGISTERED ARCHITECT
STATE OF NEW YORK

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
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LEVEL 04 - ROOF PLAN

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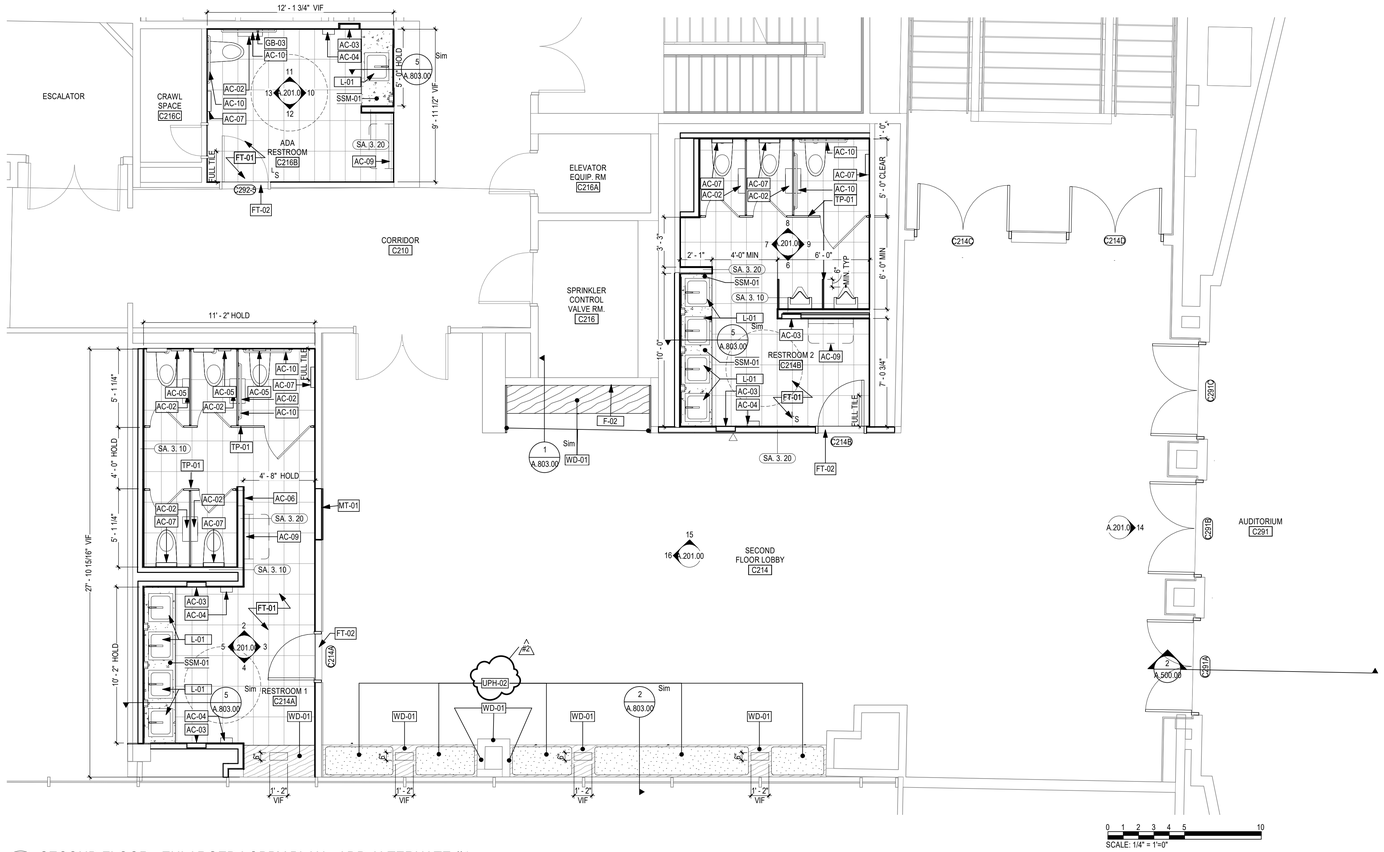
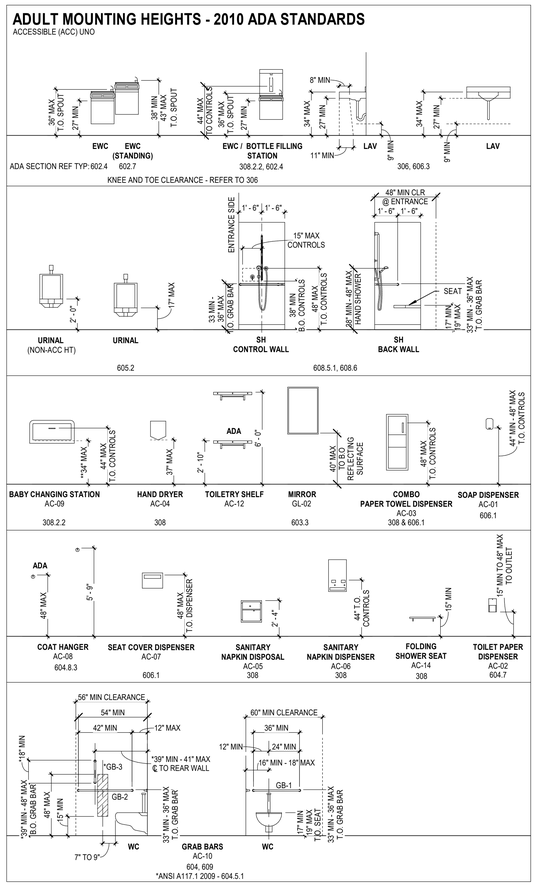


1 A.201.00 SECOND FLOOR - ENLARGED LOBBY PLAN - ADD ALTERNATE #1
SCALE: 1/4" = 1'=0"

ADULT MOUNTING HEIGHTS - 2010 ADA STANDARDS

ACCESSIBLE (ACC) UNO

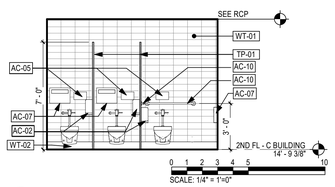


GENERAL NOTES FOR ACCESSIBILITY - 2010 ADA

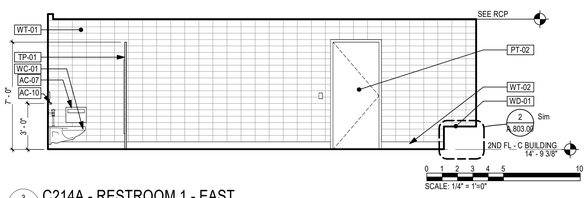
A. ACCESSIBLE URINAL SHALL PROVIDE CLEAR FLOOR SPACE PER 605.3.
B. ACCESSIBLE WATER CLOSETS SHALL PROVIDE CLEAR SPACE PER 604.3.1.
C. ACCESSIBLE LAVATORIES AND SINKS SHALL PROVIDE CLEAR SPACE PER 606.2.
D. ACCESSIBLE TOILET ROOMS SHALL PROVIDE A TURNING SPACE OF 60 INCHES IN DIAMETER PER 304.3.1.
E. ACCESSIBLE DRINKING FOUNTAINS / ELECTRIC WATER COOLERS SHALL PROVIDE CLEAR FLOOR SPACE PER 602.2.
F. ACCESSIBLE TOILET PARTITIONS SHALL COMPLY WITH 604.8.1.
G. EXPOSED PIPES AND SURFACES UNDER LAVATORIES AND SINKS SHALL BE INSULATED PER 606.5.

TOILET ACCESSORIES ABBREVIATIONS

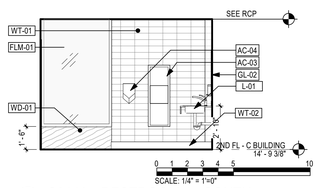
ABBREV	DESCRIPTION
ACC	ADA ACCESSIBLE
BCS	BABY CHANGING STATION
EWC	ELECTRIC WATER COOLER
FSS	FOLDING SHOWER SEAT
GB-1	GRAB BAR (BACK WALL)
GB-2	GRAB BAR (SIDE WALL)
GB-3	GRAB BAR (VERTICAL)
GB-4	GRAB BAR (AMBULATORY STALL)
GB-5	GRAB BAR (SHOWER)
GB-6	GRAB BAR (BACK WALL 24")
GB-7	GRAB BAR (BACK WALL 12")
HD	HAND DRYER
LAV	LAVATORY
MBH	MOP/BROOM HOLDER
MR	MIRROR
MR/S	MIRROR WITH SHELF
PTD	PAPER TOWEL DISPENSER
PTD/R	COMBINATION TOWEL DISPENSER/RECEPTACLE
RH	ROBE HOOK
SCD	SEAT COVER DISPENSER
SCR	SHOWER CURTAIN ROD
SD	SOAP DISPENSER
SND	SANITARY NAPKIN DISPOSAL
SNV	SANITARY NAPKIN VENDOR
SSS	STAINLESS STEEL SHELF
TTD	TOILET TISSUE DISPENSER
US	UTILITY SHELF
WC	WATER CLOSET
WR	WASTE RECEPTACLE



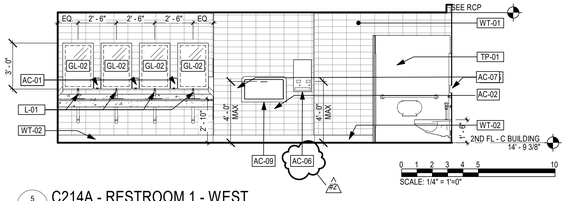
2 A.201.00 C214A - RESTROOM 1 - NORTH
SCALE: 1/4" = 1'=0"



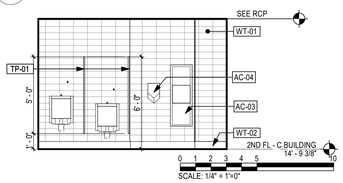
3 A.201.00 C214A - RESTROOM 1 - EAST
SCALE: 1/4" = 1'=0"



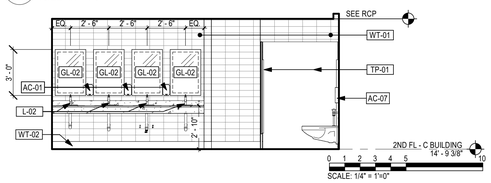
4 A.201.00 C214A - RESTROOM 1 - SOUTH
SCALE: 1/4" = 1'=0"



5 A.201.00 C214A - RESTROOM 1 - WEST
SCALE: 1/4" = 1'=0"



6 A.201.00 C214B - RESTROOM 2 - SOUTH
SCALE: 1/4" = 1'=0"



7 A.201.00 C214B - RESTROOM 2 - WEST
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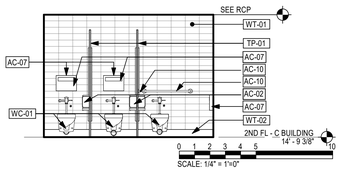
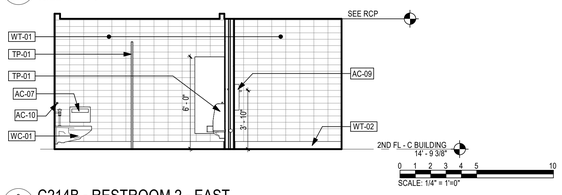
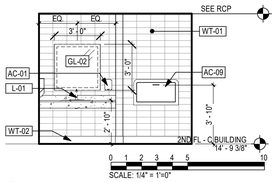


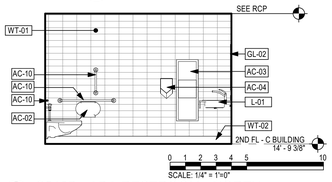
8 A.201.00 C214B - RESTROOM 2 - NORTH
SCALE: 1/4" = 1'=0"



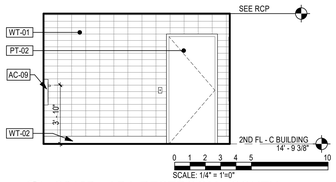
9 A.201.00 C214B - RESTROOM 2 - EAST
SCALE: 1/4" = 1'=0"



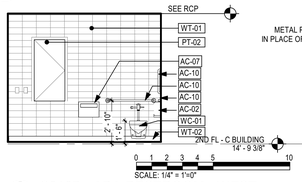
10 A.201.00 C216B - ADA RESTROOM - EAST
SCALE: 1/4" = 1'=0"



11 A.201.00 C216B - ADA RESTROOM - NORTH
SCALE: 1/4" = 1'=0"



12 A.201.00 C216B - ADA RESTROOM - SOUTH
SCALE: 1/4" = 1'=0"



13 A.201.00 C216B - ADA RESTROOM - WEST
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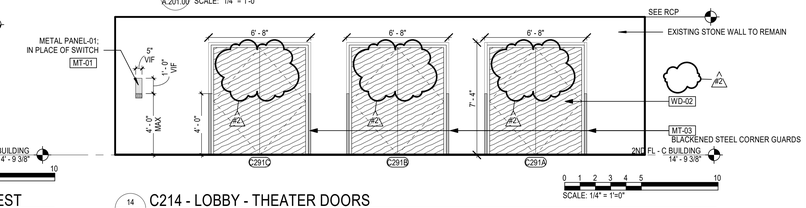
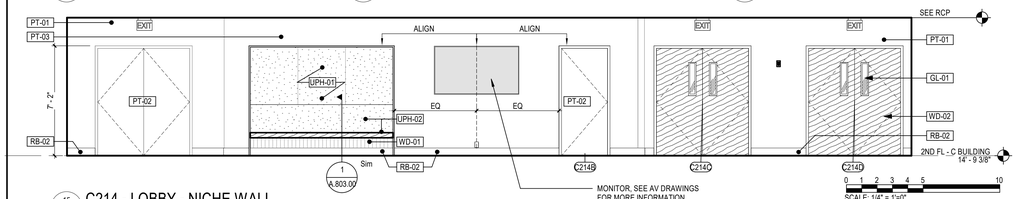
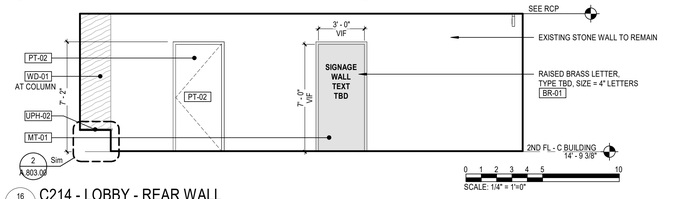


14 A.201.00 C214 - LOBBY - THEATER DOORS
SCALE: 1/4" = 1'=0"



15 A.201.00 C214 - LOBBY - NICHE WALL
SCALE: 1/4" = 1'=0"



16 A.201.00 C214 - LOBBY - REAR WALL
SCALE: 1/4" = 1'=0"

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

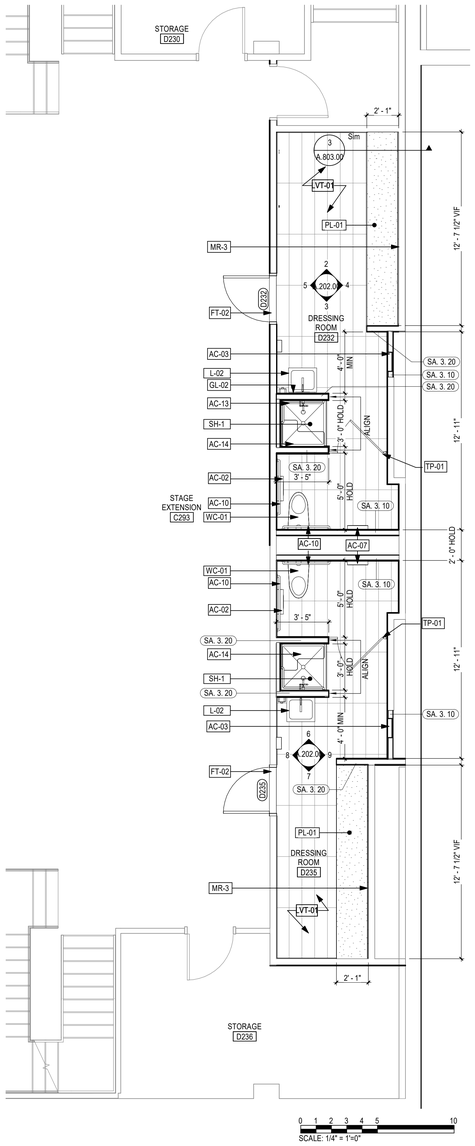
ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

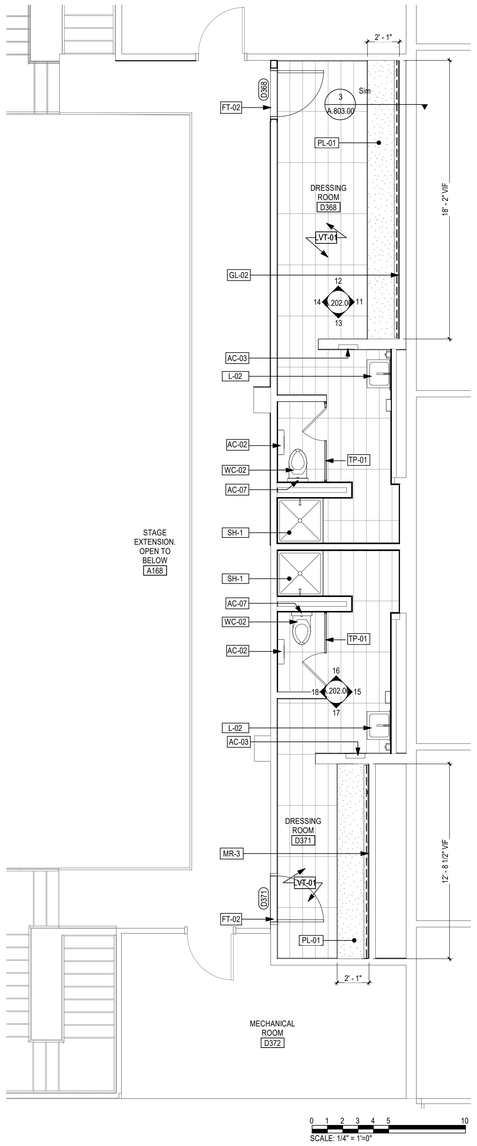
ENLARGED FLOOR PLANS - 2ND FL LOBBY (ADD ALT. #1)

A.201.00

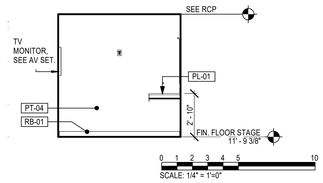
Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_AR_24.rvt
1/13/2025 1:15:44 AM



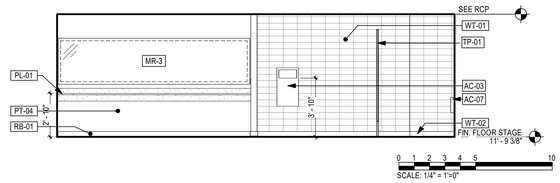
1 A.202.00 SECOND FLOOR - ENLARGED DRESSING ROOMS
SCALE: 1/4" = 1'-0"



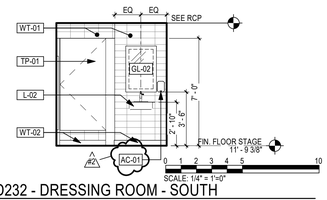
10 A.202.00 THIRD FLOOR - ENLARGED DRESSING ROOMS
SCALE: 1/4" = 1'-0"



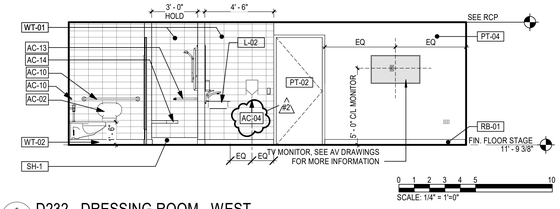
2 A.202.00 D232 - DRESSING ROOM - NORTH
SCALE: 1/4" = 1'-0"



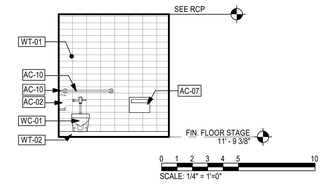
4 A.202.00 D232 - DRESSING ROOM - EAST
SCALE: 1/4" = 1'-0"



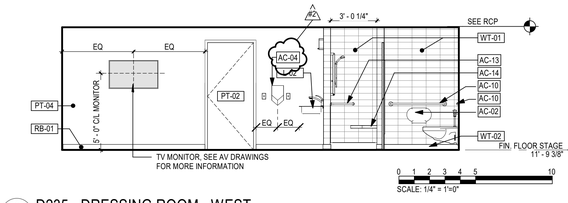
3 A.202.00 D232 - DRESSING ROOM - SOUTH
SCALE: 1/4" = 1'-0"



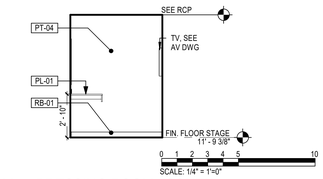
5 A.202.00 D232 - DRESSING ROOM - WEST
SCALE: 1/4" = 1'-0"



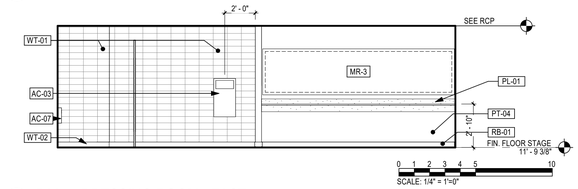
6 A.202.00 D235 - DRESSING ROOM - NORTH
SCALE: 1/4" = 1'-0"



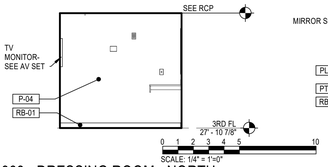
8 A.202.00 D235 - DRESSING ROOM - WEST
SCALE: 1/4" = 1'-0"



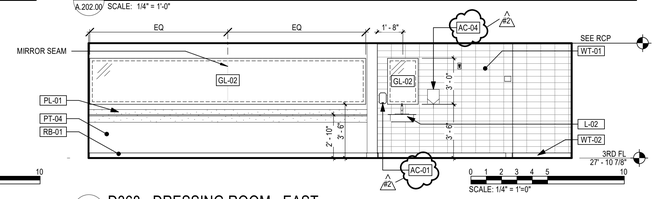
7 A.202.00 D235 - DRESSING ROOM - SOUTH
SCALE: 1/4" = 1'-0"



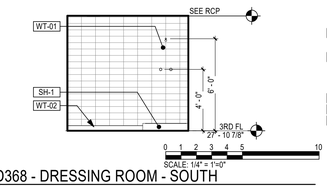
9 A.202.00 D235 - DRESSING ROOM - EAST
SCALE: 1/4" = 1'-0"



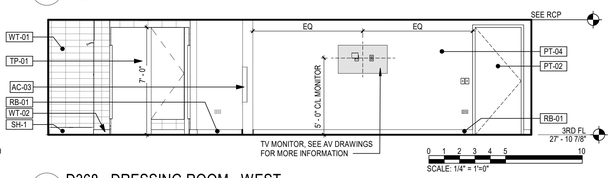
12 A.202.00 D368 - DRESSING ROOM - NORTH
SCALE: 1/4" = 1'-0"



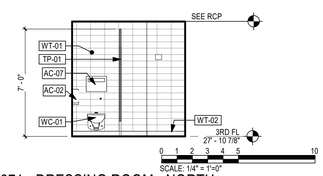
11 A.202.00 D368 - DRESSING ROOM - EAST
SCALE: 1/4" = 1'-0"



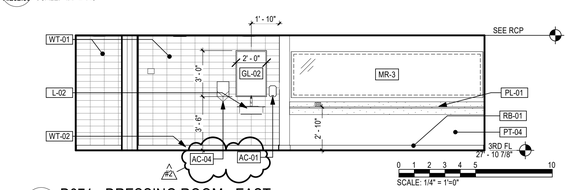
13 A.202.00 D368 - DRESSING ROOM - SOUTH
SCALE: 1/4" = 1'-0"



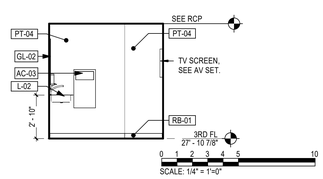
14 A.202.00 D368 - DRESSING ROOM - WEST
SCALE: 1/4" = 1'-0"



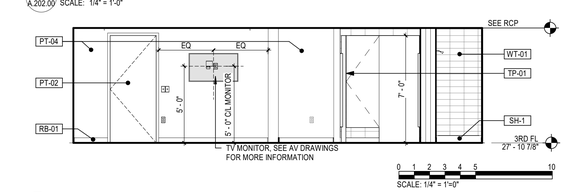
16 A.202.00 D371 - DRESSING ROOM - NORTH
SCALE: 1/4" = 1'-0"



15 A.202.00 D371 - DRESSING ROOM - EAST
SCALE: 1/4" = 1'-0"



17 A.202.00 D371 - DRESSING ROOM - SOUTH
SCALE: 1/4" = 1'-0"



18 A.202.00 D371 - DRESSING ROOM - WEST
SCALE: 1/4" = 1'-0"

GENERAL NOTES FOR ACCESSIBILITY - 2010 ADA

A. ACCESSIBLE URINAL SHALL PROVIDE CLEAR FLOOR SPACE PER 605.3.
B. ACCESSIBLE WATER CLOSETS SHALL PROVIDE CLEAR SPACE PER 604.3.1.
C. ACCESSIBLE LAVATORIES AND SINKS SHALL PROVIDE CLEAR SPACE PER 606.2.
D. ACCESSIBLE TOILET ROOMS SHALL PROVIDE A TURNING SPACE OF 60 INCHES IN DIAMETER PER 304.3.1.
E. ACCESSIBLE DRINKING FOUNTAINS / ELECTRIC WATER COOLERS SHALL PROVIDE CLEAR FLOOR SPACE PER 602.2.
F. ACCESSIBLE TOILET PARTITIONS SHALL COMPLY WITH 604.8.1.
G. EXPOSED PIPES AND SURFACES UNDER LAVATORIES AND SINKS SHALL BE INSULATED PER 606.5.

TOILET ACCESSORIES ABBREVIATIONS

ABBREV	DESCRIPTION
ACC	ADA ACCESSIBLE
BCS	BABY CHANGING STATION
EWC	ELECTRIC WATER COOLER
FSS	FOLDING SHOWER SEAT
GB-1	GRAB BAR (BACK WALL)
GB-2	GRAB BAR (SIDE WALL)
GB-3	GRAB BAR (VERTICAL)
GB-4	GRAB BAR (AMBULATORY STALL)
GB-5	GRAB BAR (SHOWER)
GB-6	GRAB BAR (BACK WALL 24")
GB-7	GRAB BAR (BACK WALL 12")
HD	HAND DRYER
LAV	LAVATORY
MBH	MOP/BROOM HOLDER
MR	MIRROR
MR/S	MIRROR WITH SHELF
PTD	PAPER TOWEL DISPENSER
PTD/R	COMBINATION TOWEL DISPENSER/RECEPTACLE
RH	ROBE HOOK
SCD	SEAT COVER DISPENSER
SCR	SHOWER CURTAIN ROD
SD	SOAP DISPENSER
SND	SANITARY NAPKIN DISPOSAL
SNV	SANITARY NAPKIN VENDOR
SSS	STAINLESS STEEL SHELF
TTD	TOILET TISSUE DISPENSER
US	UTILITY SHELF
WC	WATER CLOSET
WR	WASTE RECEPTACLE

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

ENLARGED FLOOR PLANS - 2ND & 3RD FL DRESSING ROOMS

A.202.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_AR_24.rvt
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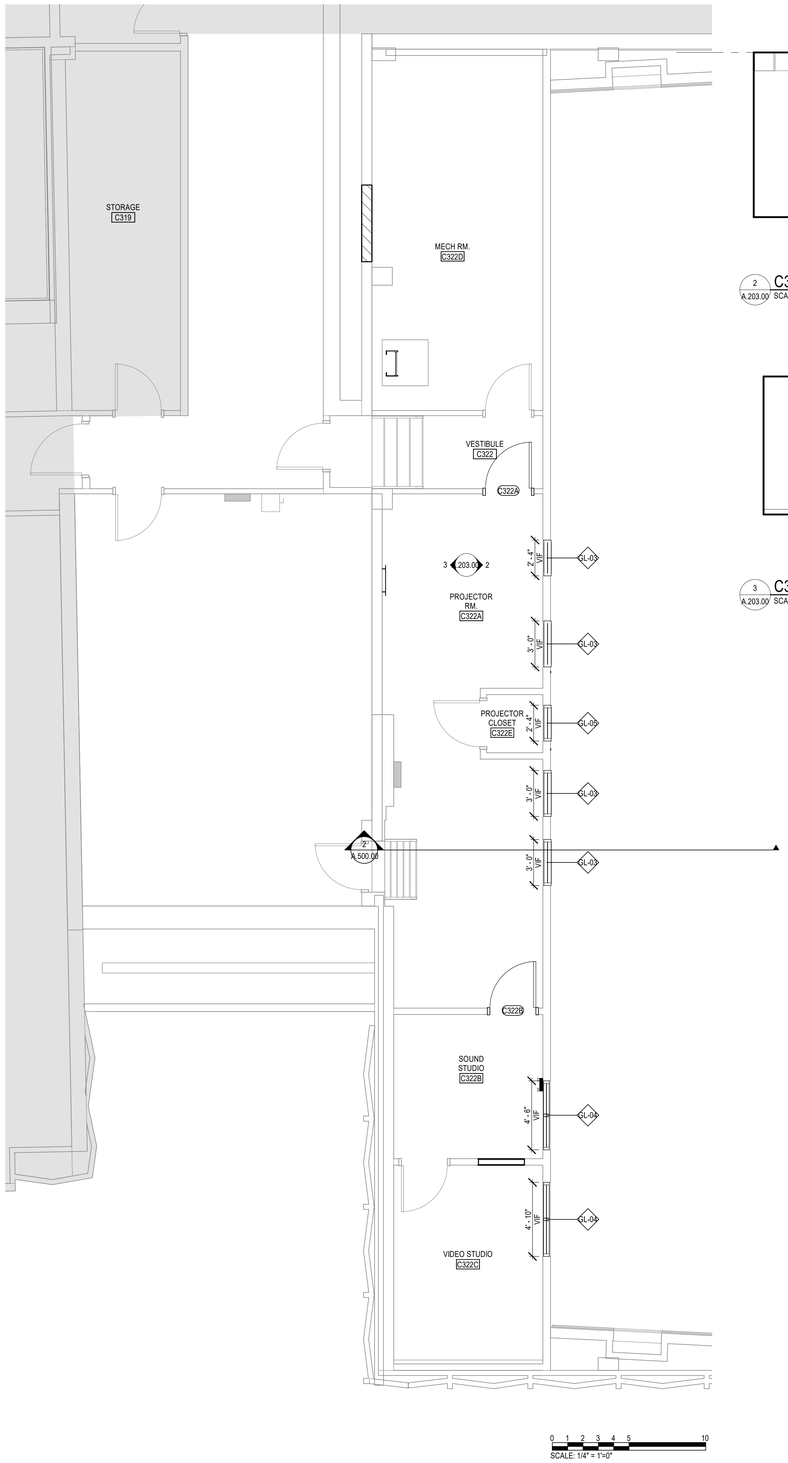
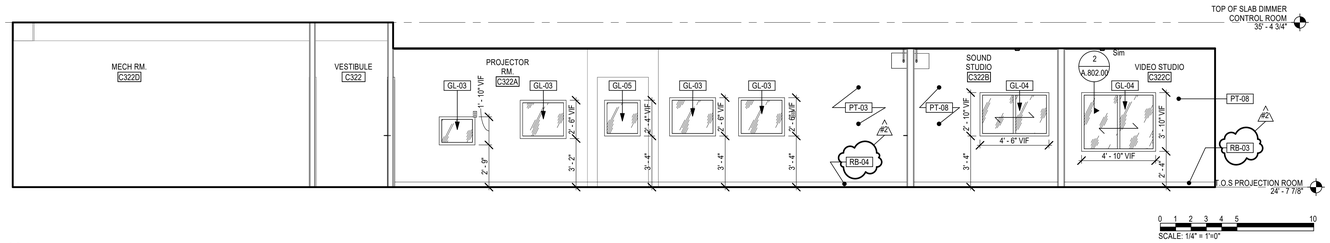
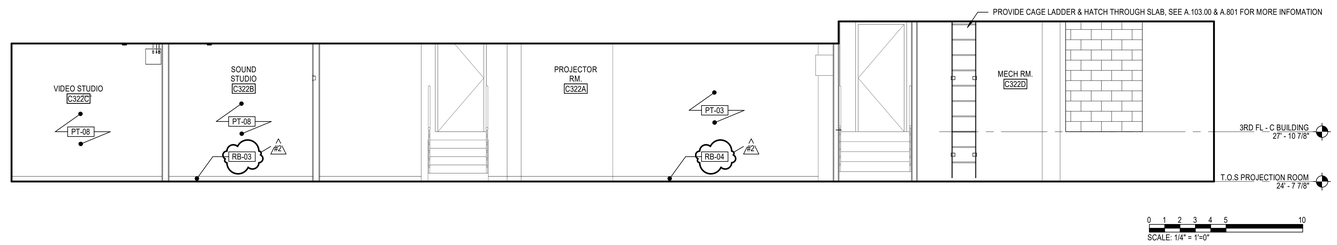


1 A.203.00 THIRD FLOOR - ENLARGED PLAN
SCALE: 1/4" = 1'-0"



2 A.203.00 C322 - PROJECTION ROOM ELEVATION FRONT
SCALE: 1/4" = 1'-0"



3 A.203.00 C322 - PROJECTION ROOM ELEVATION REAR
SCALE: 1/4" = 1'-0"

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REGISTERED ARCHITECT
STATE OF NEW YORK

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

ENLARGED FLOOR PLANS - 3RD FL AV ROOMS

A.203.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_AR_24.rvt
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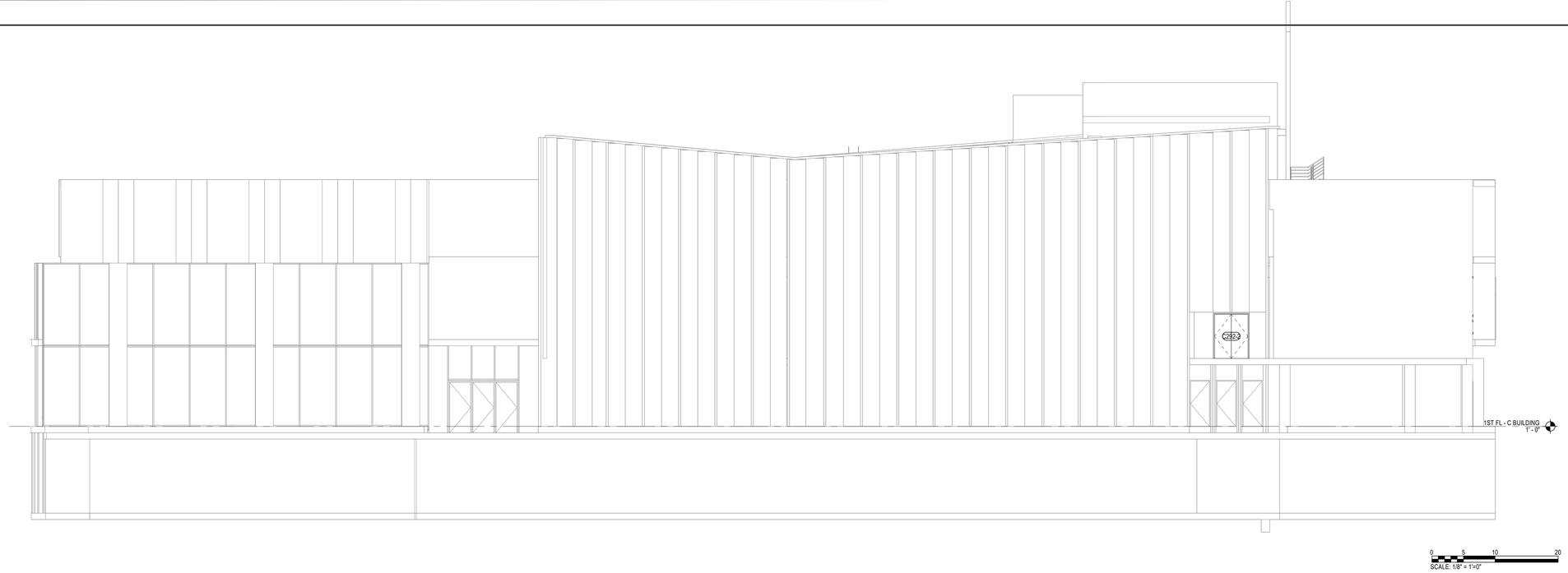

1 A.400.00 HAFT ELEVATION - SOUTH
SCALE: 1/8" = 1'-0"

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

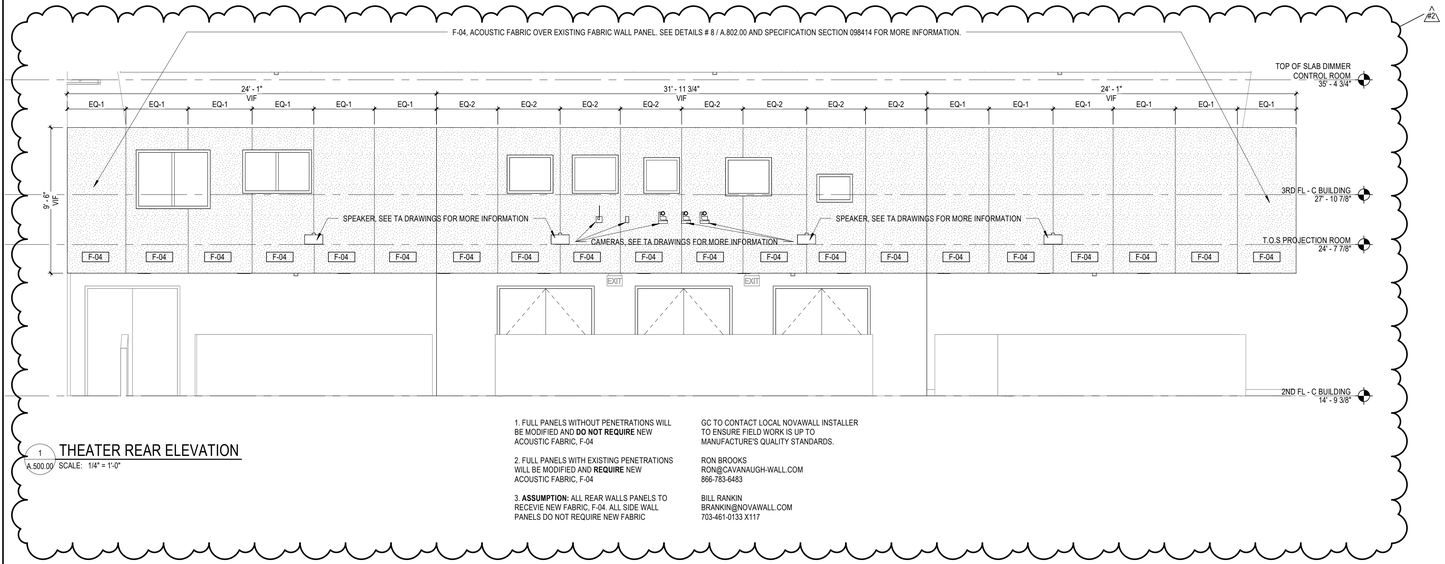
ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS

57-23140-00

EXTERIOR ELEVATIONS

A.400.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_AR_24.rvt
1/13/2025 1:15:39 AM



1 A.500.00 THEATER REAR ELEVATION
SCALE: 1/4" = 1'-0"

1. FULL PANELS WITHOUT PENETRATIONS WILL BE MODIFIED AND **DO NOT REQUIRE** NEW ACOUSTIC FABRIC, F-04

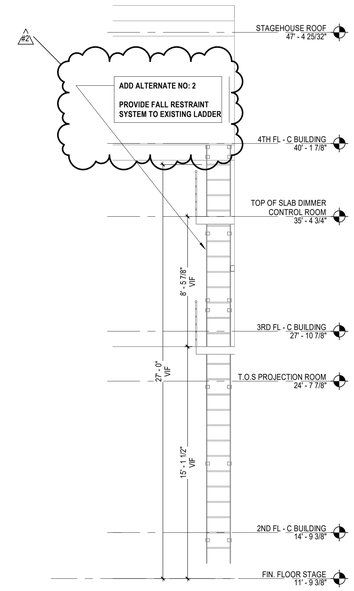
2. FULL PANELS WITH EXISTING PENETRATIONS WILL BE MODIFIED AND **REQUIRE** NEW ACOUSTIC FABRIC, F-04

3. **ASSUMPTION:** ALL REAR WALLS PANELS TO RECEIVE NEW FABRIC, F-04. ALL SIDE WALL PANELS DO NOT REQUIRE NEW FABRIC

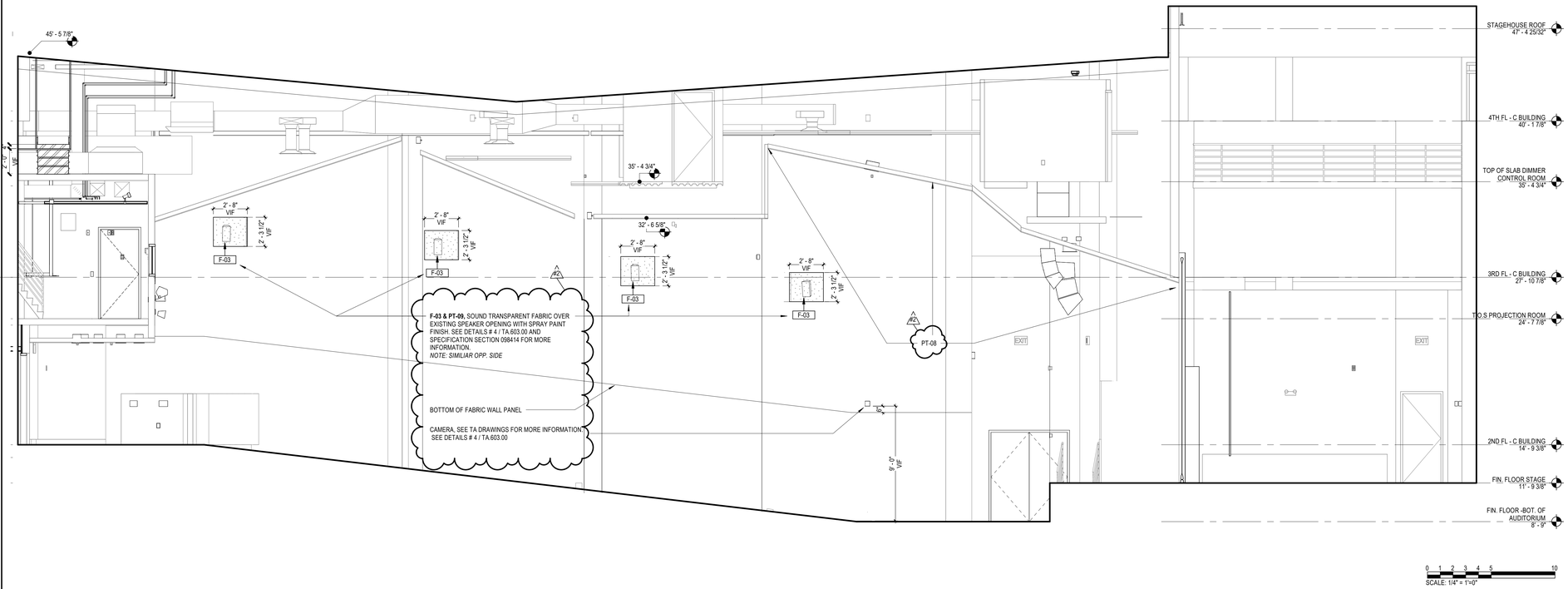
GC TO CONTACT LOCAL NOVAWALL INSTALLER TO ENSURE FIELD WORK IS UP TO MANUFACTURE'S QUALITY STANDARDS.

RON BROOKS
RON@CAVANAUGH-WALL.COM
866-783-6483

BILL RANKIN
BRANKIN@NOVAWALL.COM
703-461-0133 X117



4 A.500.00 SECTION AT LADDER TO DIMMING ROOM
SCALE: 1/4" = 1'-0"



2 A.500.00 THEATER SIDE ELEVATION
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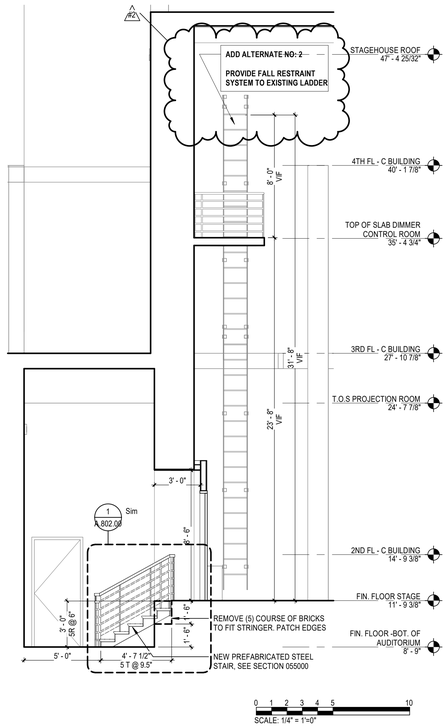

3 A.500.00 SECTION AT CORRIDOR
SCALE: 1/4" = 1'-0"

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

BUILDING SECTIONS

A.500.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_AR_24.rvt
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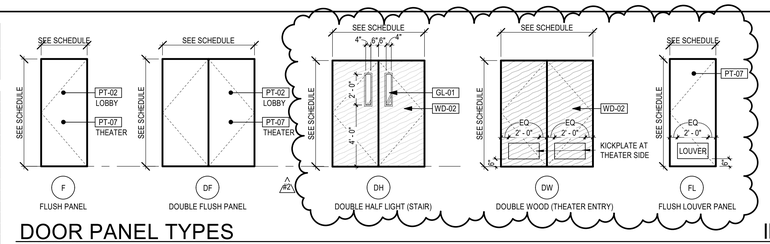
DOOR AND FRAME SCHEDULE

NUMBER	NO. OF PANELS	WIDTH	HEIGHT	THICKNESS	MATERIAL	GLASS	TYPE	FRAME MATERIAL	FRAME TYPE	FIRE RATING	HARDWARE SET	HEAD	JAMB LEFT	JAMB RIGHT	SILL	SCOPE	COMMENTS	Phase Created
C214A	1	3' - 0"	7' - 0"	1 3/4"	WD	-	F	HM	1	-	9.0	25	26	26	11	ADD ALT #1	BATHROOM DOOR	Phase I
C214B	1	3' - 0"	7' - 0"	1 3/4"	WD	-	F	HM	1	-	8.0	21	22	22	11	ADD ALT #1	BATHROOM DOOR	Phase I
C214C	2	3' - 0"	7' - 0"	1 3/4"	WD	GL-01	DH	HM	1	90 MIN	3.0	23	24	24	-	ADD ALT #1	STAIR DOOR	Phase I
C214D	2	3' - 0"	7' - 0"	1 3/4"	WD	GL-01	DH	HM	1	90 MIN	3.0	23	24	24	-	ADD ALT #1	STAIR DOOR	Phase I
C291A	2	3' - 0"	7' - 0"	1 3/4"	WD	-	DW	HM	1	90 MIN	2.0	23	24	24	-	ADD ALT #1	THEATER ENTRY DOOR	Phase I
C291B	2	3' - 0"	7' - 0"	1 3/4"	WD	-	DW	HM	1	90 MIN	2.0	23	24	24	-	ADD ALT #1	THEATER ENTRY DOOR	Phase I
C291C	2	3' - 0"	7' - 0"	1 3/4"	WD	-	DW	HM	1	90 MIN	2.0	23	24	24	-	ADD ALT #1	THEATER ENTRY DOOR	Phase I
C292-1	2	3' - 0"	7' - 0"	1 3/4"	WD	-	DF	HM	1	90 MIN	7.0	21	22	22	-		STAGE DOOR	Phase I
C292-2	2	2' - 8"	7' - 0"	1 3/4"	HM	-	DF	HM	2	-	1.0	27	28	28	-		NEW EXTERIOR STC 51 DOOR. VIF OPENING SIZE.	Phase I
C292-3	2	3' - 0"	7' - 0"	1 3/4"	WD	-	DF	HM	1	90 MIN	2.1	25	26	26	-		THEATER ENTRY DOOR	Phase I
C322A	1	3' - 0"	7' - 0"	1 3/4"	WD	-	F	HM	1	-	4.0	25	26	26	-		PROJECTION ROOM	Phase I
C322B	1	3' - 0"	7' - 0"	1 3/4"	WD	-	F	HM	1	-	4.0	25	26	26	-		SOUND STUDIO	Phase I
D232	1	3' - 0"	7' - 0"	1 3/4"	WD	-	FL	HM	1	-	6.0	25	26	26	12		DRESSING ROOM	Phase I
D235	1	3' - 0"	7' - 0"	1 3/4"	WD	-	FL	HM	1	-	6.0	25	26	26	12		DRESSING ROOM	Phase I
D368	1	3' - 0"	7' - 0"	1 3/4"	WD	-	FL	HM	1	-	5.0	25	26	26	12		DRESSING ROOM	Phase I
D371	1	3' - 0"	7' - 0"	1 3/4"	WD	-	FL	HM	1	-	5.0	25	26	26	12		DRESSING ROOM	Phase I



DOOR PANEL TYPES

SCALE: 1/4" = 1'-0"

INTERIOR FRAME TYPES

DOOR AND FRAME SCHEDULE GENERAL NOTES

A. ALL EXTERIOR HOLLOW METAL FRAMES SHALL BE FILLED WITH INSULATION.
B. ALL INTERIOR HOLLOW METAL FRAMES SET IN MASONRY AND CONCRETE WALLS SHALL BE GROUTED SOLID.
C. ALL HOLLOW METAL FRAMES SET IN METAL STUD WALLS SHALL BE FILLED WITH MINERAL WOOL BLANKET INSULATION.
D. ALL EXTERIOR FRAMES SHALL BE INSTALLED WITH 1/4" SHIM AND SEALANT AROUND PERIMETER OF FRAME.
E. MASONRY LINTELS AND STEEL LINTELS ARE SHOWN ON STRUCTURAL DRAWINGS.
F. GLASS TYPES FOR DOORS ARE INDICATED IN THE DOOR GLAZING COLUMN OF THE DOOR AND FRAME SCHEDULE. GLASS TYPES FOR FRAMES ARE INDICATED ON THE FRAME ELEVATIONS.
G. FOR COILING DOORS, GRILLES AND SECTIONAL DOORS, WIDTH AND HEIGHT DIMENSIONS SHOWN IN DOOR AND FRAME SCHEDULE REPRESENT FINISHED OPENING SIZE. CONTRACTOR TO COORDINATE EXACT SIZE OF DOOR WITH MANUFACTURER.
H. FRAME MANUFACTURER SHALL COORDINATE LOCATIONS OF ALL CONCEALED CONDUIT AND J-BOXES REQUIRED FOR SECURITY SYSTEM HARDWARE PRIOR TO MANUFACTURING OF HOLLOW METAL FRAMES AND COORDINATE WITH SECURITY HARDWARE AND DEVICES.
I. PROVIDE HEAD RECEIVERS AT ALUMINUM STOREFRONTS AND CURTAIN WALLS AS REQUIRED FOR STRUCTURAL DEFLECTION ALLOWANCE.
J. SEE SPECIFICATIONS HARDWARE SECTION FOR HARDWARE SETS NOTED IN DOOR AND FRAME SCHEDULE.

DOOR PANEL TYPE DESCRIPTIONS

F FLUSH PANEL
DF DOUBLE FLUSH PANEL
DH DOUBLE HALF LITE (STAIR)
DW DOUBLE WOOD (THEATER ENTRY)
FL FLUSH LOUVER PANEL

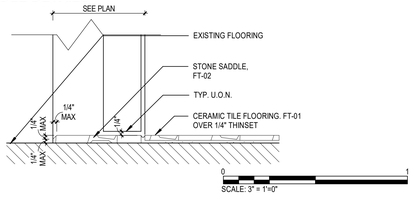
FRAME TYPE DESCRIPTIONS

1 INTERIOR FRAME
2 EXTERIOR FRAME

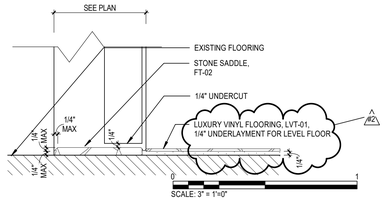
GLAZING TYPE DESCRIPTIONS

GL-01 LAMINATED GLASS, SEE A.900.00 FOR MORE INFORMATION

SADDLE DETAILS

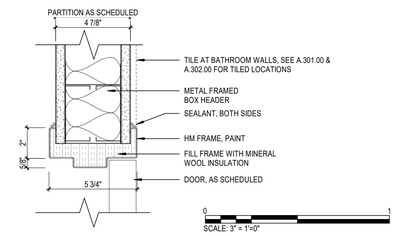


11 A.800.00 SILL - FLOOR TILE TO EXISTING FLOORING
SCALE: 3" = 1'-0"

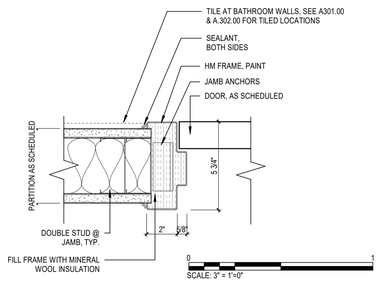


12 A.800.00 SILL - LVT TO EXISTING FLOORING
SCALE: 3" = 1'-0"

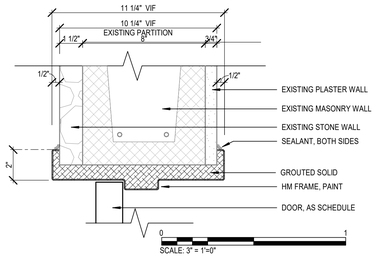
HEAD & JAMB DETAILS



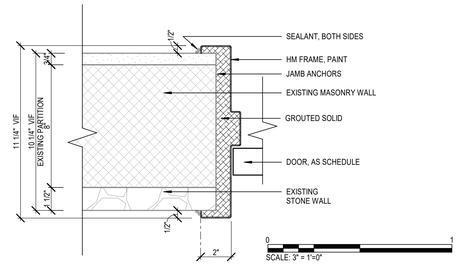
21 A.800.00 INTERIOR HOLLOW METAL HEAD DETAIL
SCALE: 3" = 1'-0"



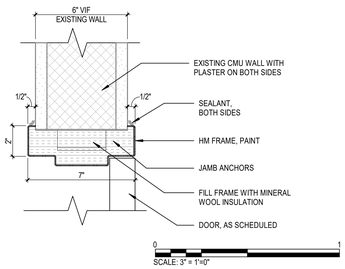
22 A.800.00 INTERIOR HOLLOW METAL JAMB DETAIL
SCALE: 3" = 1'-0"



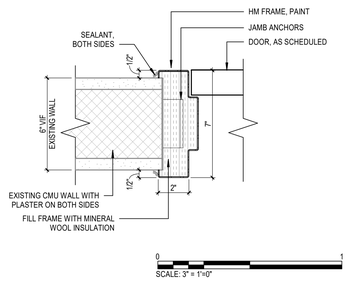
23 A.800.00 INTERIOR HOLLOW METAL HEAD AT MASONRY & STONE WALL
SCALE: 3" = 1'-0"



24 A.800.00 INTERIOR HOLLOW METAL JAMB AT MASONRY & STONE WALL
SCALE: 3" = 1'-0"



25 A.800.00 INTERIOR CMU HOLLOW METAL HEAD DETAIL
SCALE: 3" = 1'-0"



26 A.800.00 INTERIOR CMU HOLLOW METAL JAMB DETAIL
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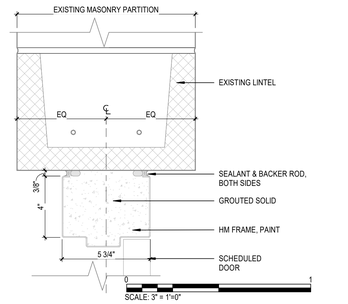
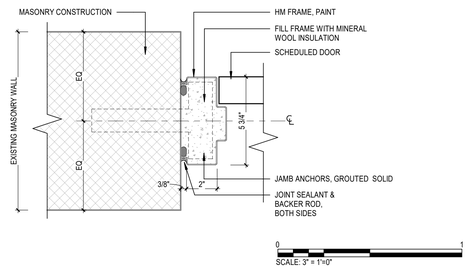


27 A.800.00 EXTERIOR HOLLOW METAL HEAD DETAIL
SCALE: 3" = 1'-0"

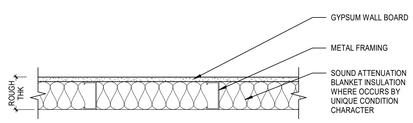


28 A.800.00 EXTERIOR HOLLOW METAL JAMB DETAIL
SCALE: 3" = 1'-0"

PARTITION TYPES

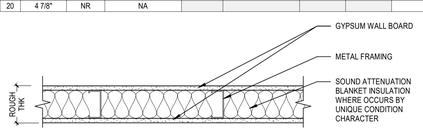
S_-_-1_ NON-RATED STUD PARTITION

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS
SA	2	10	3 1/8"	NR	NA					
SA	3	10	4 1/4"	NR	NA					



S_-_-2_ NON-RATED STUD PARTITION

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS
SA	3	20	4 7/8"	NR	NA					



S0-_-4_ 0-HOUR RATED STUD PARTITION

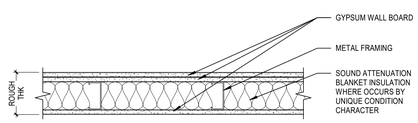
MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DEAIL	COMMENTS

S1-_-4_ 1-HOUR RATED STUD PARTITION

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS

S2-_-4_ 2-HOUR RATED STUD PARTITION

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS



S1-_-2_ 1-HOUR RATED STUD PARTITION

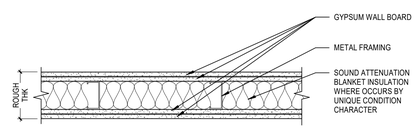
MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS

S_-_-3_ NON-RATED STUD PARTITION

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS

S1-_-3_ 1-HOUR RATED STUD PARTITION

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS



NON-RATED MASONRY PARTITON

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS

0-HOUR RATED MASONRY PARTITION

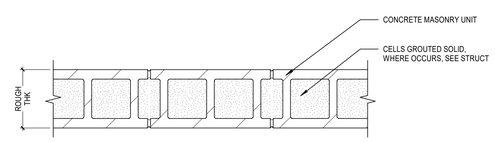
MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS
M0	6	00	6"	0	UL ###					
M0	8	00	8"	0	UL ###					

1-HOUR RATED MASONRY PARTITION

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS

2-HOUR RATED MASONRY PARTITION

MARK			ROUGH THICKNESS	FIRE/SMOKE RATING	FIRE/SMOKE TESTED ASSEMBLIES	STC RATING	SOUND TESTED ASSEMBLIES	T.O. WALL DETAIL	B.O. WALL DETAIL	COMMENTS



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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

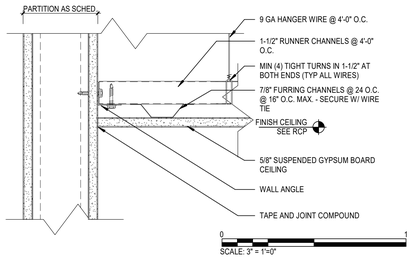
343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

DOOR SCHEDULE, DETAILS & PARTITION SCHEDULES

A.800.00



4 A.801.00 SUSP GYP @ STUD WALL FIXED
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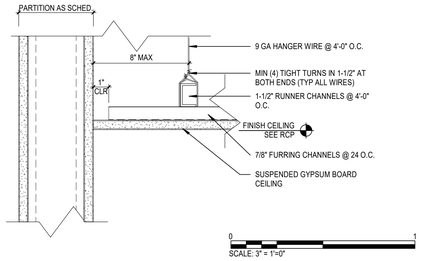
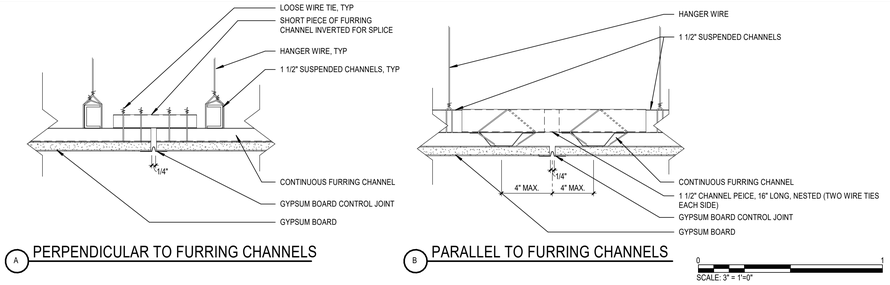
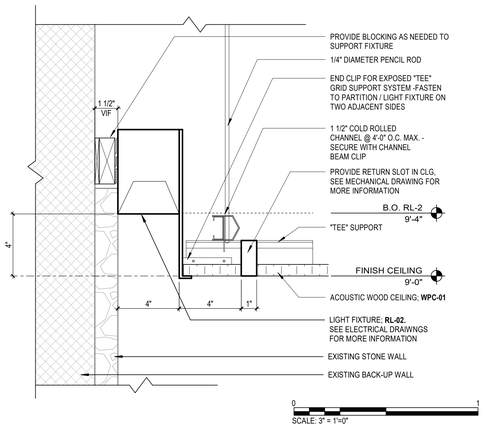


7 A.801.00 SUSP GYP CEILING, CROSS RUNNER @ FIXED END - TYP.
SCALE: 3" = 1'-0"

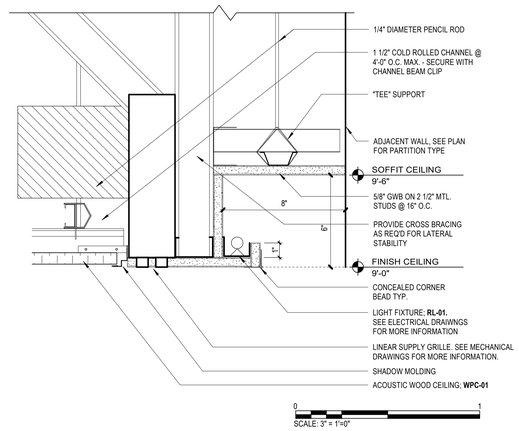


A PERPENDICULAR TO FURRING CHANNELS
B PARALLEL TO FURRING CHANNELS

6 A.801.00 SUSP GYP CEILING, CONTROL JOINTS - TYP.
SCALE: 3" = 1'-0"



1 A.801.00 LOBBY CEILING DETAIL AT END WALL
SCALE: 3" = 1'-0"



2 A.801.00 LOBBY CEILING DETAIL AT SOFFIT
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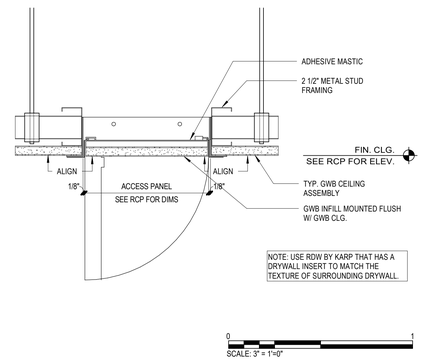
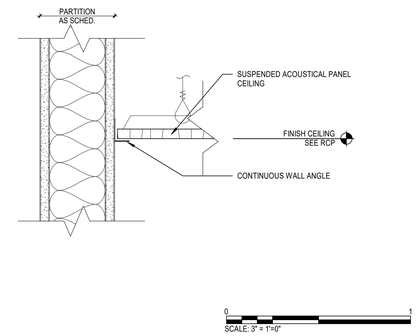


5 A.801.00 TYPICAL ACCESS PANEL
SCALE: 3" = 1'-0"



9 A.801.00 APC PERIMETER @ WALL TILE
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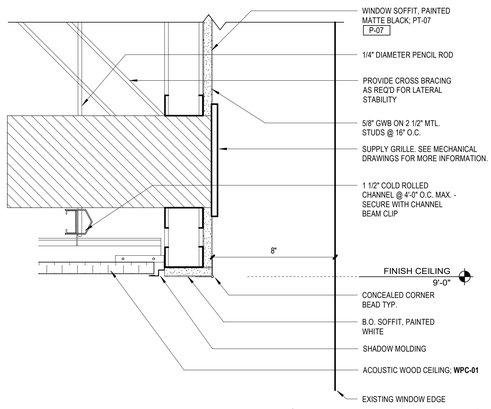

3 A.801.00 LOBBY CEILING DETAIL AT WINDOW
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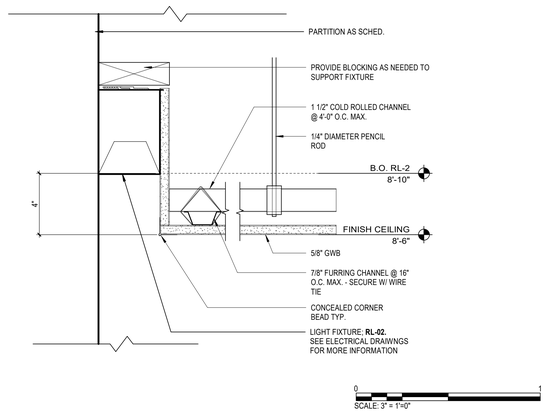
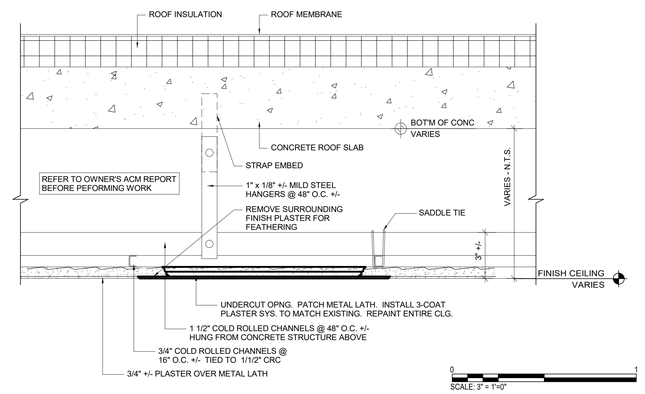
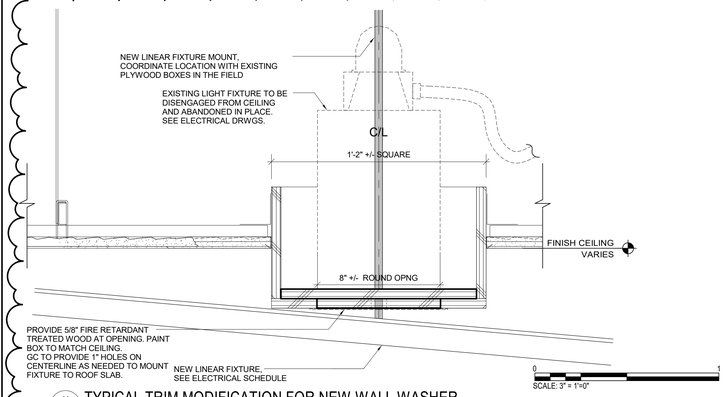


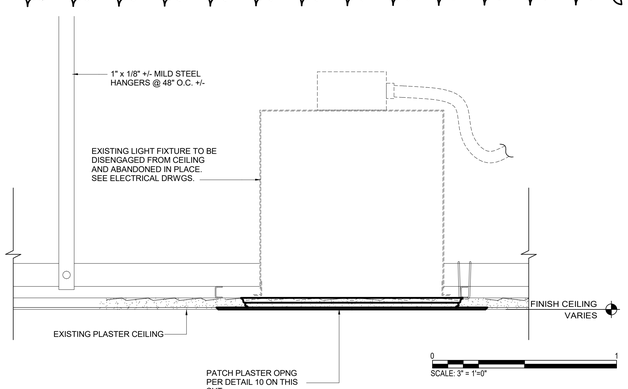
8 A.801.00 RESTROOM -CEILING DETAIL AT END WALL
SCALE: 3" = 1'-0"



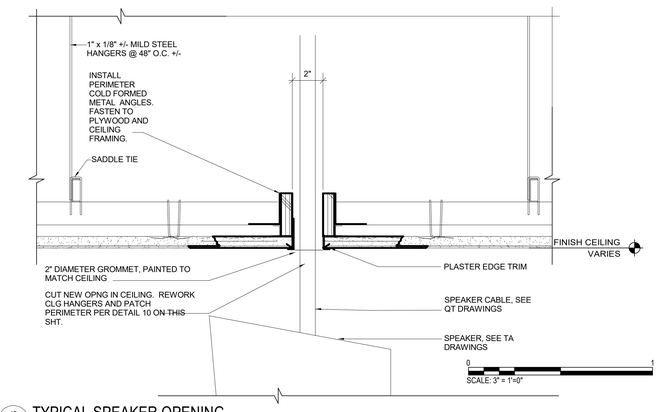
10 A.801.00 TYPICAL AUDITORIUM EXISTING PLASTER PATCHING
SCALE: 3" = 1'-0"



11 A.801.00 TYPICAL TRIM MODIFICATION FOR NEW WALL WASHER
SCALE: 3" = 1'-0"



12 A.801.00 TYPICAL EXISTING PLASTER CEILING PATCHING AT ABANDONED LIGHT FIXTURE
SCALE: 3" = 1'-0"



13 A.801.00 TYPICAL SPEAKER OPENING
SCALE: 3" = 1'-0"

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
343 WEST 27TH STREET
NEW YORK, NY 10001

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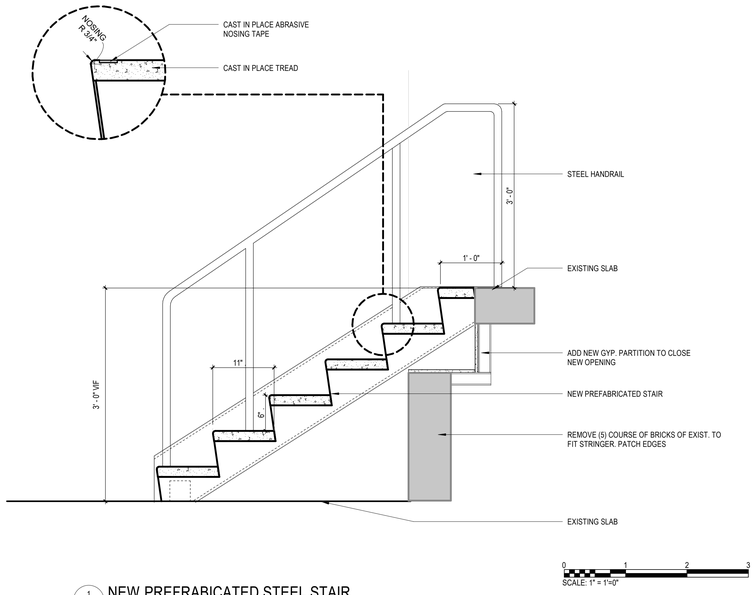
01.23.25
REVISIONS
#3 01/23/25

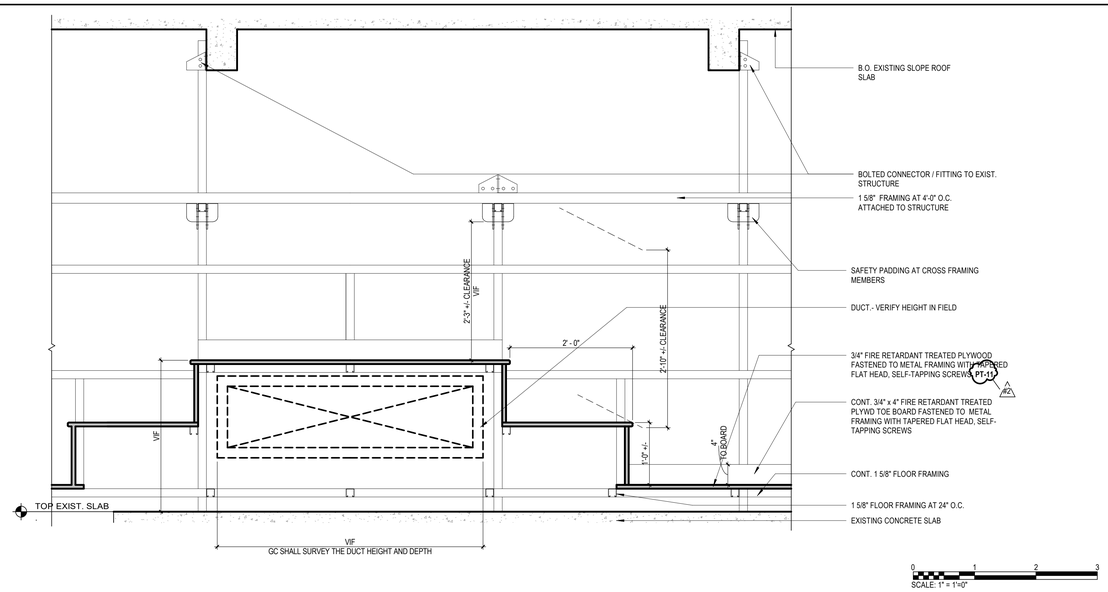
57-23140-00

INTERIOR DETAILS - CEILINGS

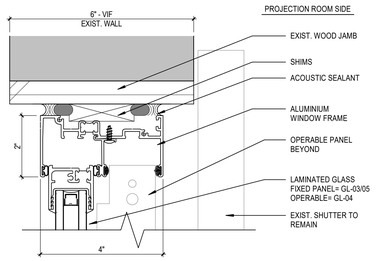
A.801.00



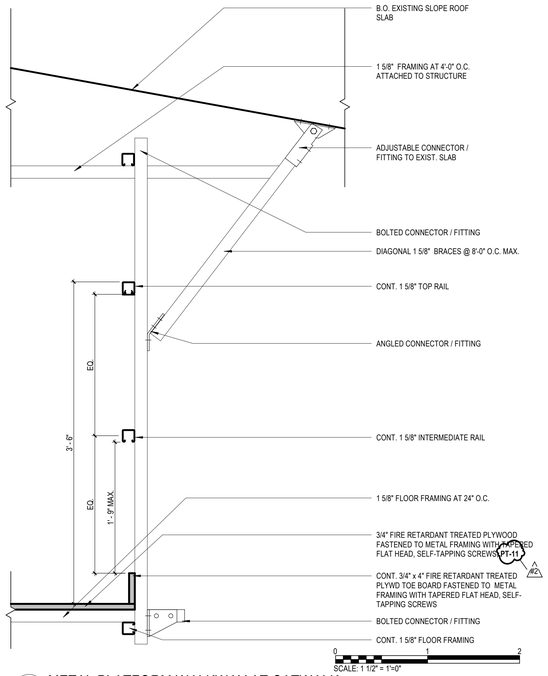
1 A.802.00 NEW PREFRABICATED STEEL STAIR
SCALE: 1" = 1'-0"



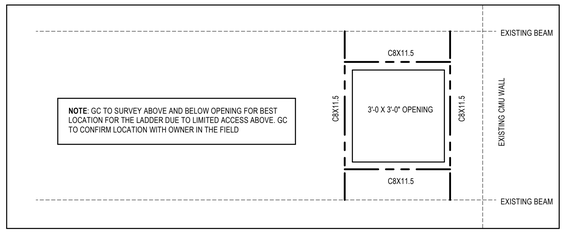
4 A.802.00 METAL PLATFORM WALKWAY AT DUCTWORK CROSSOVER
SCALE: 1" = 1'-0"

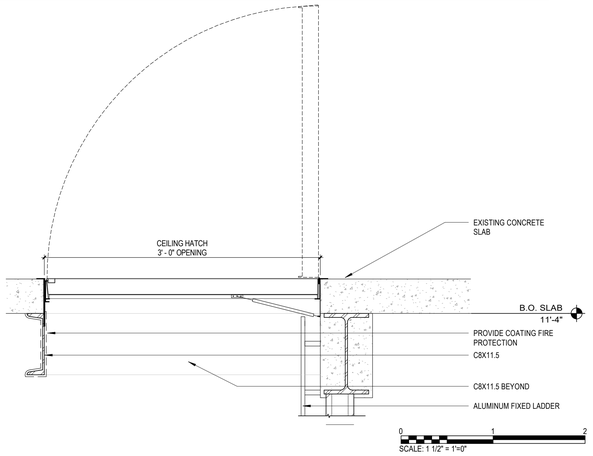


2 A.802.00 INT. SLIDING WINDOW HEAD/JAMB
SCALE: 6" = 1'-0"

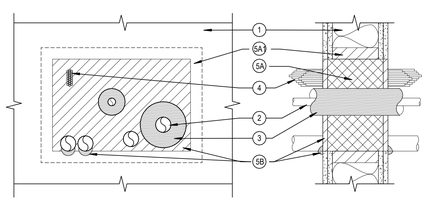


5 A.802.00 METAL PLATFORM WALKWAY AT CATWALK
SCALE: 1 1/2" = 1'-0"





6 A.802.00 LADDER & HATCH TO SLAB ABOVE PROJECTION ROOM
SCALE: 1 1/2" = 1'-0"



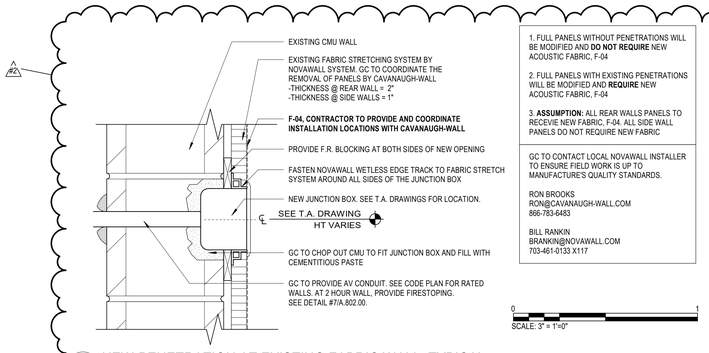
1. WALL TYPE PER PLAN
2. ONE OR MORE PIPES, CONDUIT, OR TUBES MAY BE INSTALLED WITHIN THE OPENING. THE TOTAL NUMBER OF THROUGH-PENETRATIONS IS DEPENDENT ON THE SIZE OF THE OPENING AND THE TYPES AND SIZES OF THE PENETRATIONS, REFER TO UL W-L-8079 FOR ADDITIONAL RESTRICTIONS
3. ONE OF MORE METALLIC PENETRATIONS MAY BE INSULATED, REFER TO UL W-L-8079 FOR ADDITIONAL RESTRICTIONS
4. ONE MAX 3 IN. DIAM BUNDLE OF CABLES INSTALLED WITHIN THE OPENING, REFER TO UL W-L-8079 FOR ADDITIONAL RESTRICTIONS

5A. MIN 4-3/4" THICKNESS OF MIN 4 PCF MINERAL WOOL BATT INSULATION FIRMLY PACKED INTO OPENING AS A PERMANENT FORM. PACKING MATERIAL RECESSED FROM BOTH SURFACES OF THE WALL TO ACCOMMODATE THE REQUIRED THICKNESS OF FILL MATERIAL

5A. PACKING MATERIAL MIN 1-1/4" THICKNESS OF MIN 4 PCF MINERAL WOOL BATT INSULATION FIRMLY PACKED AS A BACKER AROUND THE PERIMETER OF OPENING AS A PERMANENT FORM.

5B. SEALANT 5/8" MIN THICKNESS OF FILL MATERIAL APPLIED WITHIN ANNULUS, FLUSH WITH BOTH SURFACES OF WALL. AT THE POINT CONTACT LOCATION BETWEEN THROUGH PENETRANTS AND GYPSUM BOARD, A MIN 1/2" DIAM BEAN OF FILL MATERIAL SHALL BE APPLIED AT THE GYPSUM BOARD / THROUGH PENETRANT INTERFACE ON BOTH SURFACES OF WALL

7 A.802.00 FIRESTOPPING AT MULTIPLE PENETRATIONS
NO SCALE



1. FULL PANELS WITHOUT PENETRATIONS WILL BE MODIFIED AND **DO NOT REQUIRE** NEW ACOUSTIC FABRIC, F-04

2. FULL PANELS WITH EXISTING PENETRATIONS WILL BE MODIFIED AND **REQUIRE** NEW ACOUSTIC FABRIC, F-04

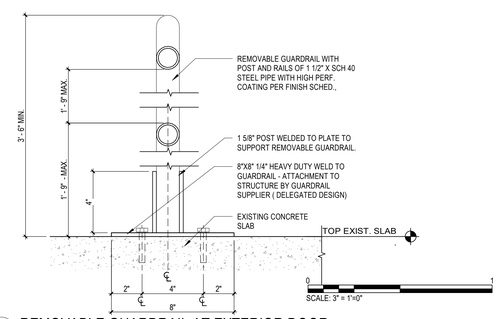
3. **ASSUMPTION:** ALL REAR WALLS PANELS TO RECEVIE NEW FABRIC, F-04. ALL SIDE WALL PANELS DO NOT REQUIRE NEW FABRIC

GC TO CONTACT LOCAL NOVAWALL INSTALLER TO ENSURE FIELD WORK IS UP TO MANUFACTURE'S QUALITY STANDARDS.

RON BROOKS
RON@CAVANAUGH-WALL.COM
866-783-6483

BILL RANKIN
BRANKIN@NOVAWALL.COM
703-461-0133 X117

8 A.802.00 NEW PENETRATION AT EXISTING FABRIC WALL, TYPICAL
SCALE: 3" = 1'-0"



9 A.802.00 REMOVABLE GUARDRAIL AT EXTERIOR DOOR
SCALE: 3" = 1'-0"

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REGISTERED ARCHITECT
STEVEN M. MOSER

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

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01.23.25
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#3 01/23/25

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INTERIOR DETAILS - MISCELLANEOUS

A.802.00

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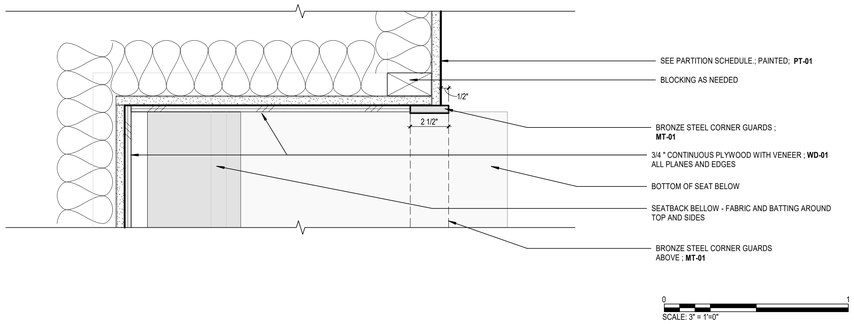
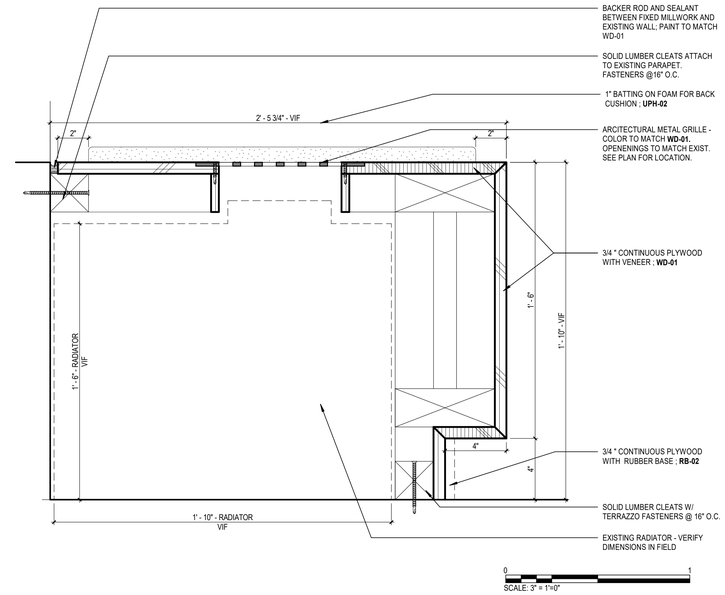
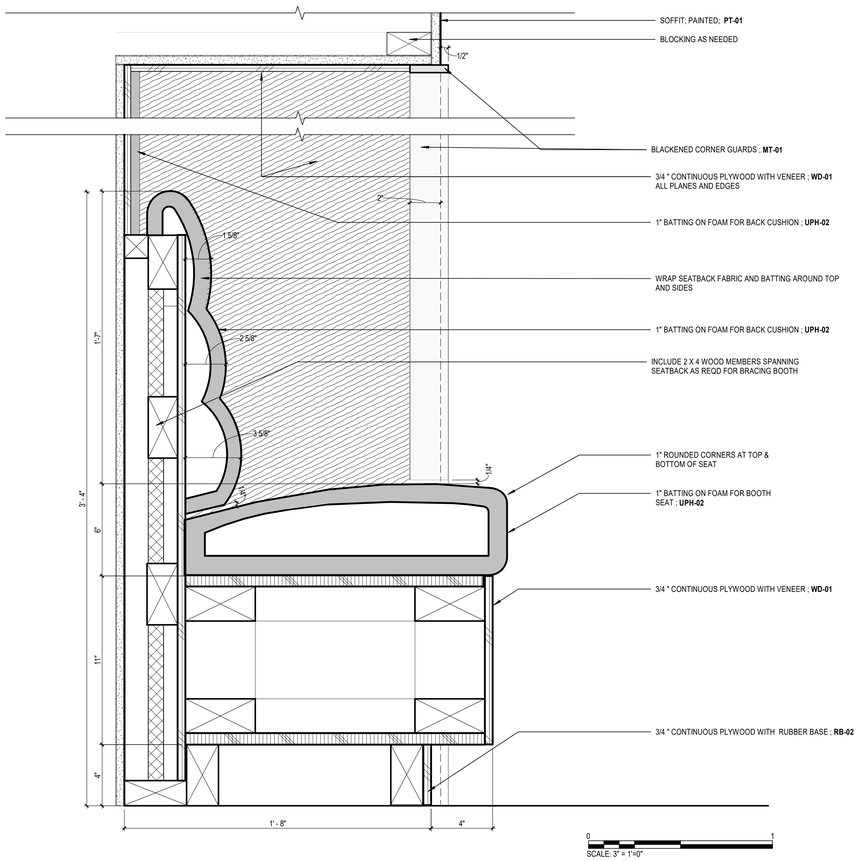


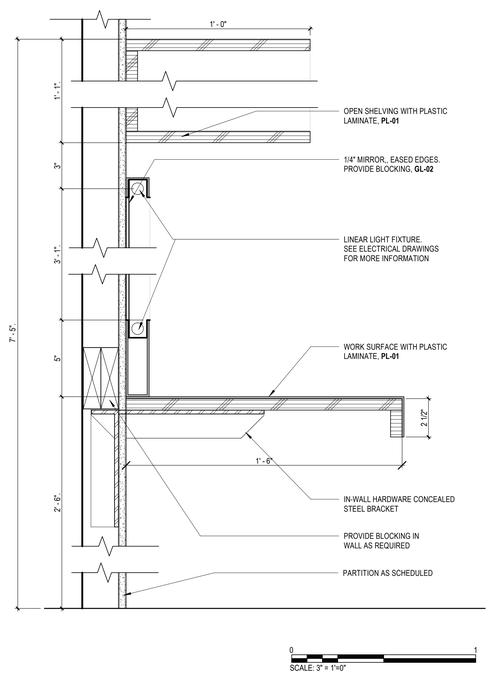
4 A.803.00 CORNER TRANSITION AT 2ND FLOOR LOBBY MILLWORK
SCALE: 3" = 1'-0"



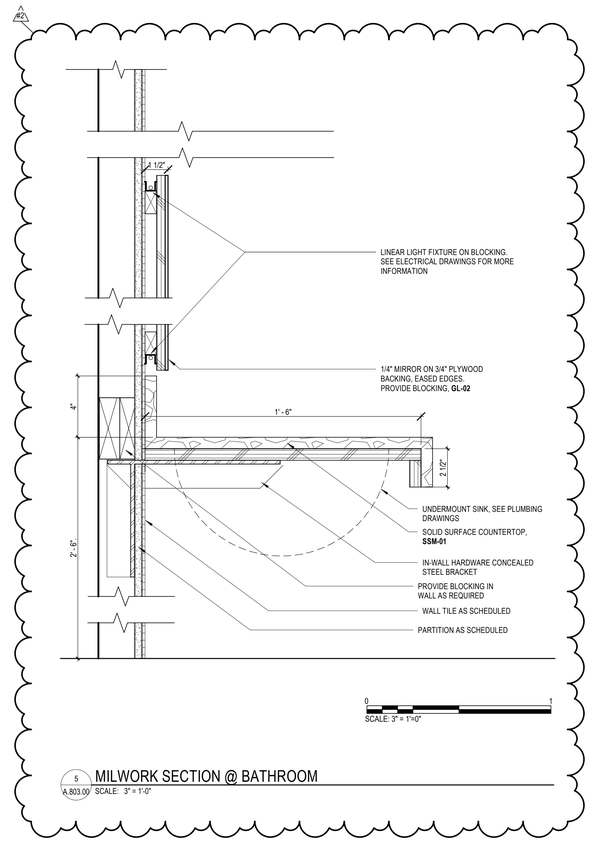
2 A.803.00 SECTION AT 2ND FLOOR LOBBY MILLWORK RADIATOR COVER
SCALE: 3" = 1'-0"



1 A.803.00 SECTION AT 2ND FLOOR LOBBY MILLWORK
SCALE: 3" = 1'-0"



3 A.803.00 MILWORK SECTION @ DRESSING ROOMS
SCALE: 3" = 1'-0"



5 A.803.00 MILWORK SECTION @ BATHROOM
SCALE: 3" = 1'-0"

CASEWORK AND MILLWORK GENERAL NOTES

A. CASEWORK AND MILLWORK GENERAL NOTES APPLY TO ALL CASEWORK/MILLWORK SHEETS.
B. ELEVATIONS DENOTED AS MILLWORK ARE SPECIFIED UNDER DIVISION 06. ALL OTHERS SHALL BE SPECIFIED UNDER DIVISION 12, UNLESS NOTED OTHERWISE.
C. ALL BASE CABINETS TO BE 2'-0" DEEP UNITS, UNLESS NOTED OTHERWISE.
D. ALL SHELVING IN CASEWORK TO BE ADJUSTABLE SHELVING, UNLESS NOTED OTHERWISE.
E. CATALOG NUMBERS SHOWN ON THE ELEVATIONS FOR CASEWORK ARE XXXXX MANUFACTURER, UNLESS NOTED OTHERWISE. (M) AFTER THE CATALOG NUMBER INDICATES THE CABINET IS SHOWN MODIFIED FROM THE MANUFACTURER'S STANDARD.
F. INDICATES CASEWORK TO BE BID AS AN ALTERNATE. SEE ALTERNATES SECTION IN THE SPECIFICATIONS FOR DESCRIPTIONS.
G. WHERE PLUMBING OR ELECTRICAL DEVICES ARE LOCATED IN CASEWORK, CASEWORK CONTRACTOR SHALL PROVIDE OPENINGS. COORDINATE LOCATION AND QUANTITY WITH THE PLUMBING OR ELECTRICAL CONTRACTOR.
H. PROVIDE SEALANT AT ALL PERIMETER JOINTS WHERE COUNTERTOPS, BACK AND SIDE SPLASHES, CASEWORK AND MILLWORK ABUT WALLS.
I. FIELD VERIFY ALL DIMENSIONS OF CABINET LOCATIONS IN THE BUILDING PRIOR TO FABRICATION.
J. PROVIDE LOCKS WHERE INDICATED AT DOORS AND DRAWERS.
K. PROVIDE FINISHED ENDS AT ALL EXPOSED ENDS OF CASEWORK AND MILLWORK.
L. ALL EXPOSED SURFACES IN OPEN SHELVING SHALL BE PLASTIC LAMINATE COVERED

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HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
NEW YORK, NY 10001

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#3 01/23/25

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INTERIOR DETAILS - MILLWORK

A.803.00

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FIT - HAFT THEATER FINISH SCHEDULE

TAG	DESCRIPTION	MANUFACTURER	PRODUCT	COLOR/FINISH	SIZE	COMMENTS
057000 DECORATIVE METAL						
MT-01	BLACKENED STREEL METAL PANEL			BLACKENED STEEL		
MT-02	SCHLUTTER TILE JOLLY-P WALL EDGE TRIM	SCHLUTER	JOLLY-P WALL EDGE TRIM	SATIN STEEL		PROVIDE AT ALL BATHROOM WALL TILE INNER AND OUTER CORNERS
MT-03	ACCENT CORNER GUARDS			BLACKENED STEEL	1/16" THICKNESS	
BR-01	4" RAISED METAL LETTERS			BRASS		FONT AND TEXT TBD
062023 INTERIOR FINISH CARPENTRY						
UPH-01	UPHOLSTERY	PALLAS	ODE	LAPIS		LOBBY BANQUETTE- BACK WALL
UPH-02	UPHOLSTERY	ARCHITEX	CUPERTINO	LAZANEO		LOBBY BANQUETTE- SEAT
062023 INTERIOR FINISH CARPENTRY						
WD-01	WOOD VENEER	PARKLEX		EUROPEAN OAK		AT BUILT IN BENCHES AND BANQUETTES.
WD-02	WOOD VENEER AT DOORS	PARKLEX		EUROPEAN OAK		SEE SECTION 081416 - FLUSH WOOD DOORS FOR MORE INFORMATION
088080 GLAZING						
GL-01	TEMPERED GLASS AT DOORS				3/8" THICK	SEE SECTION 088813FIRE RATED GLAZING FOR MORE INFORMATION
GL-02	TEMPERED MIRROR GLASS				1/8" THICK	SEE 088300 MIRRORS
GL-03	LAMINATED GLASS IN PROJECTOR ROOM				3/4" THICK	(2) 3/8" GLASS PANELS
GL-04	LAMINATED OPERABLE GLASS IN SOUND STUDIOS				3/4" THICK	(2) 3/8" GLASS PANELS WITH OPERABLE PORTION
GL-05	OPTICALLY CLEAR GLASS IN THE PROJECTION CLOSET				3/4" THICK	(2) 3/8" OPTICALLY CLEAR GLASS PANELS
093013 CERAMIC TILING						
FT-01	FLOOR TILE	STONE SOURCE	SIENNA MONOLITH	ANTHRACITE NATURAL FINISH	12X24, 8.5MM THICK	RESTROOMS (ADD ALT NO. 1)
FT-02	STONE SADDLE	-	-	ABSOLUTE BLACK GRANITE	3'-0" LONG X 3/4" THICK	TRANSITION AT DRESSING ROOM (BASE BID) & RESTROOMS (ADD ALT NO. 1)
WT-01	WALL TILE	STONE SOURCE	CENTRO SHADES	GRIGIO CHAIRO FRAME, GLOSSY FINISH	5X11, 9MM THICK	DRESSING ROOM (BASE BID) & RESTROOMS (ADD ALT NO. 1) WT-02 = WT-01 AT 4" HEIGHT
095113 ACOUSTIC CEILING TILES						
ACT-01	ACOUSTIC CEILING TILES	ARMSTRONG WORLD INDUSTRIES		MATTE BLACK	24X24	PROJECTION ROOM & SOUND STUDIOS
098400 SUSPENDED WOOD CEILINGS						
WPC-01	WOOD PANEL CEILING	TOPAKUSTIK / ARMSTRONG	ACOUSTIC WOODEN PANEL MICRO TYPE 3/3	EUROPEAN OAK		SECOND FLOOR LOBBY- ADD ALT
096519 RESILIENT FLOORING						
LVT-01	LUXURY VINYL TILE	INTERFACE	BRUSHED LINES 3.0	C00702 GRAPHITE	25cm x 1m	
RB-01	LINYL RUBBER BASE - DRESSING ROOM	VPI CORPORATION	COVE PROFILE	WHITE	4" TALL	SEE SECTION 096513 RESILIIENT BASE & ACCESSORIES FOR MORE INFORMATION
RB-02	LINYL RUBBER BASE - LOBBY		STRAIGHT PROFILE	WHITE	4" TALL	SEE SECTION 096513 RESILIIENT BASE & ACCESSORIES FOR MORE INFORMATION
RB-03	LINYL RUBBER BASE -PROJECTION ROOM		STRAIGHT PROFILE	TBD, TO MATCH PT-03	4" TALL	SEE SECTION 096513 RESILIIENT BASE & ACCESSORIES FOR MORE INFORMATION
RB-04	LINYL RUBBER BASE - SOUND STUDIO 1 & 2		STRAIGHT PROFILE	TBD, TO MATCH PT-08	4" TALL	SEE SECTION 096513 RESILIIENT BASE & ACCESSORIES FOR MORE INFORMATION
098444 ACOUSTIC FABRIC						
F-03	SPEAKER GRILLE CLOTHE	GUILFORD	FR-701	S-W PRO-MAR 200 - SW 6035 SPRAY PAINT	SEE ELEVATION	SPRAY PAINT, PT-09 TO MATCH F-04
F-04	PAPER-BACKED FABRIC AT EXISTING SIDE WALLS	NEXUS 6425	XOREL	W403	SEE ELEVATION	PROVIDE 919, 920, & 903 FOR FIELD VERIFICATION
099000 INTERIOR PAINTING						
PT-01	WALL PAINT- FIELD	SHERWIN WILLIAMS	LOW VOC, PREMIUM PAINT	SW 6070 HERON PLUME; EGGSHELL FINISH		LOBBY
PT-02	HM DOORS AND FRAMES - LOBBY	SHERWIN WILLIAMS	LOW VOC, PREMIUM PAINT	SW 7674 PEPPERCORN; SEMI-GLOSS FINISH		LOBBY RESTROOMS
PT-03	WALL PAINT- PROJECTION ROOM	SHERWIN WILLIAMS	LOW VOC, PREMIUM PAINT	TBD (LIGHT)		PROJECTION ROOM
PT-04	WALL PAINT - DRESSING ROOM	SHERWIN WILLIAMS	LOW VOC, PREMIUM PAINT	TBD (WHITE)		DRESSING ROOM
PT-05	WALL PAINT - SOUND STUDIO ROOM	SHERWIN WILLIAMS	LOW VOC, PREMIUM PAINT	TBD (DARK)		
PT-06	CEILING PAINT (WET AREAS)	SHERWIN WILLIAMS	LOW VOC, PREMIUM PAINT	TBD (WIHTE)		CEILING AT DRESSING ROOM (BASE BID) & RESTROOMS (ADD ALT NO. 1)
PT-07	HM DOORS AND FRAMES - SIDE DOORS THEATER & METAL HANDRAILS / RAILINGS AT STAIR	SHERWIN WILLIAMS	PROCRYL B66-310 PRIMER + S-W- PRO INDUSTRIAL PRE-CATALYZED WATERBASED EPOXY K45 EGGHSELL	PITTSBURGH PAINTS 518-7 BLACK MAGIC		
PT-08	PROSCENIUM PAINT	SHERWIN WILLIAMS	PRO GREEN PRIMER + S-W PRO-MAR 200 ZERO VOC EGGSHELL	PITTSBURGH PAINTS 518-7 BLACK MAGIC		
PT-09	SPEAKER GRILLE CLOTHE PAINT	SHERWIN WILLIAMS	S-W PRO-MAR 200 ZERO VOC EGGSHELL ENAMEL	S-W 6035 GAUZY WHITE		SEE SECTION 098414 ACOUSTIC FABRIC FOR MORE INFORMATION
PT-10	WOOD FLOORING PAINT	DULUX PROFESSIONAL EXTERIO	100% ACRYLIC LATEX FLAT FINISH	MATCH EXISTING BLACK FLOORING		SEE SECTION 098414 ACOUSTIC FABRIC FOR MORE INFORMATION
PT-11	SEALER FOR PLYWOOD FLOORING AT CATWALK	MIXWAX	WATER-BASED POLYURETHANE FOR FLOORINGS			
102113.14 TOILET COMPARTMENTS						
TP-01	TOILET PARTITIONS	BRADLEY CORPORATION		STAINLESS STEEL		PROVIDE AC-08 AT EACH DOOR
123661 COMPOSITE SOLID SURFACE						
SSM-01	SOLID SURFACE	WILSONART	SOLID SURFACE	BASALT CONCRETE 9254SS	1/2" THICK	RESTROOMS
PL-01	PLASTIC LAMINATE	WILSONART	HIGH PRESSURE LAMINATE	BLACK ALICANTE 4925		SEE 123623.13 PLASTIC-LAMINATE-CLAD COUNTERTOPS FOR MORE INFORMATION
XX XX XX BATHROOM ACCESSORIES						
AC-01	SOAP DISPENSER	HILLYARD	AFFINITY EXPRESSIONS AUTOMATIC DISPENSER	BLACK	3.875"x 6.5" x 10.5"	COORDINATE SIZE WITH GL-02 AT RESTROOMS
AC-02	TOILET PAPER	BOBRICK	SURFACE-MOUNTED SINGLE JUMBO TOILET ROLL HOLDER	SATIN-FINISH SS	11-11/16" x 12-3/4" x 5"	
AC-03	COMBO WASTE & PAPER TOWEL	BOBRICK	COMBO PAPER TOWEL DISPENSER/WASTE RECEPTACLE	SATIN-FINISH SS	11-12" x 53-5/8" x 5-3/4"	
AC-04	HAND DRYER	BOBRICK	ADA RECESSED HAND DRYER	SATIN-FINISH SS	11-13/16" x 24-1/16" x 2"	REQUIRES ELECTRICITY
AC-05	SANITARY NAPKIN DISPOSAL	BOBRICK	SURFACE-MOUNTED SANITARY NAPKIN DISPOSAL	SATIN-FINISH SS	8-1/16" x 14-1/8" x 4-1/2"	
AC-06	SANITARY NAPKIN DISPENSER	BOBRICK	NAPKIN/TAMPON VENDOR, FREE VEND OPERATION	SATIN-FINISH SS	13-7/8" x 28"	
AC-07	SEAT COVER DISPENSER	BOBRICK	SURFACE MOUNTED SEAT-COVER DISPENSER	SATIN-FINISH SS	15-3/4" x 11" x 2"	
AC-08	COAT HOOK	BOBRICK	SURFACE-MOUNTED COAT HOOK	SATIN-FINISH SS	1-1/2" x 3" x 1-5/16"	SEE TP-01
AC-09	BABY CHANGING STATION	KOALA KARE	HORIZONTAL SURFACE MOUNTED BABY CHANGING STATION	SATIN-FINISH SS	43-3/4" x 28-5/8"	PROVIDE WOOD BLOCKING.
AC-10	ADA GRAB BAR TOILET	BOBRICK	TWO-WALL TOILET COMPARTMENT GRAB BAR		1-1/4" DIAMETER	PROVIDE WOOD BLOCKING.
AC-11	SHOWER CURTAIN	BOBRICK	SHOWER CURTAIN		42" x 72"	
AC-12	TOILETRY SHELF	BOBRICK	SURFACE-MOUNTED TOILETRY SHELF		24" x 4-3/4" x 5-3/4"	PROVIDE WOOD BLOCKING.
AC-13	SHOWER GRAB BAR	BOBRICK	TWO-WALL SHOWER GRAB BAR		1-1/2" DIAMETER	PROVIDE WOOD BLOCKING.
AC-14	FOLDING SHOWER SEAT	BOBRICK	REVERSIBLE FOLDING SHOWER SEAT		33" x 22-5/16"	PROVIDE WOOD BLOCKING.

FINISH SCHEDULE GENERAL NOTES

A. SEE SPECIFICATION FOR PAINTING OF ITEMS NOT NOTED IN THE ROOM FINISH SCHEDULE OR FINISH PLANS.
B. ALL GYPSUM WALLBOARD BULKHEADS SHALL BE PAINTED P-? UNLESS NOTED OTHERWISE.
C. SEE REFLECTED CEILING PLANS FOR CEILING MATERIAL AND HEIGHT.
D. CEILING HEIGHTS, AS NOTED ON THE REFLECTED CEILING PLANS, ARE MEASURED FROM FINISH FLOOR OF THE ROOM.
E. CONTRACTOR SHALL FURNISH AND INSTALL WALL BASE AROUND CASEWORK AND MILLWORK.
F. WHERE FLOOR FINISH CHANGES FROM ONE ROOM TO ANOTHER, SET JOINT OF THE MATERIALS AT THE CENTER OF THE COMMUNICATING DOOR.

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REGISTERED ARCHITECT

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3 - C1651
01.23.25

REVISIONS
#3 01/23/25

57-23140-00

FINISH SCHEDULE

A.900.00

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APPLICABLE SPECIFICATION SECTIONS

DIVISION 11 - EQUIPMENT

- 11 61 13 THEATRICAL NETWORKED LIGHTING CONTROL SYSTEM
- 11 61 16 THEATRICAL WIRING DEVICES
- 11 61 19 THEATRICAL LIGHTING FIXTURES & ACCESSORIES
- 11 61 33 MOTORIZED RIGGING
- 11 61 36 COUNTERWEIGHT RIGGING AND PIN RAILS
- 11 61 39 FIRE SAFETY CURTAIN

DIVISION 26 - ELECTRICAL

- 26 01 00 BASIC ELECTRICAL REQUIREMENTS
- 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL
- 26 05 03 DEMOLITION OF ELECTRICAL SYSTEMS
- 26 05 19 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS
- 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
- 26 05 33 RACEWAY & BOXES FOR ELECTRICAL SYSTEMS
- 26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS
- 26 51 00 LIGHTING
- 26 56 00 EXTERIOR LIGHTING
- 26 27 26 WIRING DEVICES

DIVISION 28 - SECURITY AND FIRE ALARM

- 28 05 13 CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY
- 28 46 00 FIRE DETECTION AND ALARM

THEATRICAL LIGHTING SYMBOLS

THEATRICAL WIRING DEVICE, AS LABELED AND SCHEDULED.

THEATRICAL CONTROL DEVICE, AS LABELED AND SCHEDULED.

OCCUPANCY/VACANCY SENSOR, CEILING-MOUNTED.

DAYLIGHT SENSOR, CEILING-MOUNTED.

ADDITIONAL THEATRICAL EQUIPMENT AS LABELED AND SCHEDULED.

FOR ADDITIONAL INFORMATION, REFER TO:

- WIRING AND CONTROL DEVICE SCHEDULES
- WIRING AND CONTROL DEVICE DETAILS
- SPECIFICATIONS

THEATRICAL LIGHTING TAGS

WD #
WIRING DEVICE
QTY AND TYPE(S) OF RECEPTS AS NOTED. QTY OF BRANCH CKTS AS NOTED. TERMINATING IN SCHEDULED DIMMER RACK(S) AND/OR PANEL(S).

ET #
ETHERNET TAP
QTY OF RJ45 PORTS AS NOTED, INDIVIDUALLY HOME RUN TO SCHEDULED PATCH BAY OR NETWORK SWITCH.

EG #
ETHERNET-TO-DMX GATEWAY NODE
(1) RJ45 HOME RUN TO SCHEDULED PATCH BAY OR NETWORK SWITCH. QTY AND CONFIGURATION OF DMX PORTS AS SCHEDULED.

DMX #
DMX DEVICE
QTY AND TYPE OF 5-PIN XLR PORTS AS NOTED, INDIVIDUALLY HOME RUN TO SCHEDULED DMX SPLITTER OR GATEWAY.

HL #
"HOUSE LIGHTING" CONTROL STATION
FACEPLATE CONFIGURATION AS SCHEDULED. WIRING TYPE AND TOPOLOGY AS NOTED.

DS #
DAYLIGHT SENSOR
CONFIGURATION AND COVERAGE AS SCHEDULED. WIRING TYPE AND TOPOLOGY AS NOTED.

VS #
OCCUPANCY/VACANCY SENSOR
CONFIGURATION AND COVERAGE AS SCHEDULED. WIRING TYPE AND TYPOLOGY AS NOTED.

WAP #
WIRELESS ACCESS POINT
(1) RJ45 HOME RUN TO SCHEDULED PATCH BAY OR NETWORK SWITCH.

ALP #
LIGHTING NETWORK CONTROL RACK
WITH ARCHITECTURAL LIGHTING PROCESSOR, NETWORK SWITCHES AND PATCH BAYS, DMX SPLITTERS AND GATEWAYS, AND RELATED EQUIPMENT.

DIN #
LIGHTING NETWORK DIN RAIL ENCLOSURE
WITH NETWORK SWITCHES AND PATCH BAYS, DMX SPLITTERS AND GATEWAYS, AND RELATED EQUIPMENT.

DR #
HIGH-DENSITY DIMMER RACK
REFER THEATRICAL DIMMER RACK SCHEDULE(S).

LCP #
LIGHTING CONTROL PANELBOARD
MAINS-FED RELAY PANEL OR MOTORIZED BREAKER PANEL. REFER THEATRICAL PANEL SCHEDULE(S).

LRP #
LIGHTING CONTROL RELAY PANEL
FEEDTHROUGH RELAY PANEL OR MOTORIZED BREAKER PANEL. REFER THEATRICAL PANEL SCHEDULE(S).

EBDK #
EMERGENCY BYPASS DETECTION KIT
WITH POWER SENSE FEED AND FIRE ALARM CONTROL PANEL CONNECTION. REFER ELECTRICAL FOR LIGHTING POWER TRANSFER.

EBC #
DMX EMERGENCY BYPASS CONTROLLER
SIGNALS SELECT DMX-CONTROLLED LIGHTING FIXTURES TO PANIC PRESET UPON LOSS OF POWER OR FIRE ALARM SIGNAL.

LCC #
LIGHTING CONTROL CONSOLE
REFER SPECIFICATIONS FOR MFR, MODEL NUMBER, AND ACCESSORIES.

THEATRICAL NOTES

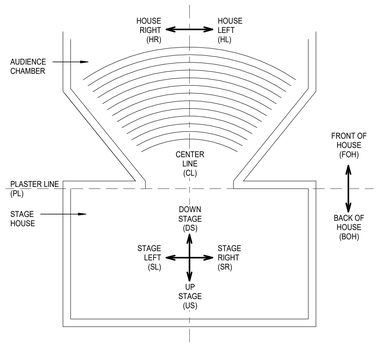
1. THE LAYOUT OF DRAPERY SHOWN IN THESE DRAWING IS FOR COMMISSIONING PURPOSES ONLY AND DOES NOT REPRESENT ANY SUGGESTED REPERTORY PLOT.
2. THE ARRANGEMENT(S) OF FLEXIBLE SEATING SHOWN IN THESE DRAWING IS FOR COMMISSIONING PURPOSES ONLY. FINAL LAYOUT AT DIRECTION OF OWNER DURING INSTALLATION OR AT CONCLUSION OF TRAINING.
3. LIGHTING CONTROL DEVICE PROGRAMMING SHOWN IN THESE DRAWINGS IS FOR INITIAL PROGRAMMING ONLY. FINAL PROGRAMMING TO BE REFINED AT COMMISSIONING BY OWNER, AND AT SUBSEQUENT TRAINING SESSIONS. REFER SPECIFICATIONS.
4. REFER G-SERIES SHEETS FOR APPLICABLE BUILDING CODES.

APPLICABLE STANDARDS

REFER STAGE LEGEND BELOW FOR ADDITIONAL ABBREVIATIONS AND THEATRICAL TERMS.

STANDARD NUMBER	DESCRIPTION
ANSI E1.1 - 2018	CONSTRUCTION AND USE OF WIRE ROPE LADDERS
ANSI E1.2 - 2021	DESIGN, MANUFACTURE AND USE OF ALUMINUM TRUSSES AND TOWERS
ANSI E1.3 - 2001 (R2021)	LIGHTING CONTROL SYSTEMS - 0 TO 10 V ANALOG CONTROL SPECIFICATION
ANSI E1.4-1 - 2022	MANUAL COUNTERWEIGHT RIGGING SYSTEMS
ANSI E1.5 - 2009 (R2018)	THEATRICAL FOG MADE WITH AQUEOUS SOLUTIONS OF DI- AND TRIHYDRIC ALCOHOLS
ANSI E1.6-1 - 2021	POWERED HOIST SYSTEMS
ANSI E1.6-2 - 2020	DESIGN, INSPECTION, AND MAINTENANCE OF ELECTRIC CHAIN HOISTS FOR THE ENTERTAINMENT INDUSTRY
ANSI E1.6-3 - 2019	SELECTION AND USE OF SERIALLY MANUFACTURED CHAIN HOISTS IN THE ENTERTAINMENT INDUSTRY
ANSI E1.6-4 - 2022	DESIGN, INSPECTION AND MAINTENANCE OF PORTABLE FIXED SPEED ELECTRIC CHAIN HOIST CONTROL SYSTEMS IN THE ENTERTAINMENT INDUSTRY
ANSI E1.6-5 - 2022	SELECTION AND USE OF PORTABLE FIXED SPEED ELECTRIC CHAIN HOIST CONTROL SYSTEMS IN THE ENTERTAINMENT INDUSTRY
ANSI E1.8 - 2018	LOUDSPEAKER ENCLOSURES INTENDED FOR OVERHEAD SUSPENSION - CLASSIFICATION, MANUFACTURE AND STRUCTURAL TESTING
ANSI E1.9 - 2007 (R2023)	REPORTING PHOTOMETRIC PERFORMANCE DATA FOR LUMINAIRES USED IN THE LIVE ENTERTAINMENT AND PERFORMANCE INDUSTRIES
ANSI E1.11 - 2008 (R2018)	USITT DMX512-A, ASYNCHRONOUS SERIAL DIGITAL DATA TRANSMISSION STANDARD FOR CONTROLLING LIGHTING EQUIPMENT AND ACCESSORIES
ANSI E1.14 - 2018 (R2023)	RECOMMENDATIONS FOR FOG EQUIPMENT MANUALS
ANSI E1.15 - 2006 (R2021)	RECOMMENDED PRACTICES AND GUIDELINES FOR THE ASSEMBLY AND USE OF THEATRICAL BOOM & BASE ASSEMBLIES
ANSI E1.16 - 2002 (R2021)	CONFIGURATION STANDARD FOR METAL HALIDE BALLAST POWER CABLES
ANSI E1.17 - 2015 (R2020)	ARCHITECTURE FOR CONTROL NETWORKS (ACN)
ANSI E1.21 - 2020	TEMPORARY STRUCTURES USED FOR TECHNICAL PRODUCTION OF OUTDOOR ENTERTAINMENT EVENTS
ANSI E1.22 - 2022	FIRE SAFETY CURTAIN SYSTEMS
ANSI E1.23 - 2020	DESIGN, EXECUTION, AND MAINTENANCE OF ATMOSPHERIC EFFECTS
ANSI E1.24 - 2012 (R2021)	DIMENSIONAL REQUIREMENTS FOR STAGE PIN CONNECTORS
ANSI E1.25 - 2012 (R2023)	RECOMMENDED BASIC CONDITIONS FOR MEASURING THE PHOTOMETRIC OUTPUT OF STAGE AND STUDIO LUMINAIRES BY MEASURING ILLUMINATION LEVELS PRODUCED ON A PLANAR SURFACE
ANSI E1.26 - 2006 (R2022)	RECOMMENDED TESTING METHODS AND VALUES FOR SHOCK ABSORPTION OF FLOORS USED IN LIVE PERFORMANCE VENUES
ANSI E1.27-1 - 2006 (R2021)	STANDARD FOR PORTABLE CONTROL CABLES FOR USE WITH USITT DMX512/1990 AND E1.11 (DMX512-A) PRODUCTS
ANSI E1.27-2 - 2009 (R2019)	RECOMMENDED PRACTICE FOR PERMANENTLY INSTALLED CONTROL CABLES FOR USE WITH ANSI E1.11 (DMX512-A) AND USITT DMX512/1990 PRODUCTS
ANSI E1.28 - 2022	GUIDANCE ON PLANNING FOLLOWSPOT POSITIONS IN PLACES OF PUBLIC ASSEMBLY
ANSI E1.29 - 2009 (R2018)	PRODUCT SAFETY STANDARD FOR THEATRICAL FOG GENERATORS THAT CREATE AEROSOLS OF WATER, AQUEOUS SOLUTIONS OF GLYCOL OR GLYCERIN, OR HIGHLY REFINED ALKANE MINERAL OIL
ANSI E1.30-1 - 2010 (R2021)	EPI 23, DEVICE IDENTIFICATION SUBDEVICE
ANSI E1.30-3 - 2009 (R2019)	EPI 25 TIME REFERENCE IN ACN SYSTEMS USING SNTP AND NTP
ANSI E1.30-4 - 2010 (R2021)	EPI 26. DEVICE DESCRIPTION LANGUAGE (DDL) EXTENSIONS FOR DMX512 AND E1.31 DEVICES
ANSI E1.30-10 - 2009 (R2019)	EPI 32 IDENTIFICATION OF DRAFT DEVICE DESCRIPTION LANGUAGE MODULES
ANSI E1.30-11 - 2019	EPI 33 ACN ROOT LAYER PROTOCOL OPERATION ON TCP
ANSI E1.31 - 2018	LIGHTWEIGHT STREAMING PROTOCOL FOR TRANSPORT OF DMX512 USING ACN
ANSI E1.32 - 2012 (R2022)	GUIDE FOR THE INSPECTION OF ENTERTAINMENT INDUSTRY INCANDESCENT LAMP LUMINAIRES
ANSI E1.33 - 2019	(RDMNET) - MESSAGE TRANSPORT AND DEVICE MANAGEMENT OF ANSI E1.20 (RDM) COMPATIBLE AND SIMILAR DEVICES OVER IP NETWORKS
ANSI E1.34 - 2009 (R2019)	MEASURING AND SPECIFYING THE SLIPPERINESS OF FLOORS USED IN LIVE PERFORMANCE VENUES
ANSI E1.35 - 2013 (R2022)	STANDARD FOR LENS QUALITY MEASUREMENTS FOR PATTERN PROJECTING LUMINAIRES INTENDED FOR ENTERTAINMENT USE
ANSI E1.36 - 2007 (R2022)	MODEL PROCEDURE FOR PERMITTING THE USE OF TUNGSTEN-HALOGEN INCANDESCENT LAMPS AND STAGE AND STUDIO LUMINAIRES IN VENDOR EXHIBIT BOOTHS IN CONVENTION AND TRADE SHOW EXHIBITION HALLS
ANSI E1.37-1 - 2012 (R2022)	ADDITIONAL MESSAGE SETS FOR ANSI E1.20 (RDM) - PART 1, DIMMER MESSAGE SETS
ANSI E1.37-2 - 2015 (R2021)	ADDITIONAL MESSAGE SETS FOR ANSI E1.20 (RDM) - PART 2, IPV4 & DNS CONFIGURATION MESSAGES
ANSI E1.37-7 - 2019	ADDITIONAL MESSAGE SETS FOR ANSI E1.20 (RDM) - GATEWAY & SPLITTER CONFIGURATION MESSAGES
ANSI E1.39 - 2021	SELECTION AND USE OF PERSONAL FALL ARREST SYSTEMS ON PORTABLE STRUCTURES USED IN THE ENTERTAINMENT INDUSTRY
ANSI E1.40 - 2016 (R2021)	RECOMMENDATIONS FOR THE PLANNING OF THEATRICAL DUST EFFECTS
ANSI E1.41 - 2023	RECOMMENDATIONS FOR MEASURING AND REPORTING PHOTOMETRIC PERFORMANCE DATA FOR ENTERTAINMENT LUMINAIRES UTILIZING SOLID STATE LIGHT SOURCES
ANSI E1.42 - 2018	DESIGN, INSTALLATION, AND USE OF ORCHESTRA PIT LIFTS
ANSI E1.43 - 2016	PERFORMER FLYING SYSTEMS
ANSI E1.44 - 2014 (R2019)	COMMON SHOW FILE EXCHANGE FORMAT FOR ENTERTAINMENT INDUSTRY AUTOMATION CONTROL SYSTEMS - STAGE MACHINERY
ANSI E1.46 - 2018	STANDARD FOR THE PREVENTION OF FALLS FROM THEATRICAL STAGES AND RAISED PERFORMANCE PLATFORMS
ANSI E1.47 - 2020	RECOMMENDED GUIDELINES FOR ENTERTAINMENT RIGGING SYSTEM INSPECTIONS
ANSI E1.48 - 2014 (R2019)	A RECOMMENDED LUMINOUS EFFICIENCY FUNCTION FOR STAGE AND STUDIO LUMINAIRE PHOTOMETRY
ANSI E1.50-1 - 2017	REQUIREMENTS FOR THE STRUCTURAL SUPPORT OF TEMPORARY LED, VIDEO & DISPLAY SYSTEMS
ANSI E1.51 - 2018	THE SELECTION, INSTALLATION, AND USE OF SINGLE-CONDUCTOR PORTABLE POWER FEEDER CABLE SYSTEMS FOR USE AT 600 VOLTS NOMINAL OR LESS FOR THE DISTRIBUTION OF ELECTRICAL ENERGY IN THE TELEVISION, FILM, LIVE PERFORMANCE AND EVENT INDUSTRIES IN CANADA
ANSI E1.53 - 2019	OVERHEAD MOUNTING OF LUMINAIRES, LIGHTING ACCESSORIES, AND OTHER PORTABLE DEVICES SPECIFICATION AND PRACTICE
ANSI E1.54 □ 2021	ESTA STANDARD FOR COLOR COMMUNICATION IN ENTERTAINMENT LIGHTING
ANSI E1.55 - 2016 (R2021)	STANDARD FOR THEATRICAL MAKEUP MIRROR LIGHTING
ANSI E1.56 - 2018	RIGGING SUPPORT POINTS
ANSI E1.57 - 2016 (R2021)	RECOMMENDATIONS TO PREVENT FALLS ON OR OFF MOVABLE PARADE FLOATS, MOVABLE STAGES, AND SIMILAR MOVING PLATFORMS
ANSI E1.58 - 2017 (R2022)	ELECTRICAL SAFETY STANDARD FOR PORTABLE STAGE AND STUDIO EQUIPMENT USED OUTDOORS
ANSI E1.60 - 2018	GUIDELINES FOR THE USE OF RAKED STAGES IN LIVE PERFORMANCE ENVIRONMENTS
ANSI ES1.19 - 2020	SAFETY REQUIREMENTS FOR SPECIAL EVENT STRUCTURES

STAGE LEGEND



THEATRICAL ABBREVIATIONS

ABBREVIATION	DESCRIPTION
##, XX	NUMBER
&	AND
2P&G	TWO-PIN & GROUND "STAGE PIN" CONNECTOR
@	AT
A, AMP	AMPERE
AC	ALTERNATING CURRENT
ADA	AMERICANS WITH DISABILITIES ACT
AFF	ABOVE FINISHED FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
ALT	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ARCH	ARCHITECTURAL
AV	AUDIOVISUAL
AWG	AMERICAN WIRE GAUGE
BAS	BUILDING AUTOMATION SYSTEM
BO	BOTTOM OF
CCT	CORRELATED COLOR TEMPERATURE
CM	CONSTRUCTION MANAGER
CTO	CORRECT-TO-ORANGE
CTR	CENTER
D	DEPTH
DC	DIRECT CURRENT
DEG	DEGREE
DEMO	DEMOLISH OR DEMOLITION
DEPT	DEPARTMENT
DIA	DIAMETER
DIV	SPECIFICATION DIVISION
DMX	DIGITAL MULTIPLEX (DMX-512 CONTROL PROTOCOL)
EA	EACH
EC	ELECTRICAL CONTRACTOR
EDLT	ENHANCED-DEFINITION LENS TUBE
ELEC	ELECTRICAL
EM	EMERGENCY
EQ	EQUAL
ESTA	ENTERTAINMENT SERVICES AND TECHNOLOGY ASSOCIATION
ETR	EXISTING TO REMAIN
EXIST, EXSTG	EXISTING
FC	FOOT CANDLE
FFE	FURNITURE FIXTURES & EQUIPMENT
FR	FLAME RETARDANT
FT	FEET
FV	FIELD VERIFY
GC	GENERAL CONTRACTOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
H	HEIGHT
HID	HIGH INTENSITY DISCHARGE (LAMP)
HMI	HYDRARGYRUM MEDIUM-ARC IODIDE (STAGE LAMP)
HP	HORSEPOWER
HSS	HOLLOW STRUCTURAL SHAPE
HV	HIGH VOLTAGE
HZ	HERTZ (FREQUENCY)
IBC	INTERNATIONAL BUILDING CODE
ID	INNER DIAMETER
IES	ILLUMINATING ENGINEERING SOCIETY
IFR	INHERENTLY FLAME RETARDANT
IN	INCH
INT	INTERIOR
K	DEGREES KELVIN
LB(S)	POUND(S)
LED	LIGHT EMITTING DIODE
LM	LUMEN
LX	"ELECTRICS" A.K.A. THEATRICAL LIGHTING
MAX	MAXIMUM
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MSR	MEDIUM-SOURCE RARE-EARTH HOT-RESTRIKE (TYPE OF HMI STAGE LAMP)
N	NEWTONS
N/A	NOT APPLICABLE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSN.
NIC	NOT IN CONTRACT
NPS	NOMINAL PIPE SIZE
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTER DIAMETER
PAR	PARABOLIC ALUMINIZED REFLECTOR
PLF	POUNDS PER LINEAR FOOT
PVC	POLYVINYL CHLORIDE
PWR	POWER
QTY	QUANTITY
REQ(D)	REQUIRE(D)
REV	REVISION(S)
RGBAW	(OR COMBINATIONS THEREOF) RED / GREEN / BLUE / AMBER / WHITE
RM	ROOM
SCHED	SCHEDULE
SJ, SO, ETC	CORD TYPE DESIGNATIONS PER NEC ARTICLE 400
SPEC	SPECIFICATION(S)
SQ FT	SQUARE FEET
SQ IN	SQUARE INCHES
STL	STEEL
STRUCT	STRUCTURAL
TYP	TYPICAL
UHMW	ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE
UL	UNDERWRITERS LABORATORIES
UPS	UNINTERRUPTABLE POWER SUPPLY
USITT	UNITED STATES INSTITUTE FOR THEATRE TECHNOLOGY
VIF	VERIFY IN FIELD
W/, W/O	WITH, WITHOUT
XLR	CONNECTOR TYPE FOR STAGE LIGHTING AND AUDIO
Ø	PHASE

THEATRICAL SHEET INDEX

SHEET NUMBER	SHEET NAME
QT001.00	THEATRICAL GENERAL INFORMATION
QT102.00	THEATRICAL LIGHTING PLAN, LEVEL 02
QT103.00	THEATRICAL LIGHTING PLAN, LEVEL 03
QT104.00	THEATRICAL LIGHTING PLAN, LEVEL 03M
QT131.00	THEATRICAL RIGGING PLAN, LEVEL 02
QT132.00	THEATRICAL RIGGING PLAN, LEVEL 03M
QT332.00	THEATRICAL RIGGING, FIRE CURTAIN ELEVATION
QT333.00	THEATRICAL RIGGING, TYP. CENTER SPEAKERS, TRANSVERSE SECTION
QT334.00	THEATRICAL RIGGING, TYP. LEFT/RIGHT SPEAKERS, TRANSVERSE SECTION
QT501.00	THEATRICAL WIRING DEVICE DETAILS & SCHEDULE
QT502.00	THEATRICAL CONTROL DEVICE DETAILS & SCHEDULE
QT531.00	THEATRICAL RIGGING DETAILS
QT532.00	THEATRICAL RIGGING DETAILS, FIRE CURTAIN
QT536.00	THEATRICAL RIGGING DETAILS, SIGNAGE
QT601.00	THEATRICAL LIGHTING CONTROL DIAGRAM
QT602.00	THEATRICAL LIGHTING PANEL SCHEDULES

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THEATRICAL GENERAL INFORMATION

QT001.00

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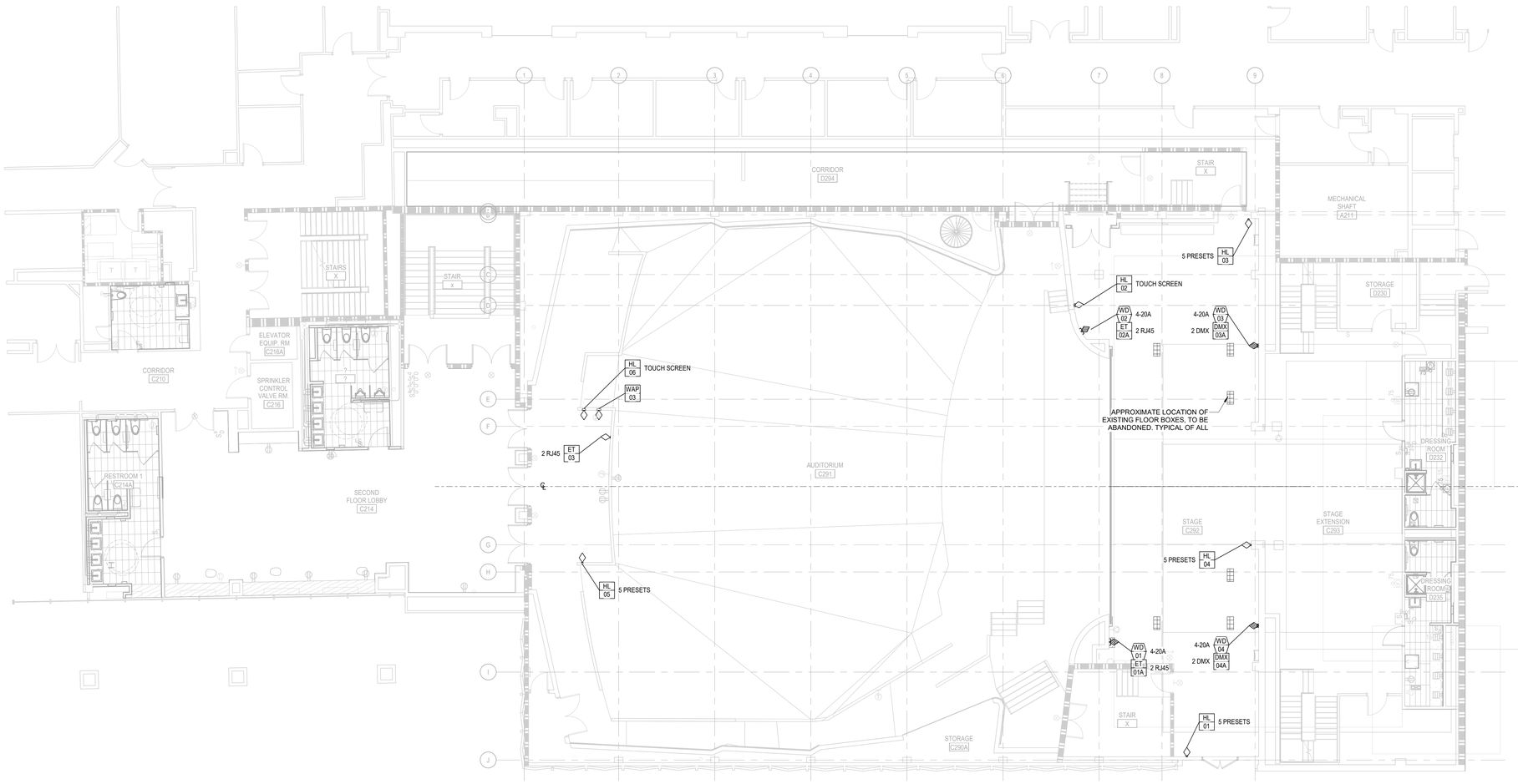

THEATRICAL LIGHTING PLAN - LEVEL 02

SCALE: 1/8" = 1'-0"

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THEATRICAL LIGHTING PLAN, LEVEL 02

QT102.00

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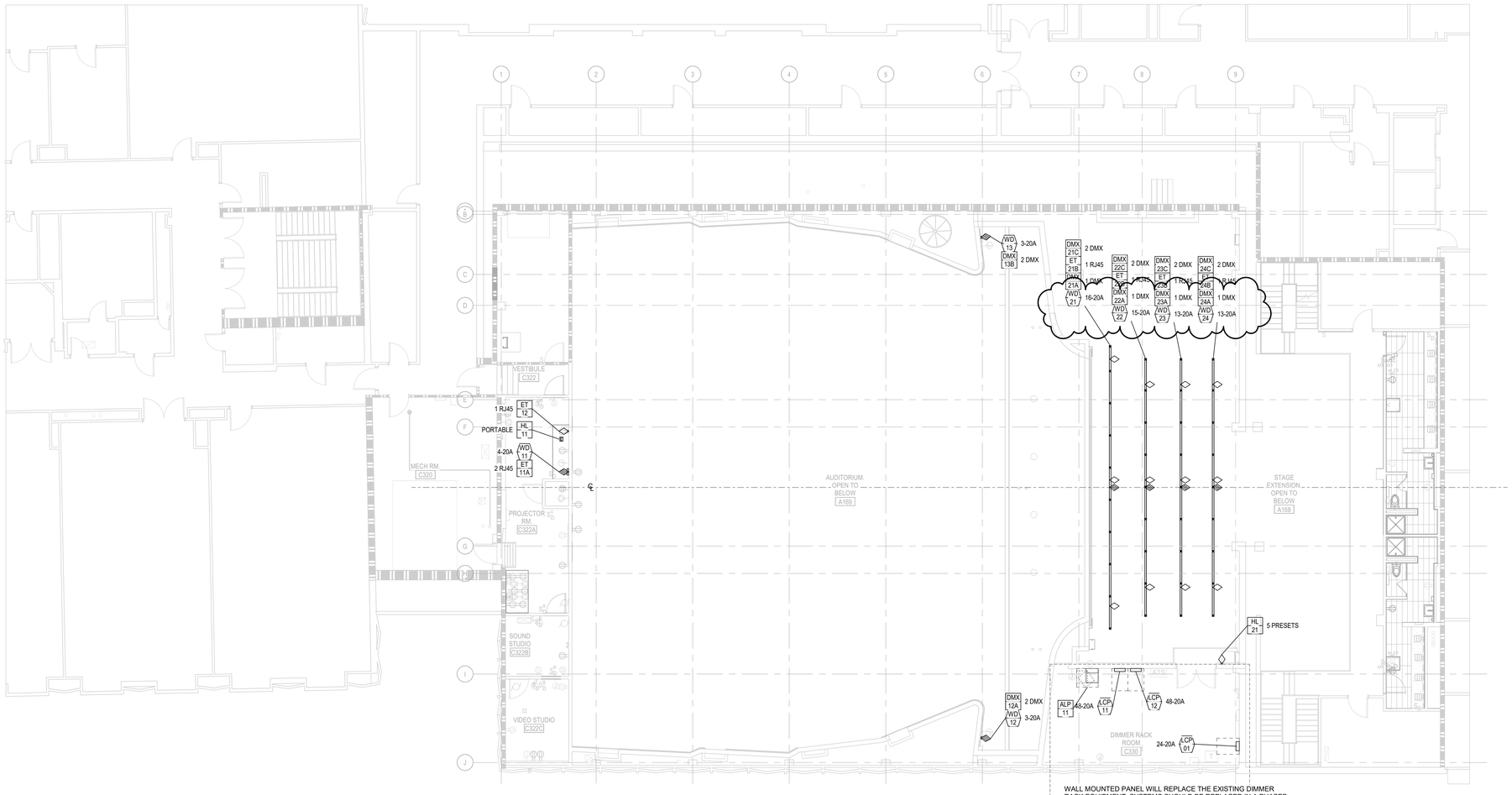

THEATRICAL LIGHTING PLAN - LEVEL 03

SCALE: 1/8" = 1'-0"

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THEATRICAL LIGHTING PLAN, LEVEL 03

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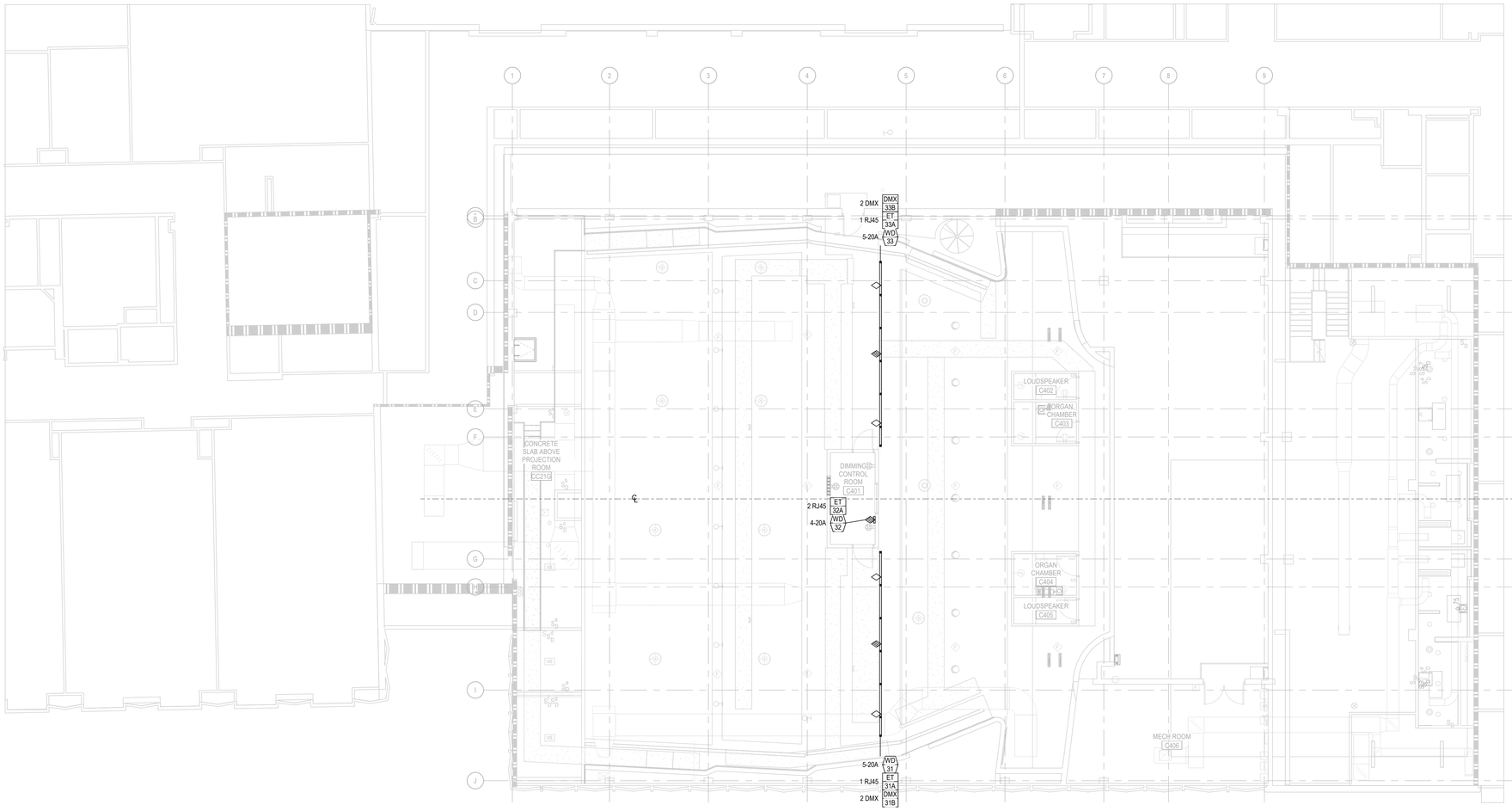

THEATRICAL LIGHTING PLAN - LEVEL 03M

SCALE: 1/8" = 1'-0"

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THEATRICAL LIGHTING PLAN, LEVEL 03M

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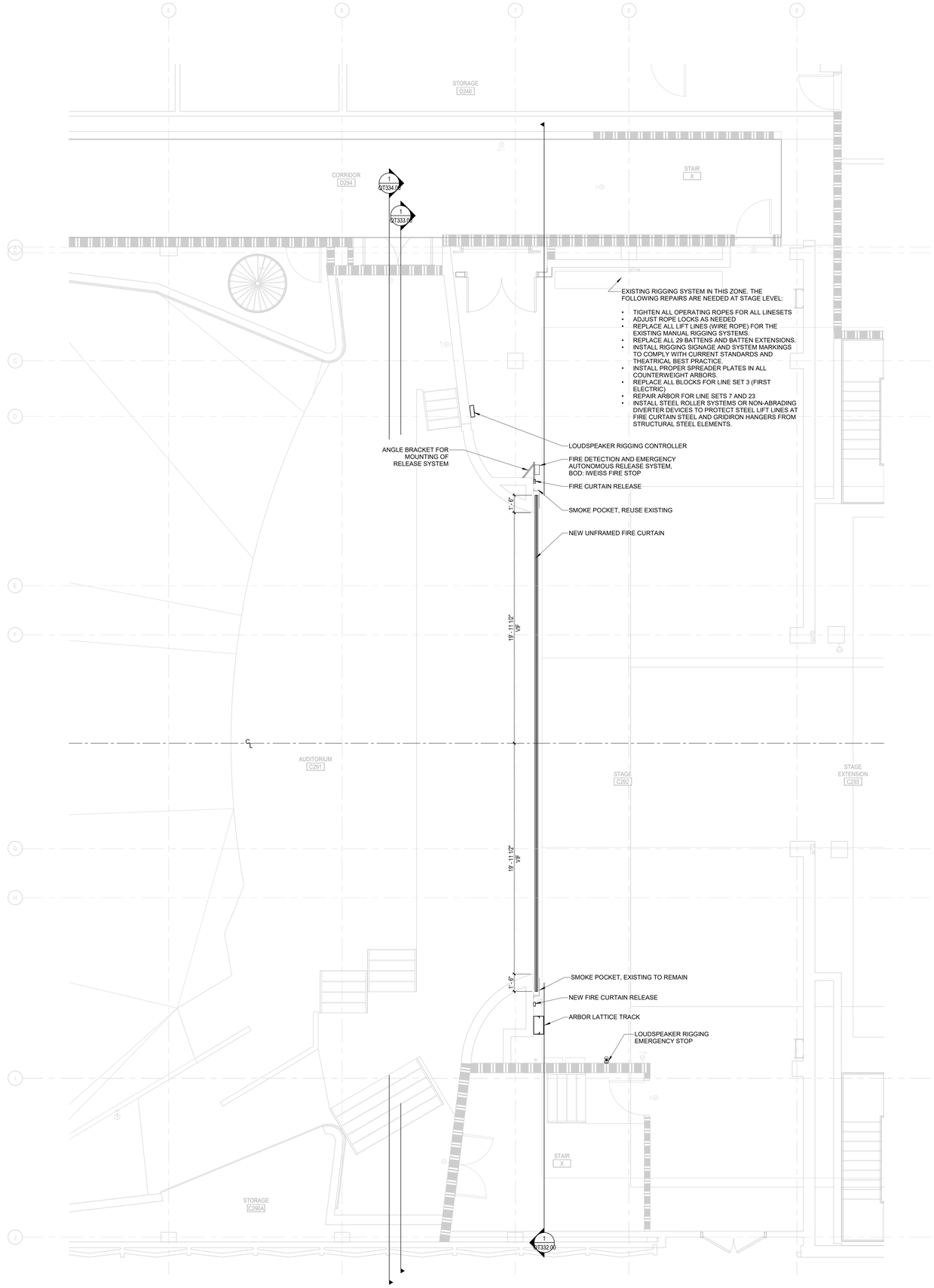

RIGGING PLAN - STAGE LEVEL

SCALE: 1/4" = 1'-0"

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THEATRICAL RIGGING PLAN, LEVEL 02

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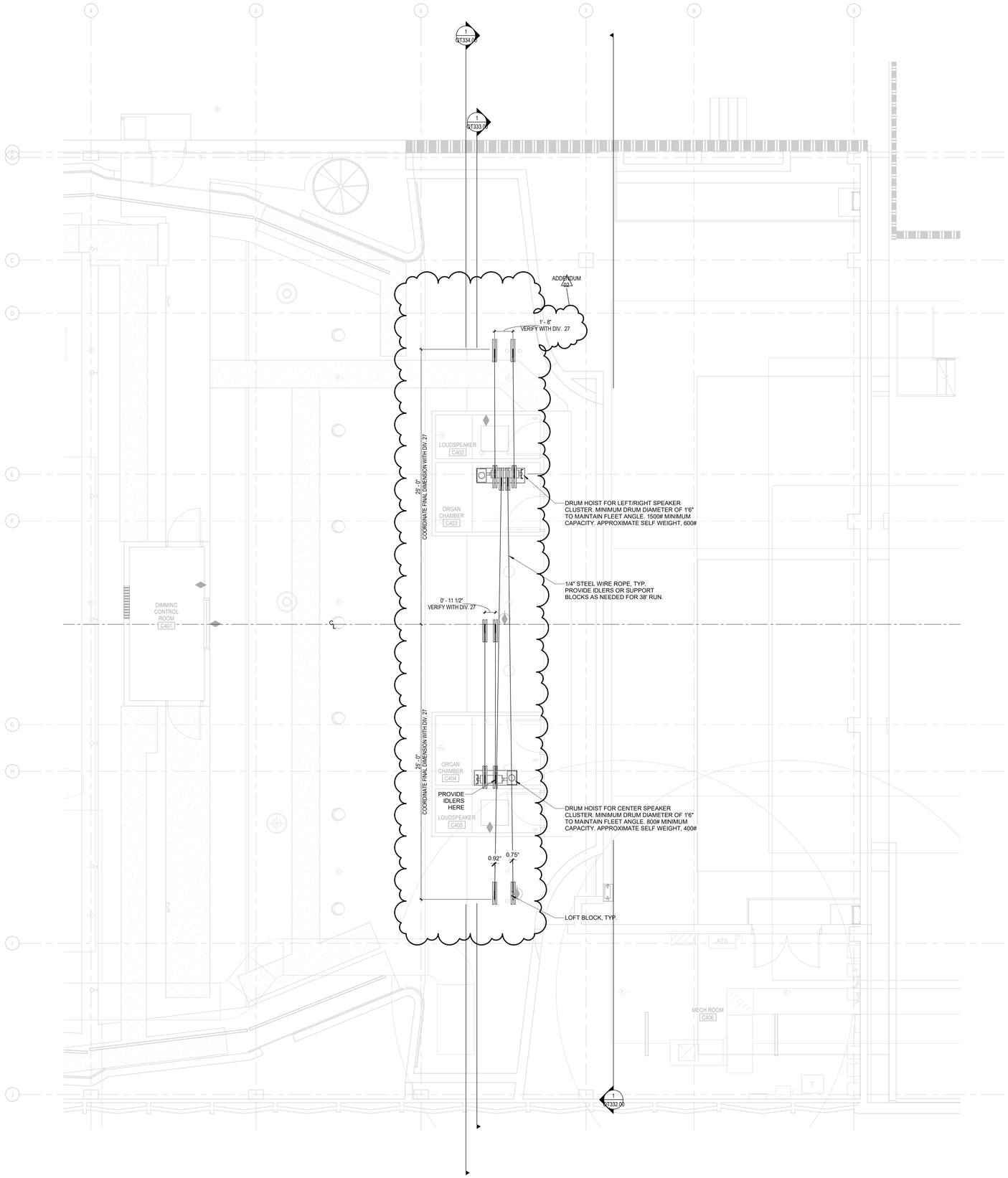

RIGGING PLAN - CATWALK LEVEL

SCALE: 1/4" = 1'-0"

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THEATRICAL
RIGGING PLAN,
LEVEL 03M

QT132.00

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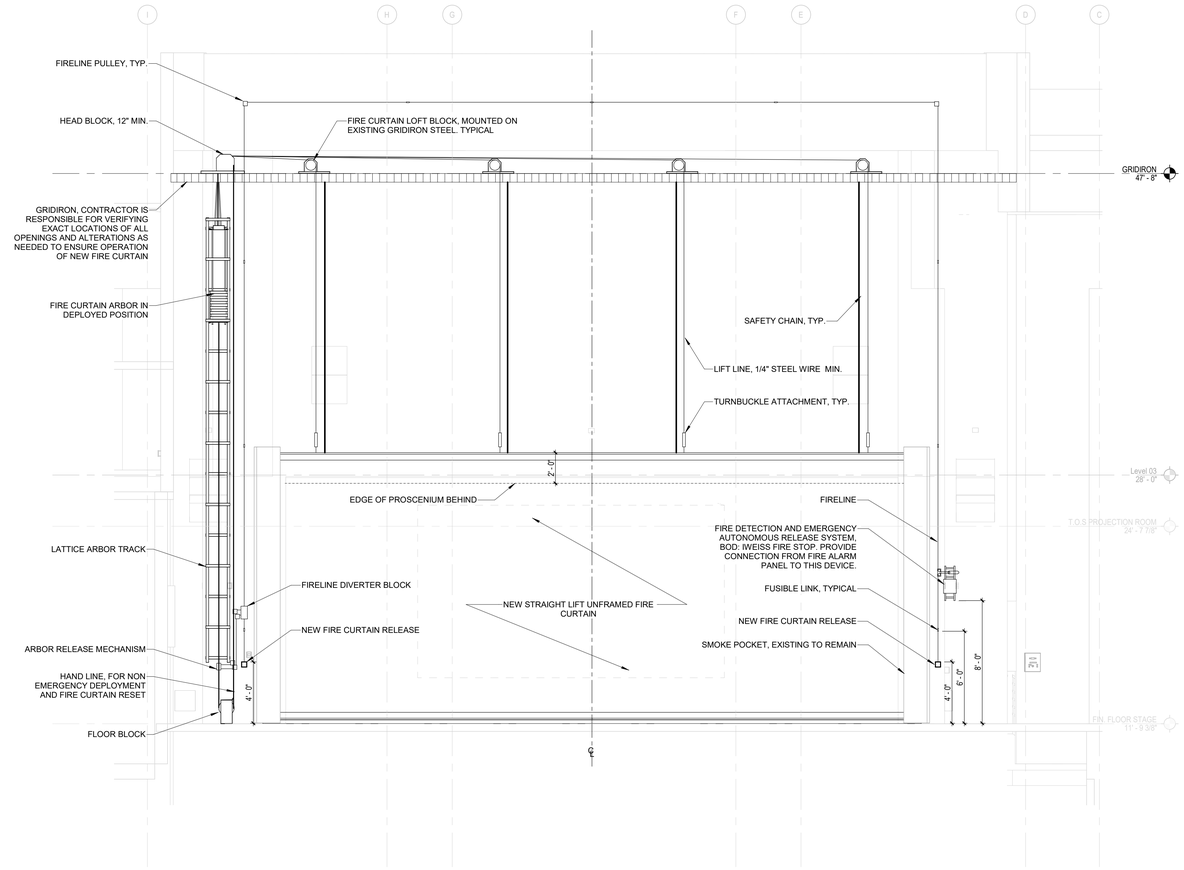

RIGGING ELEVATION - FIRE CURTAIN

SCALE: 1/4" = 1'-0"

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NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS

57-23140-00

THEATRICAL RIGGING, FIRE CURTAIN ELEVATION

QT332.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_QT_24.rvt
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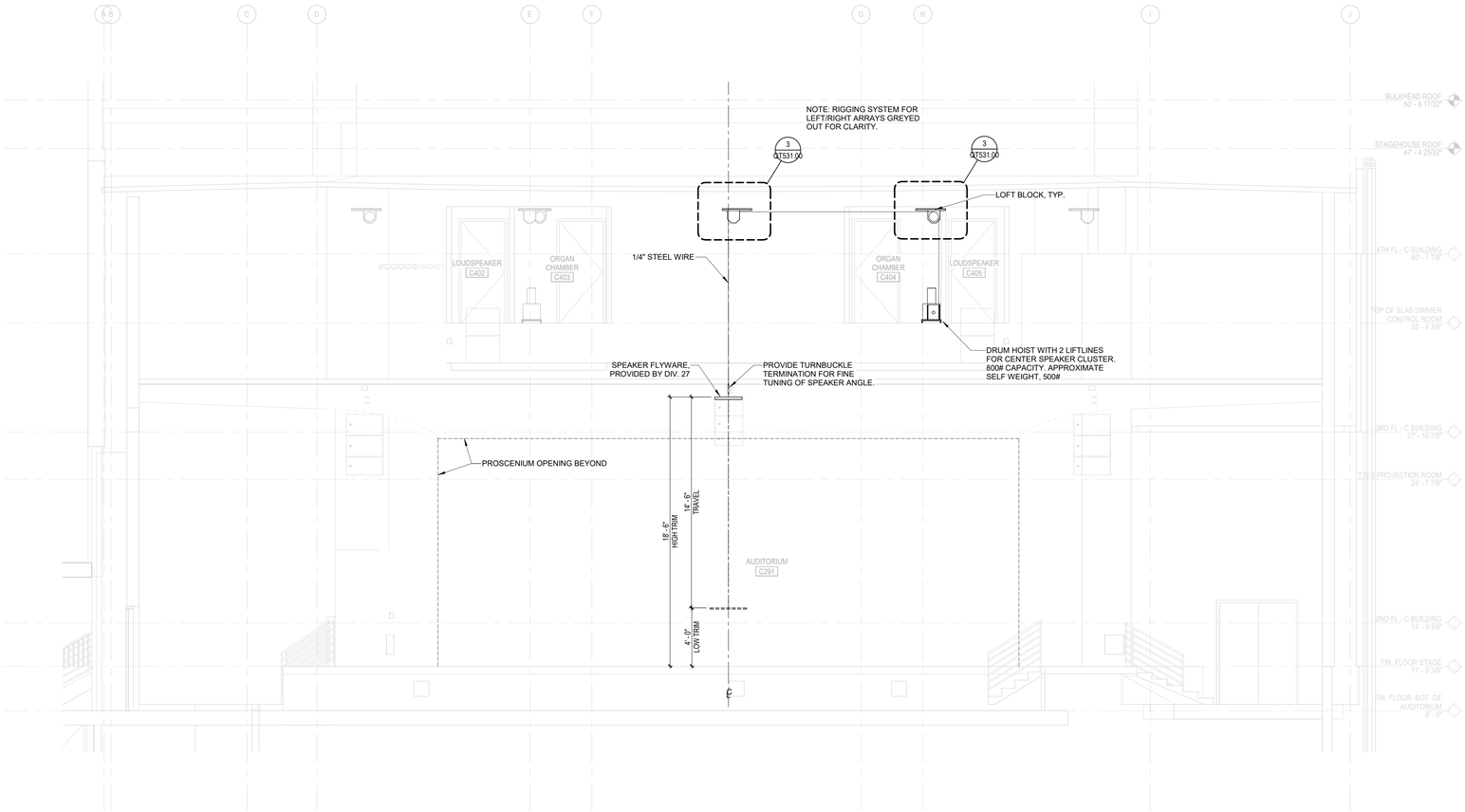

RIGGING SECTION - CENTER SPEAKER ARRAY

SCALE: 1/4" = 1'-0"

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HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

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ISSUE FOR ADDENDUM #3-C1651

01.23.25

REVISIONS

57-23140-00

THEATRICAL RIGGING, TYP. CENTER SPEAKERS, TRANSVERSE SECTION

QT333.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_QT_24.rvt
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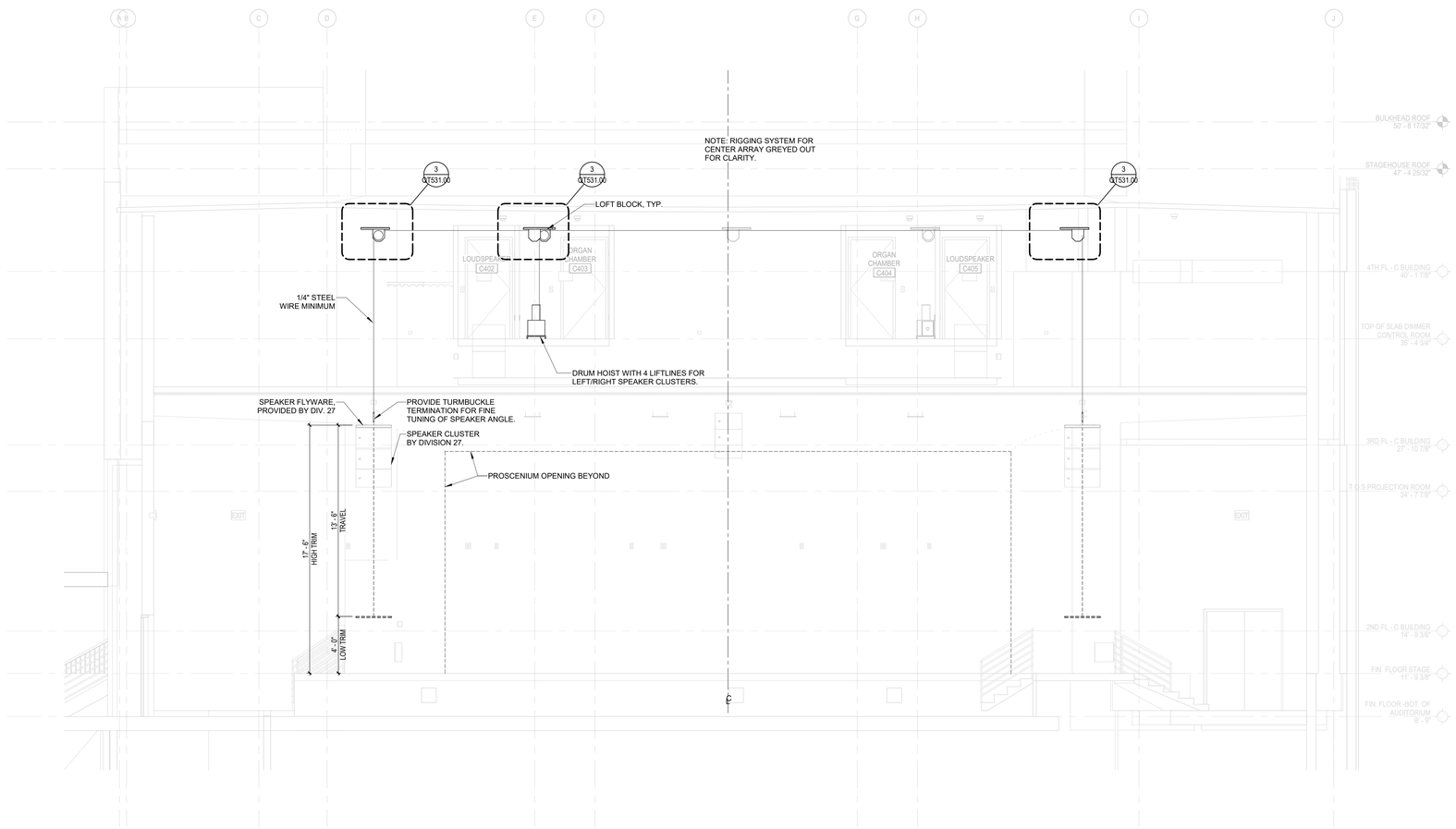

RIGGING SECTION - LEFT RIGHT SPEAKER ARRAY

SCALE: 1/4" = 1'-0"

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HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WESTT 27TH STREET
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ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS

57-23140-00

THEATRICAL RIGGING, TYP. LEFT/RIGHT SPEAKERS, TRANSVERSE SECTION

QT334.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_QT_24.rvt
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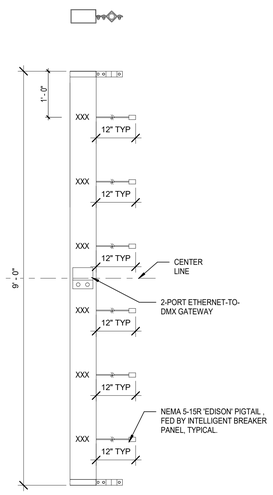
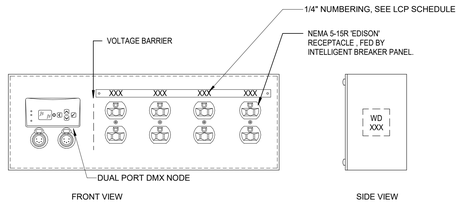
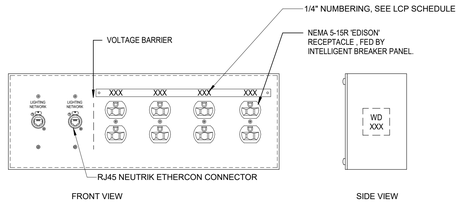




5 WIRING DEVICE TYPE W4S-EGN2
QT501.00 SCALE: 3" = 1'-0"



6 WIRING DEVICE TYPE W4S-ETN2
QT501.00 SCALE: 3" = 1'-0"

THEATRICAL WIRING DEVICE SCHEDULE

GENERAL NOTES
1. "VERIFY" = FINAL COLOR SELECTION BY ARCHITECT AND SPECIFIER AT SUBMITTAL PHASE. FOR BIDDING PURPOSES, ASSUME CUSTOM COLOR WITH SAMPLE VERIFICATION.
2. "MFR" = MANUFACTURER'S DEFAULT COLOR.

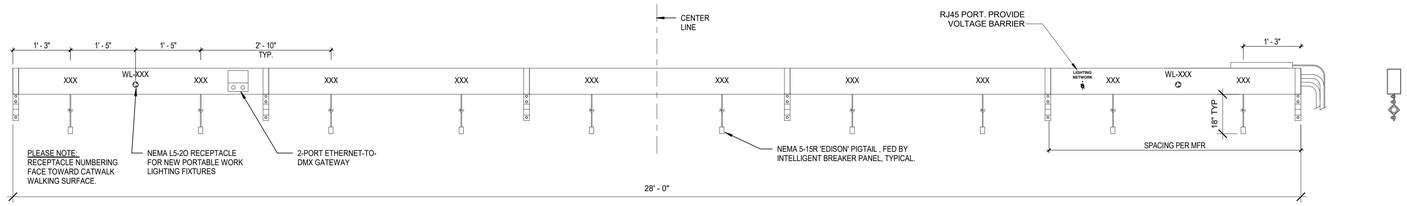
DEVICE NO.	DEVICE TYPE	DESCRIPTION AND MOUNTING	MOUNTING HEIGHT	COLOR	LOCATION	CIRCUIT QTY	FED FROM	CONDUIT & FEEDER SIZE
WD-01	W4S-ET2N	SURFACE-MOUNT, HORIZONTAL, WITH (4) NEMA 5-20R 'EDISON' DUPLEX PANEL-MOUNT RECEPTACLE + ETHERNET TAP WITH (2) RJ45	+24" A.F.F.	BLACK	STAGE C292 - DOWNSTAGE LEFT	4-20A	LCP-02	REFER ELECTRICAL
WD-02	W4S-ET2N	SURFACE-MOUNT, HORIZONTAL, WITH (4) NEMA 5-20R 'EDISON' DUPLEX PANEL-MOUNT RECEPTACLE + ETHERNET TAP WITH (2) RJ45	+24" A.F.F.	BLACK	STAGE C292 - DOWNSTAGE RIGHT	4-20A	LCP-02	REFER ELECTRICAL
WD-03	W4S-EG2N	SURFACE-MOUNT, HORIZONTAL, WITH (4) NEMA 5-20R 'EDISON' DUPLEX PANEL-MOUNT RECEPTACLE + ETHERNET TO DMX GATEWAY 5-PIN DMX PORTS	FLOOR MOUNT	BLACK	STAGE C292 - UPSTAGE RIGHT	4-20A	LCP-02	REFER ELECTRICAL
WD-04	W4S-EG2N	SURFACE-MOUNT, HORIZONTAL, WITH (4) NEMA 5-20R 'EDISON' DUPLEX PANEL-MOUNT RECEPTACLE + ETHERNET TO DMX GATEWAY 5-PIN DMX PORTS	FLOOR MOUNT	BLACK	STAGE C292 - UPSTAGE LEFT	4-20A	LCP-02	REFER ELECTRICAL
WD-11	W4S-ET2N	SURFACE-MOUNT, HORIZONTAL, WITH (4) NEMA 5-20R 'EDISON' DUPLEX PANEL-MOUNT RECEPTACLE + ETHERNET TAP WITH (2) RJ45	+24" A.F.F.	BLACK	PROJECTOR ROOM C322A	4-20A	LCP-01	REFER ELECTRICAL
WD-12	BXBM-1	VERTICAL CONNECTOR STRIP WITH (6) 20A FLUSH MOUNT EDISOPN DUPLEX RECEPTACLES AND ETHERNET TO DMX GATEWAY WITH (2) 5-PIN PORTS	VIF	BLACK	HOUSE RIGHT BOX BOOM	3-20A	LCP-01	REFER ELECTRICAL
WD-13	BXBM-1	VERTICAL CONNECTOR STRIP WITH (6) 20A FLUSH MOUNT EDISOPN DUPLEX RECEPTACLES AND ETHERNET TO DMX GATEWAY WITH (2) 5-PIN PORTS	VIF	BLACK	HOUSE LEFT BOX BOOM	3-20A	LCP-01	REFER ELECTRICAL
WD-21	OVSTG-1	HORIZONTAL CONNECTOR STRIP, BATTEN MOUNT WITH (15) 20A FLUSH MOUNT DUPLEX RECEPTACLES + (3) DMX PORTS, AND (2) RJ45	PIPE-MOUNT AS SHOWN	BLACK	BORDER LIGHT 1	16-20A	LCP-01 / LRP-S1	REFER ELECTRICAL
WD-22	OVSTG-2	HORIZONTAL CONNECTOR STRIP, BATTEN MOUNT WITH (16) 20A FLUSH MOUNT DUPLEX RECEPTACLES + (3) DMX PORTS, AND (2) RJ45	PIPE-MOUNT AS SHOWN	BLACK	BORDER LIGHT 2	15-20A	LCP-01, LCP-02 / LRP-S1	REFER ELECTRICAL
WD-23	OVSTG-3	HORIZONTAL CONNECTOR STRIP, BATTEN MOUNT WITH (12) 20A FLUSH MOUNT DUPLEX RECEPTACLES + (3) DMX PORTS, AND (2) RJ45	PIPE-MOUNT AS SHOWN	BLACK	BORDER LIGHT 3	13-20A	LCP-02 / LRP-S1	REFER ELECTRICAL
WD-24	OVSTG-3	HORIZONTAL CONNECTOR STRIP, BATTEN MOUNT WITH (12) 20A FLUSH MOUNT DUPLEX RECEPTACLES + (3) DMX PORTS, AND (2) RJ45	PIPE-MOUNT AS SHOWN	BLACK	BORDER LIGHT 4	13-20A	LCP-02 / LRP-S1	REFER ELECTRICAL
WD-31	FOH	PIPE-MOUNT, HORIZONTAL, WITH (10) NEMA 5-20R 'EDISON' DUPLEX PANEL-MOUNT RECEPTACLES, 1 GATEWAY WITH 2 DMX PORTS	PIPE-MOUNT AS SHOWN	BLACK	CATWALK HOUSE RIGHT	5-20A	LCP-01	REFER ELECTRICAL
WD-32	W4S-ET2N	SURFACE-MOUNT, HORIZONTAL, WITH (4) NEMA 5-20R 'EDISON' DUPLEX PANEL-MOUNT RECEPTACLE + ETHERNET TAP WITH (2) RJ45	+24" A.F.F.	BLACK	DIMMING CONTROL ROOM C401	4-20A	LCP-01	REFER ELECTRICAL
WD-33	FOH	PIPE-MOUNT, HORIZONTAL, WITH (10) NEMA 5-20R 'EDISON' DUPLEX PANEL-MOUNT RECEPTACLES, 1 GATEWAY WITH 2 DMX PORTS	PIPE-MOUNT AS SHOWN	BLACK	CATWALK HOUSE LEFT	5-20A	LCP-01	REFER ELECTRICAL

ADDENDUM 4

THEATRICAL ELECTRICAL EQUIPMENT SCHEDULE

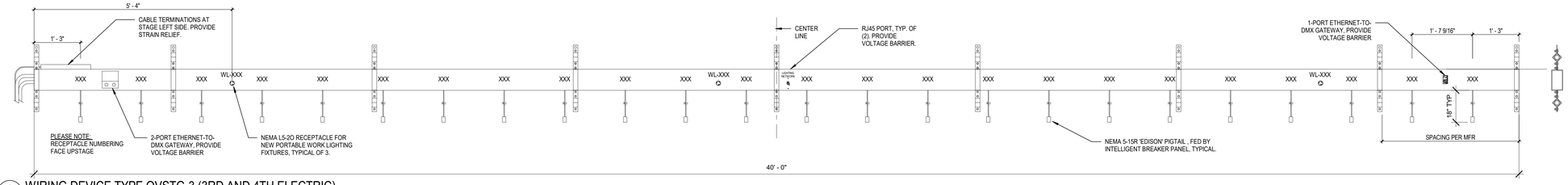
GENERAL NOTES
1. "VERIFY" = FINAL COLOR SELECTION BY ARCHITECT AND SPECIFIER AT SUBMITTAL PHASE. FOR BIDDING PURPOSES, ASSUME CUSTOM COLOR WITH SAMPLE VERIFICATION.
2. "MFR" = MANUFACTURER'S DEFAULT COLOR.

DEVICE NO.	DEVICE TYPE	DESCRIPTION AND MOUNTING	MOUNTING HEIGHT	LOCATION	CIRCUIT QTY	FED FROM	CONDUIT AND FEEDER SIZE
LCP-01	LCP-24 (ECHO)	MAINS-FED RELAY PANEL WITH (24) RELAYS	WALL	DIMMER RACK ROOM C330	24-20A	REFER ELECTRICAL	REFER ELECTRICAL
LCP-11	LCP-48 (SENS-IQ)	MAINS-FED MOTORIZED BREAKER PANEL WITH (48) BREAKERS	WALL	DIMMER RACK ROOM C330	48-20A	REFER ELECTRICAL	REFER ELECTRICAL
LCP-12	LCP-48 (SENS-IQ)	MAINS-FED MOTORIZED BREAKER PANEL WITH (48) BREAKERS	WALL	DIMMER RACK ROOM C330	48-20A	REFER ELECTRICAL	REFER ELECTRICAL

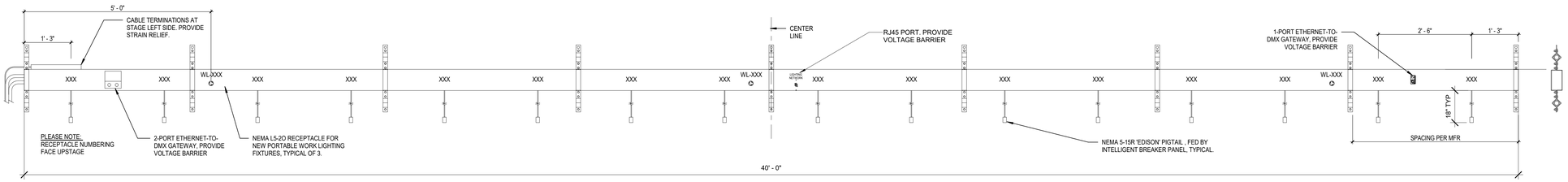


1 WIRING DEVICE TYPE BXBM-1
QT501.00 SCALE: 3/4" = 1'-0"

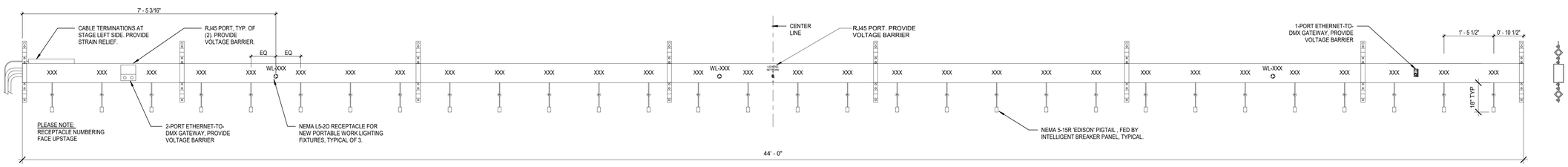
7 WIRING DEVICE TYPE 2-WR4 (FOH)
QT501.00 SCALE: 3/4" = 1'-0"



2 WIRING DEVICE TYPE OVSTG-3 (3RD AND 4TH ELECTRIC)
QT501.00 SCALE: 3/4" = 1'-0"



3 WIRING DEVICE TYPE OVSTG-2 (2ND ELECTRIC)
QT501.00 SCALE: 3/4" = 1'-0"



4 WIRING DEVICE TYPE OVSTG-1 (1ST ELECTRIC)
QT501.00 SCALE: 3/4" = 1'-0"

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#3 01/23/25

57-23140-00

THEATRICAL WIRING DEVICE DETAILS & SCHEDULE

QT501.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_QT_24.rvt
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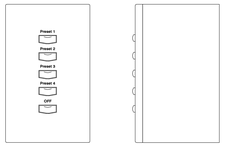
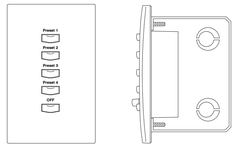
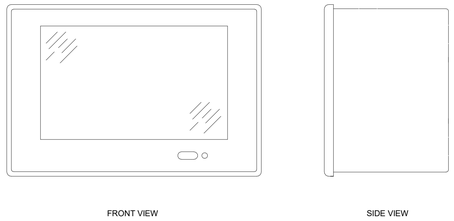


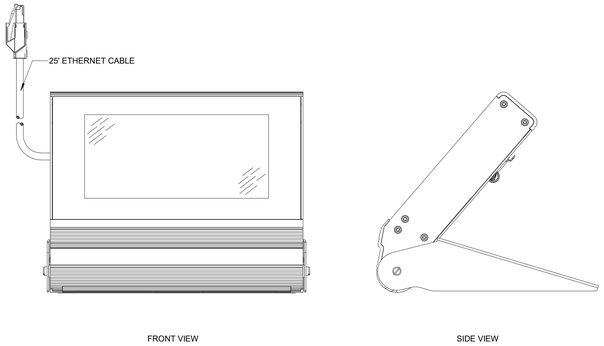
1 HL TYPE H1S
QT502.00 SCALE: 6" = 1'-0"



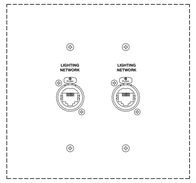
4 HL TYPE H1F
QT502.00 SCALE: 6" = 1'-0"



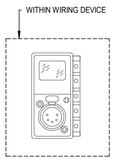
6 HL TYPE H2F, H2S
QT502.00 SCALE: 6" = 1'-0"



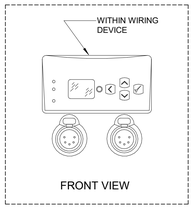
2 HL PORTABLE
QT502.00 SCALE: 6" = 1'-0"



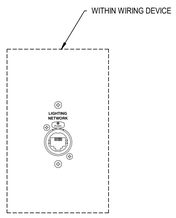
7 CONTROL DEVICE TYPE ET2N
QT502.00 SCALE: 6" = 1'-0"



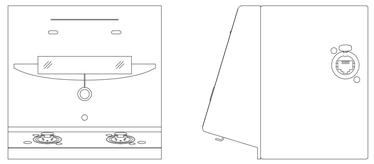
3 CONTROL DEVICE TYPE EG1N
QT502.00 SCALE: 6" = 1'-0"



5 CONTROL DEVICE TYPE EG2N
QT502.00 SCALE: 6" = 1'-0"



8 CONTROL DEVICE TYPE ET1N
QT502.00 SCALE: 6" = 1'-0"



BOD: ETC MK2 GATEWAY. PROVIDE 4

- PROVIDE (1) 10' ETHERNET CABLE WITH EACH GATEWAY

9 CD TYPE EG2P PORRTABLE
QT502.00 SCALE: 6" = 1'-0"

THEATRICAL CONTROL DEVICE SCHEDULE

GENERAL NOTES
1. "VERIFY" = FINAL COLOR SELECTION BY ARCHITECT AND SPECIFIER AT SUBMITTAL PHASE. FOR BIDDING PURPOSES, ASSUME CUSTOM COLOR WITH SAMPLE VERIFICATION.
2. "MFR" = MANUFACTURER'S DEFAULT COLOR.

DEVICE NO.	DEVICE TYPE	DESCRIPTION AND MOUNTING	COLOR	MOUNTING HEIGHT	LOCATION	PORTS		FED FROM
						DMX	RJ45	
ALP-11	WALL RACK - 24RU	LIGHTING NETWORK RACK WITH ARCH. LIGHTING CONTROL PROCESSOR. REFER SPECIFICATIONS.	BLACK	WALL	DIMMER RACK ROOM C330			N/A
DMX-03A	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	BLACK	+24" A.F.F.	WITHIN WIRING DEVICE, REFER WD DETAILS	2		ALP-11
DMX-04A	SURFACE	DMX DEVICE, SURFACE-MOUNT, WITH (2) 5-PIN DMX-OUT PORTS	BLACK	+24" A.F.F.	WITHIN WIRING DEVICE, REFER WD DETAILS	2		ALP-11
DMX-12A	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	BLACK	PIPE-MOUNT AS SHOWN	HL SIDE BOOM	2		ALP-11
DMX-13B	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	BLACK	PIPE-MOUNT AS SHOWN	HL SIDE BOOM	2		ALP-11
DMX-21A	EG1N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (1) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	1		ALP-11
DMX-21C	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	2		ALP-11
DMX-22A	EG1N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (1) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	1		ALP-11
DMX-22C	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	2		ALP-11
DMX-23A	EG1N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (1) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	1		ALP-11
DMX-23C	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	2		ALP-11
DMX-24A	EG1N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (1) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	1		ALP-11
DMX-24C	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	2		ALP-11
DMX-31B	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	2		ALP-11
DMX-33B	EG2N	DMX DEVICE, WITHIN WIRING DEVICE, WITH (2) 5-PIN DMX-OUT PORTS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS	2		ALP-11
ET-01A	ET2N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	BLACK	+24" A.F.F.	WITHIN WIRING DEVICE, REFER WD DETAILS		2	ALP-11
ET-02A	ET2N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	BLACK	+24" A.F.F.	WITHIN WIRING DEVICE, REFER WD DETAILS		2	ALP-11
ET-03	ET2F	ETHERNET TAP, FLUSH-MOUNT, WITH (2) RJ45 JACKS	BLACK	+24" A.F.F.	IN HOUSE MIX POSITION		2	ALP-11
ET-11A	ET2N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	BLACK	+24" A.F.F.	PROJECTOR RM. C322A		2	ALP-11
ET-12	ET1S	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	BLACK	+24" A.F.F.	PROJECTOR RM. C322A		1	ALP-11
ET-21B	ET1N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS		1	ALP-11
ET-22B	ET1N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS		1	ALP-11
ET-23B	ET1N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS		1	ALP-11
ET-24B	ET1N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS		1	ALP-11
ET-31A	ET1N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS		1	ALP-11
ET-32A	ET2N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS		2	ALP-11
ET-33A	ET1N	ETHERNET TAP, WITHIN WIRING DEVICE, WITH (2) RJ45 JACKS	N/A	N/A	WITHIN WIRING DEVICE, REFER WD DETAILS		1	ALP-11
WAP-03	WAP1F	WIRELESS ACCESS POINT, FLUSH-MOUNT	BLACK	+48" A.F.F.	HL IN HOUSE MIX POSITION			ALP-11

THEATRICAL HOUSE LIGHT CONTROL STATION SCHEDULE

GENERAL NOTES
1. "VERIFY" = FINAL COLOR SELECTION BY ARCHITECT AND SPECIFIER AT SUBMITTAL PHASE. FOR BIDDING PURPOSES, ASSUME CUSTOM COLOR WITH SAMPLE VERIFICATION.
2. "MFR" = MANUFACTURER'S DEFAULT COLOR.

DEVICE NO.	DEVICE TYPE	DESCRIPTION AND MOUNTING	COLOR	MOUNTING HEIGHT	LOCATION	INPUTS		FED FROM
						PRESETS	FADERS	
HL-01	H1S	HOUSE LIGHT STATION, SURFACE-MOUNT, WITH (5) PRESET BUTTONS	VERIFY	+48" A.F.F.	STAGE LEFT ENTRY	5		ALP-11
HL-02	H2S	HOUSE LIGHT STATION, SURFACE-MOUNT COLOR TOUCHSCREEN STATION	VERIFY	+48" A.F.F.	DOWNSTAGE RIGHT			ALP-11
HL-03	H1S	HOUSE LIGHT STATION, SURFACE-MOUNT, WITH (5) PRESET BUTTONS	VERIFY	+48" A.F.F.	UPSTAGE RIGHT	5		ALP-11
HL-04	H1S	HOUSE LIGHT STATION, SURFACE-MOUNT, WITH (5) PRESET BUTTONS	VERIFY	+48" A.F.F.	UPSTAGE ENTRANCE	5		ALP-11
HL-05	H1F	HOUSE LIGHT STATION, FLUSH-MOUNT, WITH (5) PRESET BUTTONS	VERIFY	+48" A.F.F.	HR IN HOUSE MIX POSITION	5		ALP-11
HL-06	H2F	HOUSE LIGHT STATION, FLUSH-MOUNT COLOR TOUCHSCREEN STATION	VERIFY	+48" A.F.F.	HL IN HOUSE MIX POSITION			ALP-11
HL-11	PORTABLE	HOUSE LIGHT STATION, PORTABLE TOUCHSCREEN	VERIFY	N/A	LOOSE EQUIPMENT: DELIVER TO CONTROL BOOTH			ALP-11
HL-21	H1S	HOUSE LIGHT STATION, SURFACE-MOUNT, WITH (5) PRESET BUTTONS	VERIFY	+48" A.F.F.		5		ALP-11

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HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
343 WESTT 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS

57-23140-00

THEATRICAL CONTROL DEVICE DETAILS & SCHEDULE

QT502.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_QT_24.rvt
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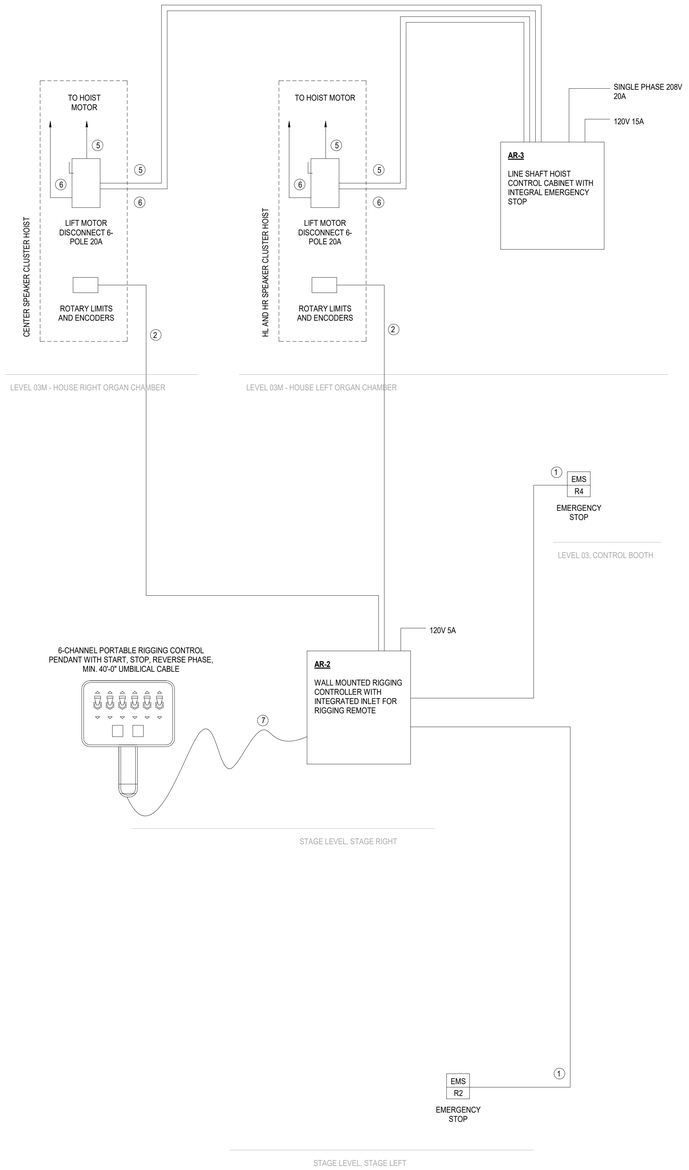
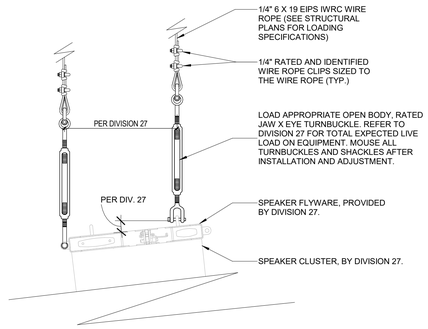
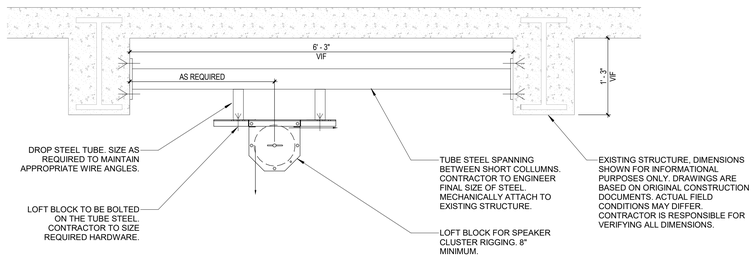


1 QT531.00 MOTORIZED RIGGING POWER & CONTROL DIAGRAM
SCALE: 12" = 1'-0"



2 QT531.00 SPEAKER CLUSTER MOUNTING DETAIL
SCALE: 1 1/2" = 1'-0"



3 QT531.00 SPEAKER LOFT BLOCK MOUNTING DETAIL
SCALE: 1" = 1'-0"

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THEATRICAL RIGGING DETAILS

QT531.00

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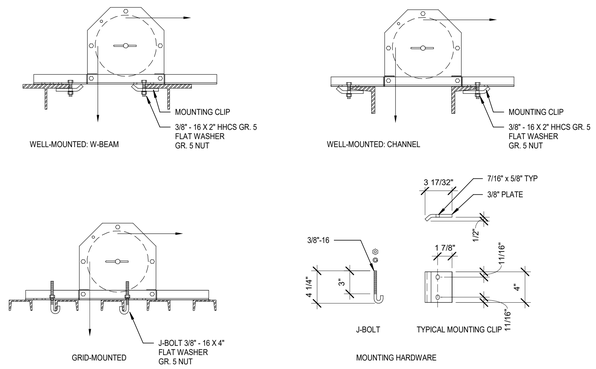
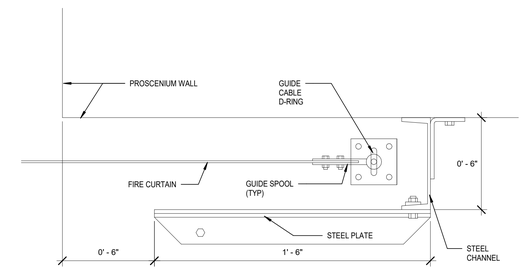
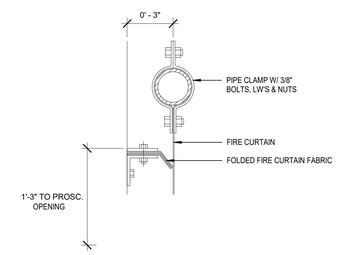


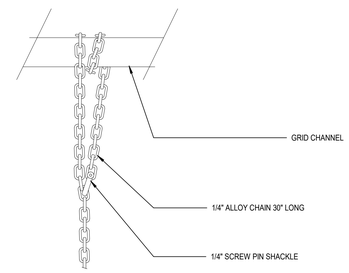
1 QT532.00 LOFT BLOCK ATTACHMENT - FIRE CURTAIN
SCALE: 1 1/2" = 1'-0"



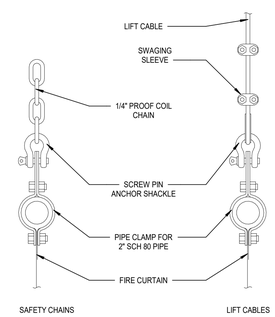
2 QT532.00 TYP. SMOKE POCKET PLAN DETAIL
SCALE: 3" = 1'-0"



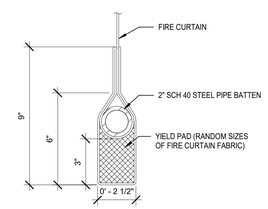
3 QT532.00 TYP. SMOKE SEAL
SCALE: 3" = 1'-0"



4 QT532.00 TYP. GRID CHANNEL STAY CHAIN DETAIL
SCALE: 3" = 1'-0"



5 QT532.00 TYP. PIPE CLAMP DETAILS - FIRE CURTAIN
SCALE: 3" = 1'-0"



6 QT532.00 TYP. YIELD PAD
SCALE: 3" = 1'-0"

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THEATRICAL
RIGGING
DETAILS, FIRE
CURTAIN

QT532.00

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GENERAL NOTES:
1. SIGNAGE SHOWN IN FULL SIZE
2. CUT FROM TWO LAYER PLASTIC, WHITE WITH BLACK LETTERING.
3. MIN 1/8" TEXT HEIGHT.
4. INSTALL IN THE FOLLOWING LOCATIONS
4.1 MAIN
(1) AT OPERATING RAIL ON STAGE LEVEL
4.2 OPERATING THE COUNTERWEIGHT SYSTEM
(1) AT THE OPERATING RAIL ON STAGE LEVEL
(1) AT THE OPERATING RAIL AT GALLERY LEVEL
4.3 OPERATING THE MOTORIZED RIGGING SYSTEM
(1) AT THE MOTORIZED RIGGING CONSOLE
4.4 LOADING WEIGHT
(1) AT THE LOADING GALLERY
4.5 LOADING GALLERY CAPACITIES
(1) ONE ON EACH END OF THE LOADING GALLERY, (2) TOTAL.
4.6 GRID CAPACITIES
(1) AT EVERY ACCESS POINT TO THE GRID

LOADING GALLERY CAPACITIES

TOTAL CAPACITY

XXXX POUNDS

CONTRACTOR MUST PROVIDE A STRUCTURAL REVIEW OF THE EXISTING GALLERIES TO DETERMINE TOTAL CAPACITY.

STORAGE CAPACITY

300 PSF

NOMINAL WEIGHTS OF 6" COUNTERWEIGHTS:

1/2" THICKNESS	11 POUNDS
1" THICKNESS	22 POUNDS
2" THICKNESS	45 POUNDS

WARNING! DO NOT STACK BRICKS ABOVE THE KICK RAILS.

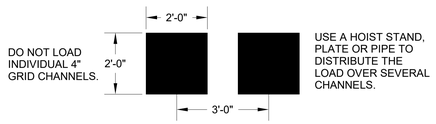
GRID CAPACITIES

WALKING SURFACE CAPACITY*

60 PSF

CONCENTRATED LOADS*

2000 LBS OVER 4 SQUARE FOOT AREA OR 500 PSF OVER 4 SQUARE FOOT AREA. CONCENTRATED LOADS CANNOT OCCUR CLOSER THAN 3FT APART, OVER NO MORE THAN 40% OF THE GRID AREA.



* NOT INCLUDING STAGE RIGGING SYSTEM LOAD.

4 QT536.00 RIGGING CAPACITY SIGNAGE - GALLERIES
SCALE: 12" = 1'-0"

OPERATING THE MOTORIZED RIGGING SYSTEM

WARNING! IMPROPER OPERATION OF RIGGING SYSTEMS MAY RESULT IN SERIOUS INJURY OR DEATH.

ONLY TRAINED PERSONNEL MAY OPERATE THE RIGGING SYSTEM.

THESE INSTRUCTIONS ARE INTENDED TO SUPPLEMENT PROPER TRAINING.

1. TURN ON THE CONTROLLER AND ENTER THE PASS CODE.

1. IDENTIFY AND INSPECT THE LINESET TO BE MOVED.
   CHECK THE SPEAKER PATH FOR OBSTRUCTIONS.CLEAR OBSTRUCTIONS AND ASSIGN SPOTTERS AS NECESSARY.
   LOAD THE APPROPRIATE HOIST INTO THE CONTROLLER.
   FOR VARIABLE SPEED HOISTS, SET APPROPRIATE SPEEDS FOR EACH HOIST.

2. ANNOUNCE THE MOVE:
   SPEAKING LOUDLY AND CLEARLY ANNOUNCE: WHAT IT IS, WHERE IT IS, WHAT IT'S DOING. (EX: ATTENTION ON DECK, LINESET 2, DOWNSTAGE, COMING IN TO THE DECK).
   WAIT FOR A RESPONSE. IF YOU DO NOT HEAR A RESPONSE, CALL OUT THE ANNOUNCEMENT AGAIN.

3. MOVE THE SPEAKER SYSTEM.
   WATCH THE APRON. WHILE WATCHING THE PATH OF THE SPEAKERS (NOT THE CONTROLLER SCREEN), PUSH AND HOLD THE APPROPRIATE BUTTON TO MOVE THE SYSTEM "IN" TOWARD THE FLOOR OR "OUT" TOWARD THE GRID.
   STAY ALERT. WHEN IN DOUBT, STOP THE HOIST(S) BY LETTING GO OF THE BUTTON.
   LISTEN. IF THE MOTOR IS WHINING LOUDLY, THERE ARE GRINDING NOISES, OR ANYTHING SOUNDS OUT OF THE ORDINARY, STOP THE HOIST AND INSPECT THE LINESET MORE CLOSELY FOR PROBLEMS. IF YOU CANNOT FIND OR RESOLVE THE PROBLEM, CONTACT A QUALIFIED RIGGER FOR ASSISTANCE. DO NOT OPERATE A LINESET THAT IS MAKING STRANGE NOISES.

4. LOCK THE CONTROLLER
   WHEN THE MOVE IS COMPLETE, RELOCK THE CONTROLLER.

3 QT536.00 RIGGING CAPACITY SIGNAGE - OPERATION MOTORIZED
SCALE: 12" = 1'-0"

OPERATING THE COUNTERWEIGHT SYSTEM

WARNING! IMPROPER OPERATION OF RIGGING SYSTEMS MAY RESULT IN SERIOUS INJURY OR DEATH.

ONLY TRAINED PERSONNEL MAY OPERATE THE RIGGING SYSTEM.

THESE INSTRUCTIONS ARE INTENDED TO SUPPLEMENT PROPER TRAINING WHEN THE SYSTEM IS BEING OPERATED "IN WEIGHT" OR PROPERLY BALANCED. OPERATION OF A SYSTEM THAT IS OUT OF WEIGHT OR WHEN LINESETS ARE BEING LOADED OR UNLOADED SHOULD NOT BE ATTEMPTED WITHOUT SIGNIFICANT FURTHER TRAINING.

1. IDENTIFY AND INSPECT THE LINESET TO BE MOVED.
   CHECK THE BATTEN PATH FOR OBSTRUCTIONS. CLEAR OBSTRUCTIONS AND ASSIGN SPOTTERS AS NECESSARY.
   IS THERE SLACK IN THE OPERATING LINE? IF ONE SIDE OF THE LINE IS SLACK, THEN THE LINESET IS OUT OF BALANCE. DO NOT OPERATE A LINESET THAT IS OUT OF BALANCE.

2. PREPARE TO MOVE THE LINESET.
   PUT A HALF TWIST IN THE OPERATING LINE.
   UNLOCK THE LINESET.
   ANNOUNCE LOUDLY: WHERE IT IS, WHAT IT IS, WHAT IT'S DOING. (EX: DOWNSTAGE, LINESET 2, COMING IN).

3. MOVE THE LINESET.
   UNTWIST. IF THE LINESET MOVES AS YOU ARE UNTWISTING THE LINE, IT MAY BE OUT OF WEIGHT. STOP AND LOCK THE SET AGAIN. SEEK HELP FROM A QUALIFIED RIGGER.
   WATCH THE STAGE. WHILE WATCHING THE PATH OF THE BATTEN (NOT THE OPERATING LINE), PULL ON THE FRONT LINE TO BRING THE BATTEN IN OR THE BACK LINE TO TAKE THE BATTEN OUT.
   NEVER MOVE A LINESET FASTER THAN YOU CAN STOP IT. THE OPERATOR IS RESPONSIBLE FOR THE MOVEMENT OF THE LINESET AND THE SCENERY ATTACHED TO IT. THE OPERATOR MUST REMAIN IN CONTROL THROUGHOUT THE MOVEMENT.
   STAY ALERT. WHEN IN DOUBT, STOP.
   NEVER FORCE A LINESET TO MOVE . IF THE LINESET APPEARS TO BE STUCK, OR BECOMES DIFFICULT TO MOVE, STOP. DETERMINE THE CAUSE BEFORE CONTINUING. IF THE CAUSE CANNOT BE DETERMINED, LOCK THE LINESET AND SEEK HELP FROM A QUALIFIED RIGGER.

4. LOCK THE LINESET.
   WHEN THE MOVE IS COMPLETE, RELOCK THE LINESET. NEVER LEAVE AN UNLOCKED LINESET UNATTENDED.

2 QT536.00 RIGGING CAPACITY SIGNAGE - OPERATION CW
SCALE: 12" = 1'-0"

LOADING WEIGHT

WARNING! IMPROPER OPERATION OF RIGGING SYSTEMS MAY RESULT IN SERIOUS INJURY OR DEATH.

ONLY TRAINED PERSONNEL MAY OPERATE THE RIGGING SYSTEM.

THESE INSTRUCTIONS ARE INTENDED TO SUPPLEMENT PROPER TRAINING. CHANGING WEIGHT ON THE COUNTERWEIGHT SYSTEM MUST BE CAREFULLY COORDINATED BY A QUALIFIED RIGGER. DO NOT ADD OR REMOVE WEIGHTS FROM A LINESET UNLESS INSTRUCTED TO DO SO.

1. FIND A PARTNER
   LOADING WEIGHT REQUIRES AT LEAST TWO PEOPLE.
2. IS THE LINESET LOCKED, TWISTED OR TIED OFF?
   COMMUNICATE. BEFORE CHANGING ANY WEIGHT, ASK THE OPERATOR IF THE LINESET HAS BEEN SECURED SO THAT IT DOES NOT MOVE AS WEIGHTS ARE LOADED OR REMOVED.
3. IS THE WEIGHT DOWN?
   GOOD PRACTICE IS TO ENSURE THAT THE WEIGHT IS ALWAYS DOWN. EX. LOAD THE LIGHTING INSTRUMENTS ON THE PIPE NEAR THE FLOOR BEFORE LOADING WEIGHT ON THE ARBOR. CONVERSELY, ALWAYS TAKE THE WEIGHT OFF THE ARBOR BEFORE REMOVING THE WEIGHT FROM THE BATTEN.
4. COMMUNICATE AND CONFIRM
   THE RIGGING SUPERVISOR SHOULD CALL OUT HOW MUCH WEIGHT NEEDS TO BE ON WHAT LINESET (EX. LOAD LINESET 12 TO 10 BRICKS ABOVE PIPE WEIGHT). REPEAT THOSE INSTRUCTIONS BACK TO THE RIGGING SUPERVISOR BEFORE ADDING OR REMOVING WEIGHTS.
5. CLEAR THE RAIL
   NO ONE SHOULD BE WORKING UNDER YOU AS YOU ADD OR REMOVE WEIGHT FROM THE ARBOR.
6. LIFT THE SPREADER PLATES
   LIFT THE SPREADER PLATES AND CLIP THEM OUT OF THE WAY.
7. ADD OR REMOVE WEIGHT.
   ONE PERSON LOADS WEIGHT, WHILE THE OTHER PERSON BRINGS THE WEIGHTS TO THEM.
8. INSERT SPREADER PLATES WHERE INDICATED.
9. SECURE THE WEIGHT.
   ONCE ALL OF THE WEIGHT HAS BEEN ADDED OR REMOVED, SLIDE THE UNUSED SPREADER PLATES DOWN ONTO THE WEIGHT STACK. HAND-TIGHTEN THE THUMBSCREW. SECURE THE WEIGHT BEFORE THE LINESET IS MOVED.
10. COMMUNICATE THAT THE WEIGHT SHIFT IS COMPLETE.
    CALL OUT THE WEIGHT AGAIN. PAUSE FOR FURTHER INSTRUCTIONS.

5 QT536.00 RIGGING CAPACITY SIGNAGE - LOADING WEIGHT
SCALE: 12" = 1'-0"

RIGGING SYSTEM INFORMATION

WARNING: IMPROPER OPERATION OF RIGGING SYSTEMS MAY RESULT IN SERIOUS INJURY
OR DEATH. ONLY TRAINED PERSONNEL MAY OPERATE THE RIGGING SYSTEM.

COUNTERWEIGHT SYSTEM

GENERAL PURPOSE COUNTERWEIGHT SETS:

X' ARBOR CAPACITY	XXXX POUNDS

NOMINAL WEIGHTS OF 6" COUNTERWEIGHTS:

1/4" THICKNESS	11 POUNDS
1/2 INCH THICKNESS	22 POUNDS
2 INCH THICKNESS	45 POUNDS

COUNTERWEIGHT BATTEN CAPACITIES:

UNIFORMLY DISTRIBUTED LOAD	35 PLF
POINT LOAD AT LIFT LINE	700 POUNDS
POINT LOAD AT CENTER OF SPAN	175 POUNDS

LOADING BRIDGE CAPACITY:

TOTAL CAPACITY	XXXXX POUNDS
STORAGE CAPACITY	XXX PSF

WARNING! DO NOT STACK BRICKS ABOVE THE KICK RAILS.

REMOVE OR TETHER ALL LOOSE ITEMS (PHONES, WALLETS, PENCILS) BEFORE CLIMBING UP TO LEVELS ABOVE THE STAGE, INCLUDING THE OPERATING OR LOADING GALLERIES.

INSTALLED BY:

COMPANY, INC.
STREET ADDRESS
CITY, ST 00000
XXX-XXX-XXXX
www.company.com

MANUFACTURED BY:

COMPANY, INC.
STREET ADDRESS
CITY, ST 00000
XXX-XXX-XXXX
www.company.com

COMPANY, INC.
STREET ADDRESS
CITY, ST 00000
XXX-XXX-XXXX
www.company.com

COMMISSIONED: AUGUST 2018

SPACE PROVIDED FOR INSTALLER OR MANUFACTURER LOGO.

MOTORIZED SYSTEMS

MOTORIZED LINESET CAPACITIES:

FIRE CURTAIN	XXXX POUNDS
FIXED SPEED SETS (LS#, #, #)	XXXX POUNDS
VARIABLE SPEED SETS (LS#, #, #)	XXXX POUNDS
TAB SETS	XXXX POUNDS

MOTORIZED BATTEN CAPACITIES:

UNIFORMLY DISTRIBUTED LOAD	35 PLF
POINT LOAD AT LIFT LINE	400 POUNDS
POINT LOAD AT CENTER OF SPAN	175 POUNDS

GRID CAPACITY:

WALKING SURFACE CAPACITY*	60 PSF

CONCENTRATED LOADS*
2000 LBS OVER 4 SQUARE FOOT AREA OR 500 PSF OVER 4 SQUARE FOOT AREA. CONCENTRATED LOADS CANNOT OCCUR CLOSER THAN 3FT APART, OVER NO MORE THAN 40% OF THE GRID AREA.

* NOT INCLUDING STAGE RIGGING SYSTEM LOAD.

TERMINATIONS MADE WITH:

1/4" NTS NICOPRESS, GO-NO-GO GAUGE OVAL F-6

ANNUAL INSPECTION REQUIRED FOR PROPER MAINTENANCE OF THIS EQUIPMENT.

LAST INSPECTION PERFORMED BY: _____ ON: _____
COMPANY MONTH/DAY/YEAR

1 QT536.00 RIGGING CAPACITY SIGNAGE - MAIN
SCALE: 12" = 1'-0"

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STAGE LIGHTING FIXTURES AND ACCESSORIES SCHEDULE

ITEM	BASE	ADD ALTERNATE	BASIS OF DESIGN DESCRIPTION	EQUAL MANUFACTURER	CONNECTOR	ACCESSORIES/NOTES
LX-1-19	10		ETC COLORSOURCE SPOT V WITH 19" EDLT LENS TUBE		NEMA 5-15P 'EDISON'	GOBO SLOT DIFFUSER
LX-1-26	8	4	ETC COLORSOURCE SPOT V WITH 26" EDLT LENS TUBE		NEMA 5-15P 'EDISON'	GOBO SLOT DIFFUSER
LX-1-36	5	4	ETC COLORSOURCE SPOT V WITH 36" EDLT LENS TUBE		NEMA 5-15P 'EDISON'	GOBO SLOT DIFFUSER
LX-1-50	2	2	ETC COLORSOURCE SPOT V WITH 50" EDLT LENS TUBE		NEMA 5-15P 'EDISON'	GOBO SLOT DIFFUSER
LX-2	0	10	ETC SOURCE FOUR LED SERIES COLORSOURCE PAR		NEMA 5-15P 'EDISON'	DIFFUSION LENS TYPES: ROUND, OVAL, MEDIUM, WIDE
LX-3	10	10	ETC COLORSOURCE CYC			
ACCS-1-50	4		EXTRA LENS TUBES FOR SOURCE 4 FIXTURES, 14" EDLT			
GTW-2		4	ETC RESPONSE MK2 TWO PORT PORTABLE GATEWAY, WHITE			PROVIDE WITH (1) 10'-0" ETHERCON CABLE
DIMM-1	40		ETC ES750 DISTRIBUTED DIMMER PACKS		NEMA 5-15P 'EDISON' MALE TO NEMA L5-20 "TWISTLOCK" FEMALE	
PWR-EXT	VIF		CONVERT EXISTING NEMA L5-20 LOOSE CABLES TO NEMA 5-15 EDISON	LEX, TMB, SSRC		VIF
PWR-5	5	4	5'-0" STAGE POWER CABLE JUMPER, NEMA 5-20 'EDISON' CONNECTORS, BLACK, 12/3 SOOW	LEX, TMB, SSRC		12/3 SOOW
PWR-10	10	4	10'-0" STAGE POWER CABLE JUMPER, NEMA 5-20 'EDISON' CONNECTORS, BLACK, 12/3 SOOW	LEX, TMB, SSRC		12/3 SOOW
PWR-15	15	5	15'-0" STAGE POWER CABLE JUMPER, NEMA 5-20 'EDISON' CONNECTORS, BLACK, 12/3 SOOW	LEX, TMB, SSRC		12/3 SOOW
PWR-25	5	2	25'-0" STAGE POWER CABLE JUMPER, NEMA 5-20 'EDISON' CONNECTORS, BLACK, 12/3 SOOW	LEX, TMB, SSRC		12/3 SOOW
PWR-50	2	0	50'-0" STAGE POWER CABLE JUMPER, NEMA 5-20 'EDISON' CONNECTORS, BLACK, 12/3 SOOW	LEX, TMB, SSRC		12/3 SOOW
TR1-5	8	4	TRUE1-TO-TRUE1 JUMPER, 5'-0", BLACK	LEX, TMB, SSRC		
TR1-10	12	5	TRUE1-TO-TRUE1 JUMPER, 10'-0", BLACK	LEX, TMB, SSRC		
TR1-15	18	8	TRUE1-TO-TRUE1 JUMPER, 15'-0", BLACK	LEX, TMB, SSRC		
TR1-25	5	2	TRUE1-TO-TRUE1 JUMPER, 25'-0", BLACK	LEX, TMB, SSRC		
PCON-5	5	8	POWERCON-TO-POWERCON JUMPER, 5'-0", BLACK	LEX, TMB, SSRC		
PCON-10	8	12	POWERCON-TO-POWERCON JUMPER, 10'-0", BLACK	LEX, TMB, SSRC		
PCON-15	15	18	POWERCON-TO-POWERCON JUMPER, 15'-0", BLACK	LEX, TMB, SSRC		
PCON-25	4	5	POWERCON-TO-POWERCON JUMPER, 25'-0", BLACK	LEX, TMB, SSRC		
DMX-5	10	5	5-PIN XLR DMX JUMPER, 5'-0", BLACK	LEX, TMB, SSRC		
DMX-10	25	10	5-PIN XLR DMX JUMPER, 10'-0", BLACK	LEX, TMB, SSRC		
DMX-15	35	15	5-PIN XLR DMX JUMPER, 15'-0", BLACK	LEX, TMB, SSRC		
DMX-25	20	8	5-PIN XLR DMX JUMPER, 25'-0", BLACK	LEX, TMB, SSRC		
DMX-50	4	2	5-PIN XLR DMX JUMPER, 50'-0", BLACK	LEX, TMB, SSRC		
DMX-T	10	5	5-PIN DMX TERMINATOR	LEX, TMB, SSRC		
ECON-5			CATEGORY CABLE JUMPER, CAT6A, 5'-0", WITH ETHERCON CONNECTORS, BLACK	LEX, TMB, SSRC		
ECON-10	2		CATEGORY CABLE JUMPER, CAT6A, 10'-0", WITH ETHERCON CONNECTORS, BLACK	LEX, TMB, SSRC		
ECON-25	4		CATEGORY CABLE JUMPER, CAT6A, 15'-0", WITH ETHERCON CONNECTORS, BLACK	LEX, TMB, SSRC		
ECON-50	2		CATEGORY CABLE JUMPER, CAT6A, 50'-0", WITH ETHERCON CONNECTORS, BLACK	LEX, TMB, SSRC		

NOTES:

WIRE TYPE LEGEND

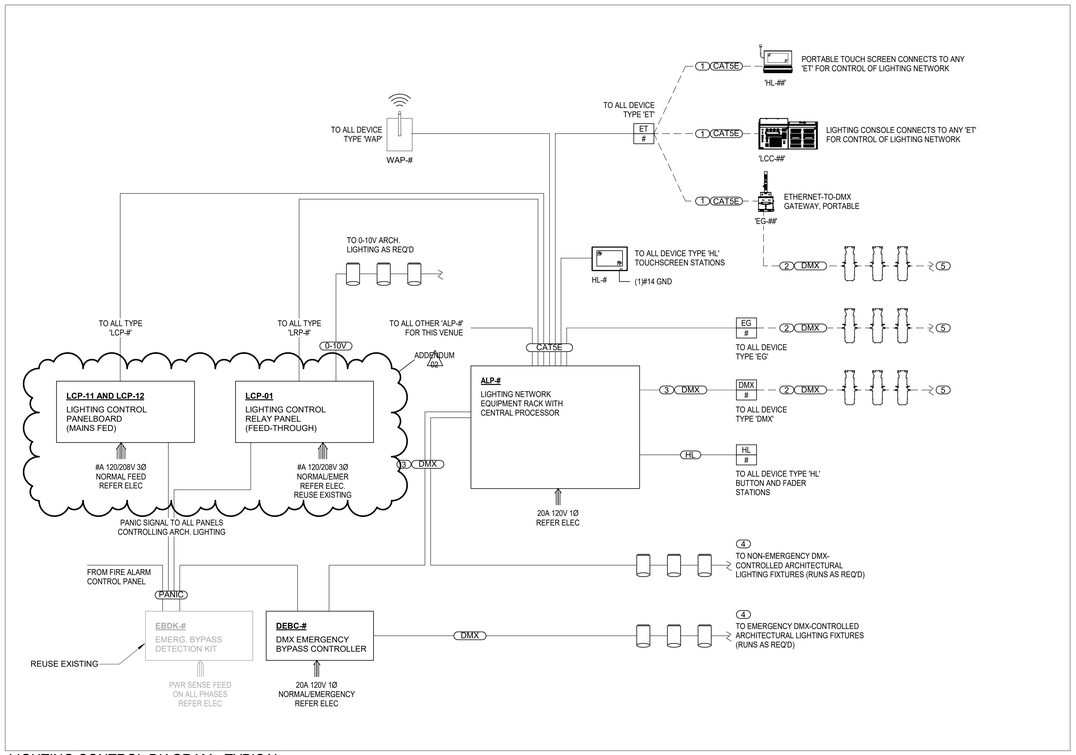
HL (1) BELDEN #8471 OR EQUIVALENT (1) #14 ESD DRAIN WIRE	LOW-VOLTAGE WIRING FOR LIGHTING CONTROL STATIONS. MAY BE DAISY-CHAIN OR STAR TOPOLOGY WITHIN LIMITS SPECIFIED BY MANUFACTURER. OBSERVE MFR'S DISTANCE LIMIT.
CAT5E (1) BELDEN #1538A (OR EQUIV.) PER HOME RUN	SACN SIGNAL ON CAT-5E CABLE TO NETWORKED DEVICES. HOME RUN ONE CABLE PER PORT ON DEVICE. MAX RUN LENGTH 100 METERS WITHOUT SIGNAL REINFORCEMENT.
DMX (1) BELDEN #1538A (OR EQUIV.) PER HOME RUN	DMX-512 SIGNAL ON CAT-5E CABLE TO DMX PORTS OR DMX LIGHTING FIXTURES. HOME RUN ONE CABLE PER PORT ON DEVICE. MAX RUN LENGTH 1,000' WITHOUT SIGNAL REINFORCEMENT. MAX (32) DEVICES (NODES) PER RUN. FOLLOW MANUFACTURER'S GUIDELINES FOR DMX OVER CATEGORY CABLE.
0-10V (2) #16	CLASS 2 WIRING FOR 0-10V ANALOG LIGHTING CONTROL. MAX RUN 400'. KEEP ALL CONTROL WIRING SEPARATE FROM LINE VOLTAGE WIRING TO MAINTAIN INTEGRITY OF CONTROL SIGNAL PER NEC 725.
PANIC (2) #16	WIRING FOR PANIC SIGNAL. PANIC SIGNAL ORIGINATES AT FIRE ALARM CONTROL PANEL. REFER ELECTRICAL.
MFR CABLE TYPE PER MANUFACTURER	REFER MFR'S SHOP DRAWINGS.

GENERAL NOTES

1. ELECTRICAL CONTRACTOR SHALL VERIFY ALL CONTROL WIRE TYPES AND PATHS ON MANUFACTURER SHOP DRAWINGS.
2. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL CONTROL WIRE AND CONDUIT.
3. WHERE CODE REQUIREMENTS APPLY, USE RISER OR PLENUM RATED CABLE TYPES EQUIVALENT TO CABLE TYPE LISTED HERE.
4. THEATRICAL LIGHTING CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL COMPONENTS NECESSARY FOR A FULLY FUNCTIONAL SYSTEM SATISFYING DESIGN INTENT CONVEYED HEREIN AND IN SPECIFICATIONS.

SHEET KEY NOTES

1. CAT-5E PATCH CABLE. LOOSE EQUIPMENT PROVIDED AS PART OF THE STAGE LIGHTING FIXTURES AND ACCESSORIES PACKAGE. REFER SCHEDULES.
2. DMX-512 5-PIN XLR PATCH CABLE. LOOSE EQUIPMENT PROVIDED AS PART OF THE STAGE LIGHTING FIXTURES AND ACCESSORIES PACKAGE. REFER SCHEDULES.
3. TERMINATES AT ETHERNET-TO-DMX GATEWAY IN DESIGNATED 'ALP' CONTROL RACK. FURNISH GATEWAYS IN QUANTITIES REQUIRED. DESIGN INTENT IS THAT USER MAY ASSIGN ANY DMX UNIVERSE AND ADDRESS TO ANY DMX PORT OR LIGHTING CONTROL RUN.
4. DMX-CONTROLLED FIXTURES SHALL BE ADDRESSED BY THEATRICAL LIGHTING CONTRACTOR OR MANUFACTURER'S FACTORY-AUTHORIZED TECHNICIAN PRIOR TO TO FOCUS AND PROGRAMMING.
5. REPRESENTS MEANS OF CONTROL FOR DMX-512 ENABLED STAGE LIGHTING FIXTURES. INSTALL OF STAGE LIGHTING FIXTURES IS N.I.C. UNLESS NOTED ELSEWHERE.



1 LIGHTING CONTROL DIAGRAM - TYPICAL
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57-23140-00
343 WEST 27TH STREET
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THEATRICAL LIGHTING CONTROL DIAGRAM

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ADDENDUM 02

'LCP-11' LIGHTING CONTROL PANELBOARD SCHEDULE

FED FROM: REFER ELECTRICAL
MAIN FEED: 120/208V - MCB
LOCATION: DIMMER RACK ROOM C138
MAIN BREAKER: 200A
MOUNTING: WALL

	CIRCUIT BREAKER		DMX-512 CONTROL												
kVA	NO.	RATING	UNIV.	ADDR.	LOAD LOCATION	DEVICE / FIXTURE	NOTES	CONTROL INPUT DEVICE	LIGHTING CONSOLE	HL STATIONS	TIME CLOCK	DAYLIGHT SENSORS	VACANCY SENSORS	FIRE ALARM	LOSS OF POWER
1.2	1	20A	64	1	STAGE LIGHTING WIRING DEVICE	WD-31			1	1	2				
1.2	2	20A	64	2	STAGE LIGHTING WIRING DEVICE	WD-31			1	1	2				
1.2	3	20A	64	3	STAGE LIGHTING WIRING DEVICE	WD-31			1	1	2				
1.2	4	20A	64	4	STAGE LIGHTING WIRING DEVICE	WD-31			1	1	2				
1.2	5	20A	64	5	STAGE LIGHTING WIRING DEVICE	WD-31			1	1	2				
1.2	6	20A	64	6	STAGE LIGHTING WIRING DEVICE	WD-32			1	1	2				
1.2	7	20A	64	7	STAGE LIGHTING WIRING DEVICE	WD-32			1	1	2				
1.2	8	20A	64	8	STAGE LIGHTING WIRING DEVICE	WD-33			1	1	2				
1.2	9	20A	64	9	STAGE LIGHTING WIRING DEVICE	WD-33			1	1	2				
1.2	10	20A	64	10	STAGE LIGHTING WIRING DEVICE	WD-33			1	1	2				
1.2	11	20A	64	11	STAGE LIGHTING WIRING DEVICE	WD-33			1	1	2				
1.2	12	20A	64	12	STAGE LIGHTING WIRING DEVICE	WD-33			1	1	2				
1.2	13	20A	64	13	STAGE LIGHTING WIRING DEVICE	WD-11			1	1	2				
1.2	14	20A	64	14	STAGE LIGHTING WIRING DEVICE	WD-11			1	1	2				
1.2	15	20A	64	15	STAGE LIGHTING WIRING DEVICE	WD-11			1	1	2				
1.2	16	20A	64	16	STAGE LIGHTING WIRING DEVICE	WD-12			1	1	2				
1.2	17	20A	64	17	STAGE LIGHTING WIRING DEVICE	WD-12			1	1	2				
1.2	18	20A	64	18	STAGE LIGHTING WIRING DEVICE	WD-12			1	1	2				
1.2	19	20A	64	19	STAGE LIGHTING WIRING DEVICE	WD-13			1	1	2				
1.2	20	20A	64	20	STAGE LIGHTING WIRING DEVICE	WD-13			1	1	2				
1.2	21	20A	64	21	STAGE LIGHTING WIRING DEVICE	WD-13			1	1	2				
1.2	22	20A	64	22	STAGE LIGHTING WIRING DEVICE	WD-13			1	1	2				
1.2	23	20A	64	23	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	24	20A	64	24	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	25	20A	64	25	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	26	20A	64	26	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	27	20A	64	27	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	28	20A	64	28	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	29	20A	64	29	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	30	20A	64	30	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	31	20A	64	31	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	32	20A	64	32	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	33	20A	64	33	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	34	20A	64	34	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	35	20A	64	35	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	36	20A	64	36	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	37	20A	64	37	STAGE LIGHTING WIRING DEVICE	WD-21			1	1	2				
1.2	38	20A	64	38	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	39	20A	64	39	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	40	20A	64	40	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	41	20A	64	41	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	42	20A	64	42	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	43	20A	64	43	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	44	20A	64	44	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	45	20A	64	45	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	46	20A	64	46	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	47	20A	64	47	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	48	20A	64	48	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
57.6	**TOTAL**														

NOTES:
1) THIS DEVICE IS A MAINS-FED PANEL, WITH EACH CIRCUIT DISCRETELY CONTROLLED FROM A DMX-512 NETWORK. REFER TO ELECTRICAL DRAWINGS FOR BRANCH FEEDS AND LOAD WIRING INFORMATION.
2) FINAL PROGRAMMING OF STATION CONTROLS, TIME SCHEDULES, AND OTHER PARAMETERS OF THIS NETWORK SHALL BE PERFORMED DURING COMMISSIONING, AT DIRECTION OF OWNER AND SPECIFIER.

KEYNOTES:
1) THIS CIRCUIT TOGGLED ON/OFF BY STATION PRESET OR LIGHTING CONTROL CONSOLE.
2) THIS CIRCUIT SWEEPS 'OFF' AT 12:59 AM DAILY, WITH 3 MINUTE BLINK WARNING.
3) THIS CIRCUIT CONTROLLED BY DAYLIGHT SENSORS.
4) THIS CIRCUIT CONTROLLED BY VACANCY SENSORS.
5) THIS CIRCUIT TOGGLED 'ON' DURING FIRE ALARM OR EVACUATION ALARM. FURNISH ALL 'PANIC' WIRING AND INTERFACE HARDWARE NECESSARY FOR THIS TRIGGER.
6) THIS CIRCUIT TOGGLED 'OFF' DURING FIRE ALARM OR EVACUATION ALARM. FURNISH ALL 'PANIC' WIRING AND INTERFACE HARDWARE NECESSARY FOR THIS TRIGGER.
7) THIS CIRCUIT TOGGLED 'ON' DURING LOSS-OF-POWER EVENT. FURNISH ALL 'PANIC' WIRING AND INTERFACE HARDWARE NECESSARY FOR THIS TRIGGER. POWER TRANSFER BY ELECTRICAL.

ADDENDUM 02

'LCP-01' LIGHTING CONTROL RELAY PANEL SCHEDULE

FED FROM: MAIN
MAIN FEED: 120/208V - MCB
LOCATION: DIMMER RACK ROOM C138
MAIN BREAKER: 100A
MOUNTING: WALL

	FED FROM			DMX-512										
	PANEL	BREAKER	RELAY	UNIV.	ADDR.	LOAD LOCATION	DEVICE/FIXTURE	VOLTAGE	NOTES	CONTROL INPUT DEVICE	LIGHTING CONSOLE	HL STATIONS	NETWORK TIME CLOCK	FIRE ALARM OVERRIDE	LOSS OF POWER
	N/A	1	1	65	73	HOUSE LIGHTING - APRON		120V			1	1	2	6	
	N/A	2	2	65	74	HOUSE LIGHTING - DOWN CENTER		120V			1	1	2	6	
	N/A	3	3	65	75	HOUSE LIGHTING - DOWN OUTER		120V			1	1	2	6	
	N/A	4	4	65	76	HOUSE LIGHTING - UP CENTER		120V			1	1	2	6	
	N/A	5	5	65	77	HOUSE LIGHTING - UP OUTER		120V			1	1	2	6	
	N/A	6	6	65	78	HOUSE LIGHTING - NORTH WALL		120V			1	1	2	6	
	N/A	7	7	65	79	HOUSE LIGHTING - SOUTH WALL		120V			1	1	2	6	
	N/A	8	8	65	80	HOUSE LIGHTING - WEST DOWNLIGHTS		120V			1	1	2	6	
	N/A	9	9	65	81	HOUSE LIGHTING - VOM EXITS		120V			1	1	2	6	
	N/A	10	10	65	82	STAGE WORK LIGHTING		120V	EXISTING FLOURESCENTS		1	1	2	6	
	N/A	11	11	65	83	STAGE WORK - FOH	WD-31, WD-33	120V			1	1	2	6	
	N/A	12	12	65	84	STAGE WORK - 1ST ELECTRIC	WD-21	120V			1	1	2	6	
	N/A	13	13	65	85	STAGE WORK - 2ND ELECTRIC	WD-22	120V			1	1	2	6	
	N/A	14	14	65	86	STAGE WORK - 3RD ELECTRIC	WD-23	120V			1	1	2	6	
	N/A	15	15	65	87	STAGE WORK - 4TH ELECTRIC	WD-24	120V			1	1	2	6	
	N/A	16	16	65	88	ARCH - SPARE	SPARE				1	1	2	6	
	N/A	17	17	65	89	ARCH - SPARE	SPARE				1	1	2	6	
	N/A	18	18	65	90	ARCH - SPARE	SPARE				1	1	2	6	
	VOLTAGE BARRIER BETWEEN NORMAL AND EMERGENCY CIRCUITS														
	N/A	19	19	65	115	HOUSE EMERGENCY LIGHTING - AISLES AND SEATS		120V			1	1	2	5	7
	N/A	20	20	65	116	HOUSE EMERGENCY LIGHTING - REAR AUDITORIUM					1	1	2	5	7
	N/A	21	21	65	117	EM - SPARE					1	1	2	5	7
	N/A	22	22	65	118	EM - SPARE					1	1	2	5	7
	N/A	23	23	65	119	EM - SPARE					1	1	2	5	7
	N/A	24	24	65	120	EM - SPARE					1	1	2	5	7
0	TOTAL														

NOTES:
1) THIS DEVICE IS A MAINS-FED PANEL, WITH EACH CIRCUIT DISCRETELY CONTROLLED FROM A DMX-512 NETWORK. REFER TO ELECTRICAL DRAWINGS FOR BRANCH FEEDS AND LOAD WIRING INFORMATION.
2) FINAL PROGRAMMING OF STATION CONTROLS, TIME SCHEDULES, AND OTHER PARAMETERS OF THIS NETWORK SHALL BE PERFORMED DURING COMMISSIONING, AT DIRECTION OF OWNER AND SPECIFIER.

KEYNOTES:
1) THIS RELAY TOGGLED ON/OFF BY STATION PRESET OR LIGHTING CONTROL CONSOLE
2) THIS RELAY SWEEPS 'ON' AT 6 A.M. DAILY AND 'OFF' AT 12:59 A.M. DAILY, WITH 3 MINUTE BLINK WARNING.
3) THIS RELAY CONTROLLED BY DAYLIGHT SENSORS
4) THIS RELAY CONTROLLED BY VACANCY SENSORS
5) THIS RELAY TOGGLED 'ON' DURING FIRE ALARM OR EVACUATION ALARM
6) THIS RELAY TOGGLED 'OFF' DURING FIRE ALARM OR EVACUATION ALARM
7) THIS RELAY TOGGLED 'ON' DURING LOSS OF POWER EVENT (POWER TRANSFER BY ELEC)

ADDENDUM 02

'LCP-12' LIGHTING CONTROL PANELBOARD SCHEDULE

FED FROM: REFER ELECTRICAL
MAIN FEED: 120/208V - MCB
LOCATION: DIMMER RACK ROOM C138
MAIN BREAKER: 200A
MOUNTING: WALL

	CIRCUIT BREAKER		DMX-512 CONTROL												
kVA	NO.	RATING	UNIV.	ADDR.	LOAD LOCATION	DEVICE / FIXTURE	NOTES	CONTROL INPUT DEVICE	LIGHTING CONSOLE	HL STATIONS	TIME CLOCK	DAYLIGHT SENSORS	VACANCY SENSORS	FIRE ALARM	LOSS OF POWER
1.2	1	20A	64	49	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	2	20A	64	50	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	3	20A	64	51	STAGE LIGHTING WIRING DEVICE	WD-22			1	1	2				
1.2	4	20A	64	52	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	5	20A	64	53	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	6	20A	64	54	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	7	20A	64	55	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	8	20A	64	56	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	9	20A	64	57	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	10	20A	64	58	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	11	20A	64	59	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	12	20A	64	60	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	13	20A	64	61	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	14	20A	64	62	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	15	20A	64	63	STAGE LIGHTING WIRING DEVICE	WD-23			1	1	2				
1.2	16	20A	64	64	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	17	20A	64	65	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	18	20A	64	66	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	19	20A	64	67	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	20	20A	64	68	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	21	20A	64	69	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	22	20A	64	70	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	23	20A	64	71	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	24	20A	64	72	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	25	20A	64	73	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	26	20A	64	74	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	27	20A	64	75	STAGE LIGHTING WIRING DEVICE	WD-24			1	1	2				
1.2	28	20A	64	76	STAGE LIGHTING WIRING DEVICE	WD-01			1	1	2				
1.2	29	20A	64	77	STAGE LIGHTING WIRING DEVICE	WD-01			1	1	2				
1.2	30	20A	64	78	STAGE LIGHTING WIRING DEVICE	WD-01			1	1	2				
1.2	31	20A	64	79	STAGE LIGHTING WIRING DEVICE	WD-01			1	1	2				
1.2	32	20A	64	80	STAGE LIGHTING WIRING DEVICE	WD-02			1	1	2				
1.2	33	20A	64	81	STAGE LIGHTING WIRING DEVICE	WD-02			1	1	2				
1.2	34	20A	64	82	STAGE LIGHTING WIRING DEVICE	WD-02			1	1	2				
1.2	35	20A	64	83	STAGE LIGHTING WIRING DEVICE	WD-02			1	1	2				
1.2	36	20A	64	84	STAGE LIGHTING WIRING DEVICE	WD-03			1	1	2				
1.2	37	20A	64	85	STAGE LIGHTING WIRING DEVICE	WD-03			1	1	2				
1.2	38	20A	64	86	STAGE LIGHTING WIRING DEVICE	WD-03			1	1	2				
1.2	39	20A	64	87	STAGE LIGHTING WIRING DEVICE	WD-03			1	1	2				
1.2	40	20A	64	88	STAGE LIGHTING WIRING DEVICE	WD-04			1	1	2				
1.2	41	20A	64	89	STAGE LIGHTING WIRING DEVICE	WD-04			1	1	2				
1.2	42	20A	64	90	STAGE LIGHTING WIRING DEVICE	WD-04			1	1	2				
1.2	43	20A	64	91	STAGE LIGHTING WIRING DEVICE	WD-04			1	1	2				
1.2	44	20A	64	92	STAGE LIGHTING WIRING DEVICE	SPARE			1	1	2				
1.2	45	20A	64	93	STAGE LIGHTING WIRING DEVICE	SPARE			1	1	2				
1.2	46	20A	64	94	STAGE LIGHTING WIRING DEVICE	SPARE			1	1	2				
1.2	47	20A	64	95	STAGE LIGHTING WIRING DEVICE	SPARE			1	1	2				
1.2	48	20A	64	96	STAGE LIGHTING WIRING DEVICE	SPARE			1	1	2				
57.6	**TOTAL**														

NOTES:
1) THIS DEVICE IS A MAINS-FED PANEL, WITH EACH CIRCUIT DISCRETELY CONTROLLED FROM A DMX-512 NETWORK. REFER TO ELECTRICAL DRAWINGS FOR BRANCH FEEDS AND LOAD WIRING INFORMATION.
2) FINAL PROGRAMMING OF STATION CONTROLS, TIME SCHEDULES, AND OTHER PARAMETERS OF THIS NETWORK SHALL BE PERFORMED DURING COMMISSIONING, AT DIRECTION OF OWNER AND SPECIFIER.

KEYNOTES:
1) THIS CIRCUIT TOGGLED ON/OFF BY STATION PRESET OR LIGHTING CONTROL CONSOLE.
2) THIS CIRCUIT SWEEPS 'OFF' AT 12:59 AM DAILY, WITH 3 MINUTE BLINK WARNING.
3) THIS CIRCUIT CONTROLLED BY DAYLIGHT SENSORS.
4) THIS CIRCUIT CONTROLLED BY VACANCY SENSORS.
5) THIS CIRCUIT TOGGLED 'ON' DURING FIRE ALARM OR EVACUATION ALARM. FURNISH ALL 'PANIC' WIRING AND INTERFACE HARDWARE NECESSARY FOR THIS TRIGGER.
6) THIS CIRCUIT TOGGLED 'OFF' DURING FIRE ALARM OR EVACUATION ALARM. FURNISH ALL 'PANIC' WIRING AND INTERFACE HARDWARE NECESSARY FOR THIS TRIGGER.
7) THIS CIRCUIT TOGGLED 'ON' DURING LOSS-OF-POWER EVENT. FURNISH ALL 'PANIC' WIRING AND INTERFACE HARDWARE NECESSARY FOR THIS TRIGGER. POWER TRANSFER BY ELECTRICAL.

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NEW YORK, NY 10001

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REVISIONS
#3 01/23/25

57-23140-00

THEATRICAL LIGHTING PANEL SCHEDULES

QT602.00

ABBREVIATIONS

(R)	RELOCATED
Ø	PHASE
A	AMPERE
A/E	ARCHITECT/ENGINEER
AC	ABOVE COUNTER
AF	AMP FRAME (CIRCUIT BREAKER)
AIC	AMPERE INTERRUPTING CAPACITY
AL	ALUMINUM
AMP	AMPERE
AP	WIRELESS ACCESS POINT
AT	AMP TRIP (CIRCUIT BREAKER OR FUSE)
ATS	AUTOMATIC TRANSFER SWITCH
AV	AUDIO-VIDEO, AUDIO-VISUAL
AWG	AMERICAN WIRE GAUGE
BAS	BUILDING AUTOMATION SYSTEM
BJ	BONDING JUMPER
BKR	BREAKER
BMS	BUILDING MANAGEMENT SYSTEM
C	CONDUIT
CAS	CASING
CATV	CABLE TELEVISION
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CE	COVER ELEVATION
CEM	CEMENT
CFCI	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
CG	CORNER GUARD
CH	CHANNEL
CJ	CONSTRUCTION JOINT
CKT	CIRCUIT
CKT BK	CIRCUIT BREAKER
CL	CIRCUIT LINE
CM	CEILING MOUNTED
CMP	CORRUGATED METAL PIPE
CO	CONDUIT ONLY
COMP	COMPOSITE
COOR	COORDINATE
COORD	COORDINATE
CSK	COUNTERSUNK
CT	CURRENT TRANSFORMER
CTL	CONTROL
CU	COPPER
CWV	COMBINATION WASTE AND VENT
DB	DECIBEL
DC	DIRECT CURRENT
DISC	DISCONNECT
DP	DISTRIBUTION PANELBOARD
DW	DISHWASHER
ECS	EMERGENCY COMMUNICATION SYSTEM
EGB	ELECTRICAL GROUNDING BUSBAR
EMD	ESTIMATED MAXIMUM DEMAND
EMGB	ELECTRICAL MAIN GROUNDING BUSBAR
EP	EXPLOSION PROOF
ERMS	ENERGY REDUCTION MAINTENANCE SWITCH
EWC	ELECTRIC WATER COOLER
FA	FIRE ALARM
FAA	FIRE ALARM ANNUNCIATOR
FACP	FIRE ALARM CONTROL PANEL
FC	FOOT CANDLE
FLA	FULL LOAD AMPS
FS	FLOW SWITCH
FSD	FIRE SMOKE DAMPER
G	EQUIPMENT GROUNDING CONDUCTOR
GEN	GENERATOR
GFI, GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFPE	GROUND FAULT PROTECTION OF EQUIPMENT
GND	EQUIPMENT GROUNDING CONDUCTOR
HH	HANDHOLE
HOA	HAND-OFF-AUTOMATIC
HP	HORSE POWER
IC	INTERCOM
IG	ISOLATED GROUND
JB	JUNCTION BOX
KAIC	THOUSAND AMPERE INTERRUPTING CIRCUIT
KV	KILOVOLT
KVA	KILOVOLT AMPERES
KW	KILOWATT
LT	LIGHT
LTG	LIGHTING
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MH	MANHOLE
MLO	MAIN LUGS ONLY
MOCP	MAXIMUM OVERCURRENT PROTECTION
MRTS	MOTOR RATED TOGGLE SWITCH
MSB	MAIN SWITCHBOARD
MTD	MOUNTED
MTG	MOUNTING
MTS	MAIN TRANSFER SWITCH
N	NEUTRAL
NC	NORMALLY CLOSED
NF	NON-FUSED
NL	NIGHT LIGHT
NO	NORMALLY OPEN
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OS&Y	OUTSIDE SCREW AND YOKE
P	POLE(S)
PA	PUBLIC ADDRESS
PB	PULL BOX
PH	PHASE
PIV	POST INDICATOR VALVE
PNL	PANEL
PWR	POWER
RCP	REFLECTED CEILING PLAN
RECPT	RECEPTACLE
REF	REFERENCE
RESP	RESPONSIVE
SCCR	SHORT CIRCUIT CURRENT RATING
SD	SMOKE DAMPER
SEC	SECONDARY
SPD	SURGE PROTECTION DEVICE
SWBD	SWITCHBOARD
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TC	TIME CLOCK
TGB	TELECOMMUNICATIONS GRONDING BUSBAR
TMGB	TELECOMMUNICATIONS MAIN GRONDING BUSBAR
TO	TELECOMMUNICATIONS OUTLET
TR	TELECOMMUNICATIONS ROOM
TS	TAMPER SWITCH
TV	TELEVISION
UG	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
UPS	UNINTERRUPTABLE POWER SUPPLY
V	VOLT
VA	VOLT-AMPERE
VFD	VARIABLE FREQUENCY DRIVE
W	WIRE
WA	TELECOMMUNICATIONS WORK AREA
WG	WIRE GUARD
WP	WEATHER-PROOF (NEMA 3R)
XFMR	TRANSFORMER

NOTES

GENERAL NOTES

1. MODIFICATIONS TO EXISTING POWER DISTRIBUTION EQUIPMENT: MATCH EXISTING MANUFACTURER, SWITCH TYPE, FUSE TYPE, BREAKER TYPE AND KAIC RATING FOR ALL INSTALLED DEVICES.
2. EXISTING PANEL DIRECTORIES AT PANELS AFFECTED BY WORK: PROVIDE UPDATED TYPED PANEL DIRECTORY. CONSULT OWNER FOR INPUT ON LABELING OF ALL EXISTING CIRCUITS.
3. DEVICES AND LIGHT FIXTURES DENOTED 'ER' ARE EXISTING TO BE RELOCATED. NOTIFY A/E IF DEVICES OR FIXTURES ARE DAMAGED.

GENERAL DEMOLITION NOTES

1. ITEMS INDICATED ON DEMOLITION PLANS ARE BASED ON AS-BUILT DRAWINGS AND FIELD OBSERVATIONS AND ARE INTENDED TO GIVE THE BIDDER A GENERAL REPRESENTATION OF EXISTING CONDITIONS.
2. REMOVE ALL ITEMS SHOWN FULL-TONE OR NOTED ELSEWHERE IN THE DOCUMENTS TO BE REMOVED OR DEMOLISHED. DEMOLISH ADDITIONAL ITEMS NOT SHOWN ON DRAWINGS, BUT WHICH MUST BE REMOVED TO COMPLETE THE PROJECT.
3. ITEMS SHOWN HALF-TONE ARE EXISTING TO REMAIN.
4. RELOCATE ITEMS DENOTED 'ER'. SEE LIGHTING, POWER AND/OR SPECIAL SYSTEM SHEETS FOR NEW LOCATIONS. 'ER' IS DEFINED AS EXISTING (TO BE) RELOCATED.
5. EXISTING CONDUIT MAY REMAIN IF ALL THE FOLLOWING ARE TRUE:
   A. IT CAN BE REUSED TO FEED DEVICES INSTALLED UNDER THIS CONTRACT.
   B. IT DOES NOT INTERFERE WITH OTHER TRADES.
   C. IT WAS ORIGINALLY INSTALLED MEETING SPECIFICATIONS RELATED TO THIS PROJECT.
   D. IT WILL NOT BE EXPOSED IN A FINISHED AREA (UNLESS NOTED OTHERWISE).
6. PROVIDE ELECTRICAL DEMOLITION ASSOCIATED WITH MECHANICAL EQUIPMENT TO BE REMOVED. IN ADDITION TO DEVICES SHOWN, REFER TO MECHANICAL AND ARCHITECTURAL DEMOLITION SHEETS TO DETERMINE EQUIPMENT TO BE REMOVED.
7. MAINTAIN FUNCTIONALITY OF ALL EXISTING LOW VOLTAGE SYSTEMS INCLUDING, BUT NOT LIMITED TO, TELECOM CABLING NETWORKS, INTERCOM, CLOCKS, FIRE ALARM, SAFETY AND SECURITY DURING ALL PHASES OF CONSTRUCTION. PROVIDE TEMPORARY INTERCONNECTIONS AS REQUIRED TO ACCOMMODATE CONSTRUCTION SCHEDULE.

GENERAL POWER NOTES

1. VERIFY ANY NEUTRAL WIRES REQUIRED ON 1Ø OR 3Ø MECHANICAL UNITS FURNISHED UNDER DIVISION 23. IF REQUIRED, PROVIDE NEUTRAL.
2. IN ADDITION TO DEVICES SHOWN, SEE SCHEDULE SHEETS FOR CONNECTIONS TO ALL MECHANICAL EQUIPMENT.
3. PROVIDE #10AWG CONDUCTORS FOR ALL WARM AIR DRYER CIRCUITS. PROVIDE LOCKOUT DEVICE AT ALL BREAKERS SERVING WARM AIR DRYERS.

GENERAL LIGHTING NOTES

1. SEE LIGHT FIXTURE SCHEDULE AND SYMBOLS LEGEND FOR MOUNTING HEIGHTS, UNLESS NOTED OTHERWISE.
2. FIXTURES DENOTED WITH LOWER CASE LETTERS SHALL BE CONTROLLED BY SWITCHES DENOTED WITH THE SAME LOWER CASE LETTER IN EACH ROOM.

GENERAL DEVICE BOX NOTES

1. SEE SYMBOLS LEGEND THIS SHEET FOR MOUNTING HEIGHTS UNLESS NOTED OTHERWISE ON DRAWINGS.
2. ALL MOUNTING HEIGHTS ARE TO CENTERLINE OF BOXES UNLESS NOTES OTHERWISE.
3. PROVIDE BOX EXTENDER FOR FLUSH INSTALLATION OF DEVICES LOCATED IN ARCHITECTURAL CASEWORK THAT IS FLUSH WITH ADJACENT WALL.
4. FLOOR BOXES: OBTAIN OWNER APPROVAL OF ALL BOX LOCATIONS PRIOR TO ROUGH IN. PROVIDE DEVICE PLATES AT DEVICES AND BLANK PLATES AT ALL UNUSED COMPARTMENTS.
5. DEVICES RECESSED IN MULLIONS: BACK BOXES TO BE RECESSED FOR FLUSH INSTALLATION OF DEVICE AND WALLPLATE. EXTEND CONCEALED CONDUIT IN MULLION UP TO WALL ABOVE AND STUB OUT ABOVE ACCESSIBLE CEILING. IN AREAS WITH NO CEILING, EXTEND CONDUIT TOWARDS CABLING SOURCE TO ABOVE NEAREST ACCESSIBLE CEILING.

GENERAL SYSTEMS NOTES

DIVISION 28

1. PROVIDE MINIMUM CANDELA RATINGS FOR ROOMS WITH WALL MOUNTED VISUAL NOTIFICATION APPLIANCES AS FOLLOWS:
   - <20x20' = 15cd
   - <28x28' = 30cd
   - <40'x40' = 60cd
   - >40'x40' = 110cd
2. PROVIDE MINIMUM CANDELA RATINGS FOR ROOMS WITH CEILING MOUNTED VISUAL NOTIFICATION APPLIANCES ON MAXIMUM 10' HIGH CEILING AS FOLLOWS:
   - <20'x20' = 15cd
   - <30'x30' = 30cd
   - <40'x40' = 60cd
   - >40'x40' = 110cd
3. INCREASE DEVICE RATINGS/SETTINGS WHEN LOCATED OFF-CENTER IN ROOMS TO MAINTAIN NFPA COVERAGE.
4. VISUAL DEVICES IN CORRIDORS SHALL BE 15cd. VISUAL DEVICES LOCATED IN OTHER AREAS SHALL BE 110cd UNLESS NOTED OTHERWISE.
5. IN ADDITION TO DEVICES SHOWN, SEE SCHEDULE SHEETS FOR FIRE ALARM SYSTEM DEVICES CONNECTIONS TO MECHANICAL EQUIPMENT.
6. UTILIZE SLEEVES AND FIRE RATED SLEEVES AT RATED WALLS PROVIDED UNDER DIVISION 26 FOR INSTALLATION OF ALL LOW VOLTAGE CABLING. FOLLOW INDUSTRY STANDARDS TO MAINTAIN 40% FILL REQUIREMENTS IN ALL SLEEVES (SUPERSEDES NEC - DO NOT FILL SLEEVES TO CAPACITY). PROVIDE ADDITIONAL SLEEVES MEETING DIVISION 26 REQUIREMENTS AS REQUIRED.
7. SYSTEM PANEL LOCATIONS: AUXILIARY SYSTEM PANELS, POWER SUPPLIES OR OTHER EQUIPMENT ENCLOSURES SHALL NOT BE LOCATED IN TELECOM ROOMS UNLESS NOTED OTHERWISE. IF DRAWINGS DO NOT DEPICT LOCATIONS FOR AUXILIARY COMPONENTS, CONSULT OWNER OR A/E PRIOR TO EQUIPMENT INSTALLATION.

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ELECTRICAL SYMBOLS

LIGHTING

LUMINAIRE TAG

HALF-FILLED* FOR LUMINAIRES ON EMERGENCY SYSTEM
*FULL-FILLED FOR LUMINAIRES ON CRITICAL SYSTEMS

XXX — LUMINAIRE ID
XXX-XX — CKT DESIGNATION (PNL-CKT #)
XXX-XX — RELAY PANEL - RELAY # OR LOCAL SWITCH DESIGNATION
TYP. — APPLIES TO ALL LUMINAIRES IN A SPACE UNO

LUMINAIRES

- LUMINAIRE
- LINEAR LUMINAIRE
- CYLINDIRCAL LUMINAIRE
- CYLINDRICAL WALL-WASH LUMINAIRE
- LIGHTING TRACK, TRACK MOUNTED LUMINAIRES
- LUMINAIRE
- WALL MOUNTED LUMINAIRE MOUNT 96" AFF, UNO
- WALL MOUNTED LUMINAIRE MOUNT 96" AFF, UNO
- WALL WASHING LUMINAIRE
- HIGH BAY LUMINAIRE
- SELF CONTAINED EMERGENCY LIGHTING UNIT MOUNT 94-INCHES AFF, UNO
- EXIT SIGN, CEILING MOUNTED, DIRECTIONAL ARROW(S) AS INDICATED
- EXIT SIGN, WALL MOUNTED, DIRECTIONAL ARROW(S) AS INDICATED. MOUNT 94-INCHES AFF, UNO

LIGHTING CONTROL DEVICES

- RPx — LIGHTING CONTROL PANEL
- CVx — CENTRAL INVERTER
- R — LOW VOLTAGE RELAY
- PC — PHOTOELECTRIC CELL
- LC — LIGHTING CONTACTOR
- BAT — REMOTE EMERGENCY BATTERY PACK

SWITCHES AND WALL-BOX CONTROLS

SWITCHES: MOUNT 42-INCHES AFF UNO

SUPERSCRIPT , SWITCH SHALL CONTROL FIXTURE DENOTED WITH SAME LOWER CASE LETTER
SWITCH SYMBOL
SUBSCRIPT, SWITCH TYPE - SEE BELOW OR REFER TO THE CONTROL SCHEDULE IF APPLICABLE
LINE THRU SWITCH INDICATES A KEY OPERATED SWITCH

- S — SWITCH, SINGLE POLE
- S_2 — SWITCH, DOUBLE POLE
- S_3 — SWITCH, 3-WAY
- S_4 — SWITCH, 4-WAY
- S_D — SWITCH, DIMMER
- S_L — SWITCH, LOW VOLTAGE
- S_O — SWITCH, WALL-BOX OCCUPANCY SENSOR
- S_{O2} — SWITCH, WALL-BOX OCCUPANCY SENSOR, 2-POLE
- S_P — SWITCH, PILOT LIGHT

CEILING MOUNTED LIGHTING CONTROL DEVICES
MAXIMUM MOUNTING HEIGHT OF 10-FEET AFF

- OS — OCCUPANCY SENSOR
- VS — VACANCY SENSOR

WALL MOUNTED LIGHTING CONTROL DEVICES:
MOUNT 94-INCHES AFF, UNO

- OS — OCCUPANCY SENSOR
- VS — VACANCY SENSOR

SAFETY

- FACP — FIRE ALARM CONTROL PANEL MOUNT CENTER OF DISPLAY 54-INCHES AFF
- FAA — FIRE ALARM ANNUNCIATOR PANEL MOUNT CENTER OF DISPLAY 54-INCHES AFF
- LOC — LOCAL OPERATOR'S CONSOLE MOUNT CENTER OF DISPLAY 54-INCHES AFF
- NAC — NOTIFICATION APPLIANCE CIRCUIT CABINET MOUNT CENTER OF DISPLAY 54-INCHES AFF
- F — MANUAL FIRE ALARM PULL STATION MOUNT 42-INCHES AFF

FIRE ALARM A/V DEVICES: MOUNT 94-INCHES AFF, OR 6-INCHES BELOW CEILING, WHICHEVER IS LOWER UNO

- F — FIRE ALARM BELL
- F — FIRE ALARM HORN
- F — FIRE ALARM VISUAL WARNING SIGNAL
- F — FIRE ALARM BELL WITH VISUAL WARNING SIGNAL
- F — FIRE ALARM HORN WITH VISUAL WARNING SIGNAL
- F — MINI FIRE ALARM HORN WITH VISUAL WARNING SIGNAL
- F — FIRE ALARM SPEAKER WITH VISUAL WARNING SIGNAL
- F — FIRE ALARM SPEAKER, FLUSH IN CEILING
- F — FIRE ALARM SPEAKER WITH VISUAL WARNING SIGNAL, CEILING
- F — FIRE ALARM VISUAL WARNING SIGNAL, CEILING
- E — ECS SPEAKER, FLUSH IN CEILING
- E — ECS SPEAKER WITH VISUAL WARNING SIGNAL, CEILING
- E — ECS VISUAL WARNING SIGNAL, CEILING
- S — SPRINKLER SYSTEMS ELECTRIC BELL ALARM
- R — FIRE ALARM RELAY TO AV SYSTEM
- D — FIRE ALARM MAGNETIC DOOR HOLDER MOUNT 74-INCHES AFF
- L — REMOTE INDICATOR LAMP
- OSY — OS&Y VALVE
- FS — WATER FLOW ALARM SWITCH
- TS — TAMPER SWITCH
- T — BEAM TRANSMITTER
- R — BEAM RECEIVER
- FF — FIRE FIGHTERS TELEPHONE MOUNT 54-INCHES AFF
- DAS ANTENNA
- D — SMOKE DETECTOR - IONIZATION TYPE (D = DUCT)
- D — SMOKE DETECTOR - PHOTOELECTRIC TYPE (D = DUCT)
- SMOKE DETECTOR - IONIZATION TYPE
- SMOKE DETECTOR - PHOTOELECTRIC TYPE
- HEAT DETECTOR RATE-OF-RISE AND FIXED TEMPERATURE, 135 F
- HEAT DETECTOR, RATE-OF-RISE AND FIXED TEMPERATURE, 200 F
- HEAT DETECTOR, FIXED TEMPERATURE ONLY, 135 F
- HEAT DETECTOR, FIXED TEMPERATURE ONLY, 200 F

POWER

- CIRCUIT HOME RUN
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT SLEEVE
- CONDUIT CONCEALED IN CEILING OR WALLS, POWER
- CONDUIT CONCEALED IN FLOOR OR UNDERGROUND, POWER
- EXPOSED CONDUIT, POWER
- T — TRANSFORMER
- XXX — BRANCH CIRCUIT PANELBOARD MOUNT 72-INCHES TO TOP
- XXX — DISTRIBUTION PANELBOARD MOUNT 72-INCHES TO TOP
- EQUIPMENT CABINET, AS NOTED
- XXX — SWITCHBOARD
- DISCONNECT SWITCH
- CT — CURRENT TRANSFORMER ENCLOSURE
- M — METER
- GEN — GENERATOR
- ATS — AUTOMATIC TRANSFER SWITCH
- SYSTEM GROUND ELECTRODE
- MOTOR CONNECTION, HORSEPOWER AS INDICATED
- PB — PULL BOX
- DIVIDED SURFACE RACEWAY MOUNT 18-INCHES AFF, UNO WHERE DENOTED 'AC', MOUNT ABOVE COUNTER

RECEPTACLES: MOUNT 18-INCHES AFF, UNO

DIAGONAL LINE THROUGH SYMBOL OR DENOTED 'AC' INDICATES MOUNT DEVICE ABOVE COUNTER.
WHERE INDICATED AS 'MOUNT ABOVE COUNTER' MOUNT BOTTOM OF BOX 2-INCHES ABOVE TOP OF BACKSPLASH OR 6-INCHES ABOVE COUNTERTOP IF NO BACKSPLASH EXISTS.

LABELS SHALL BE MACHINE PRINTED, UNO

- DUPLEX RECEPTACLE
- DUPLEX RECEPTACLE, GFI TYPE
- DUPLEX RECEPTACLE, MOUNT ABOVE COUNTER
- DUPLEX RECEPTACLE, GFI TYPE, MOUNT ABOVE COUNTER
- FOURPLEX RECEPTACLE
- FOURPLEX RECEPTACLE, GFI TYPE
- FOURPLEX RECEPTACLE, MOUNT ABOVE COUNTER
- FOURPLEX RECEPTACLE, GFI TYPE, MOUNT ABOVE COUNTER
- DUPLEX RECEPTACLE, FLUSH IN CEILING
- FOURPLEX RECEPTACLE, FLUSH IN CEILING
- DUPLEX RECEPTACLE, HORIZONTALLY MOUNTED
- DUPLEX RECEPTACLE, HORIZ. MTD, GFI TYPE
- DUPLEX RECEPTACLE, HORIZ. MTD, ABOVE COUNTER
- DUPLEX RECEPTACLE, HORIZ. MTD, GFI TYPE, MOUNT ABOVE COUNTER
- WP — WEATHER RESISTANT GFI DUPLEX RECEPTACLE, MOUNT 18-INCHES AFF WITH A WEATHERPROOF, IN-USE COVER
- EWC — STD DUPLEX RECEPTACLE TO SERVE ELECTRIC WATER COOLER, MOUNT AT HEIGHT PER EQUIPMENT MANUFACTURER'S INSTALLATION GUIDELINES. WIRE TO GFCI BKR IN PANELBOARD.
- TV — DUPLEX RECEPTACLE TO SERVE TELEVISION, MOUNT AT SAME HEIGHT AND WITHIN 8-INCHES OF ADJACENT TV OUTLET
- DUPLEX RECEPTACLE, SWITCHED
- SPECIAL RECEPTACLE, DEEP WELL BOX
- FLUSH FLOOR OUTLET BOX UNO
- FLUSH FLOOR BOX WITH DUPLEX RECEPTACLE UNO. SEE PLANS FOR SPECIFICATION
- J — FLUSH JUNCTION BOX, CEILING MOUNTED
- J — FLUSH JUNCTION BOX, WALL MOUNTED
- H — HAND DRYER, INSTALL HAND DRYER SPECIFIED IN DIV. 11

* NOTE *

ALL NOTES ON THIS SHEET ARE APPLICABLE TO ALL OTHER SHEETS IN THIS SET.

THE SYMBOLS AND ABBREVIATIONS SHOWN ON THIS SHEET MAY OR MAY NOT BE APPLICABLE IN THIS SET OF DRAWINGS.

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01/15/2025

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ELECTRICAL SYMBOLS, ABBREVIATIONS & NOTES

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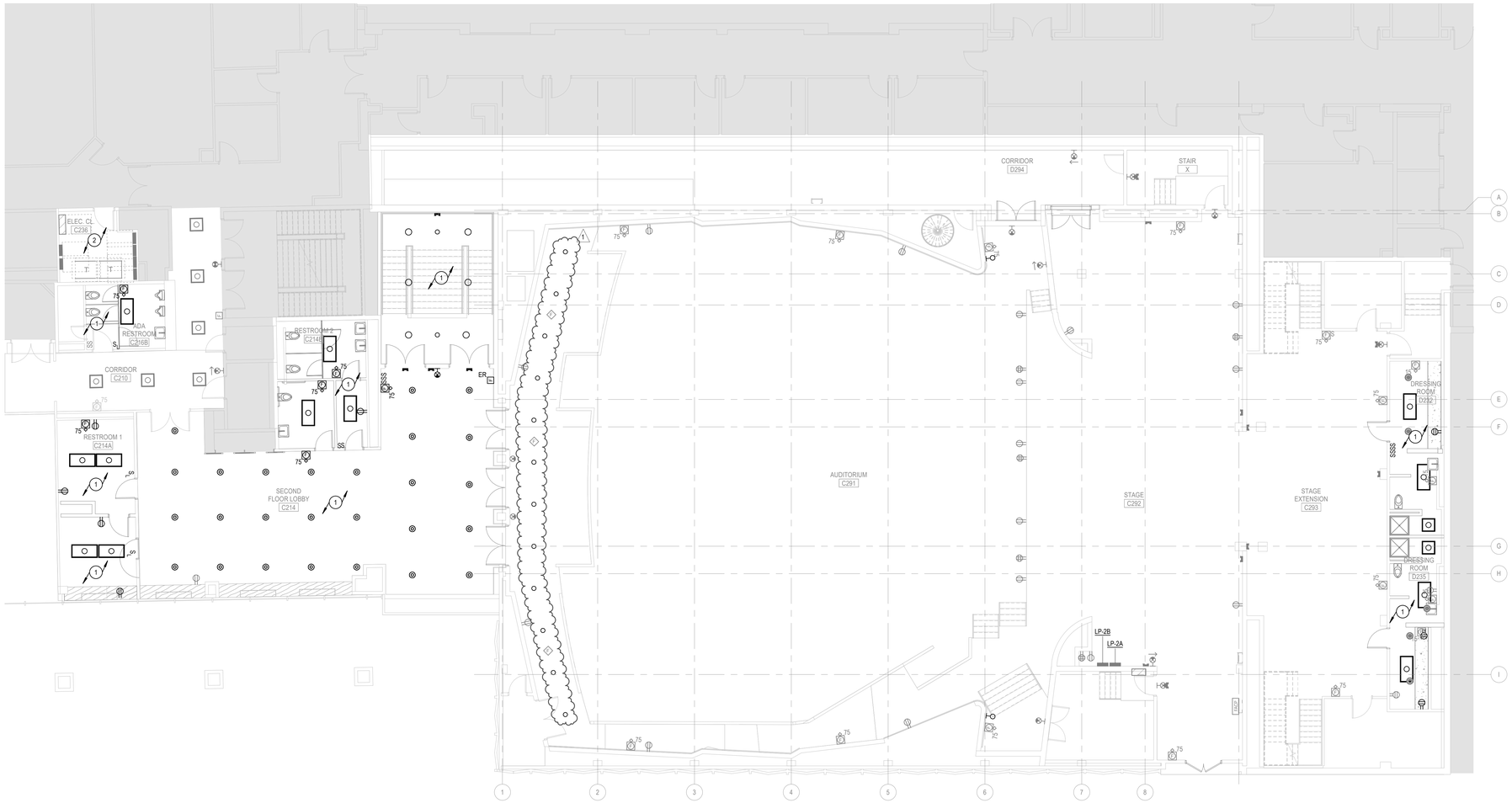

1 LEVEL 02 - ELECTRICAL DEMOLITION PLAN
ED102.00 SCALE: 1/8" = 1'-0"

GENERAL NOTES

A
B

SHEET NOTES

1 LIGHTING CIRCUITING IN THIS AREA TO BE REUSED FOR NEW LIGHTING.
2 ALL EQUIPMENT IN THIS ROOM IS EXISTING TO REMAIN.

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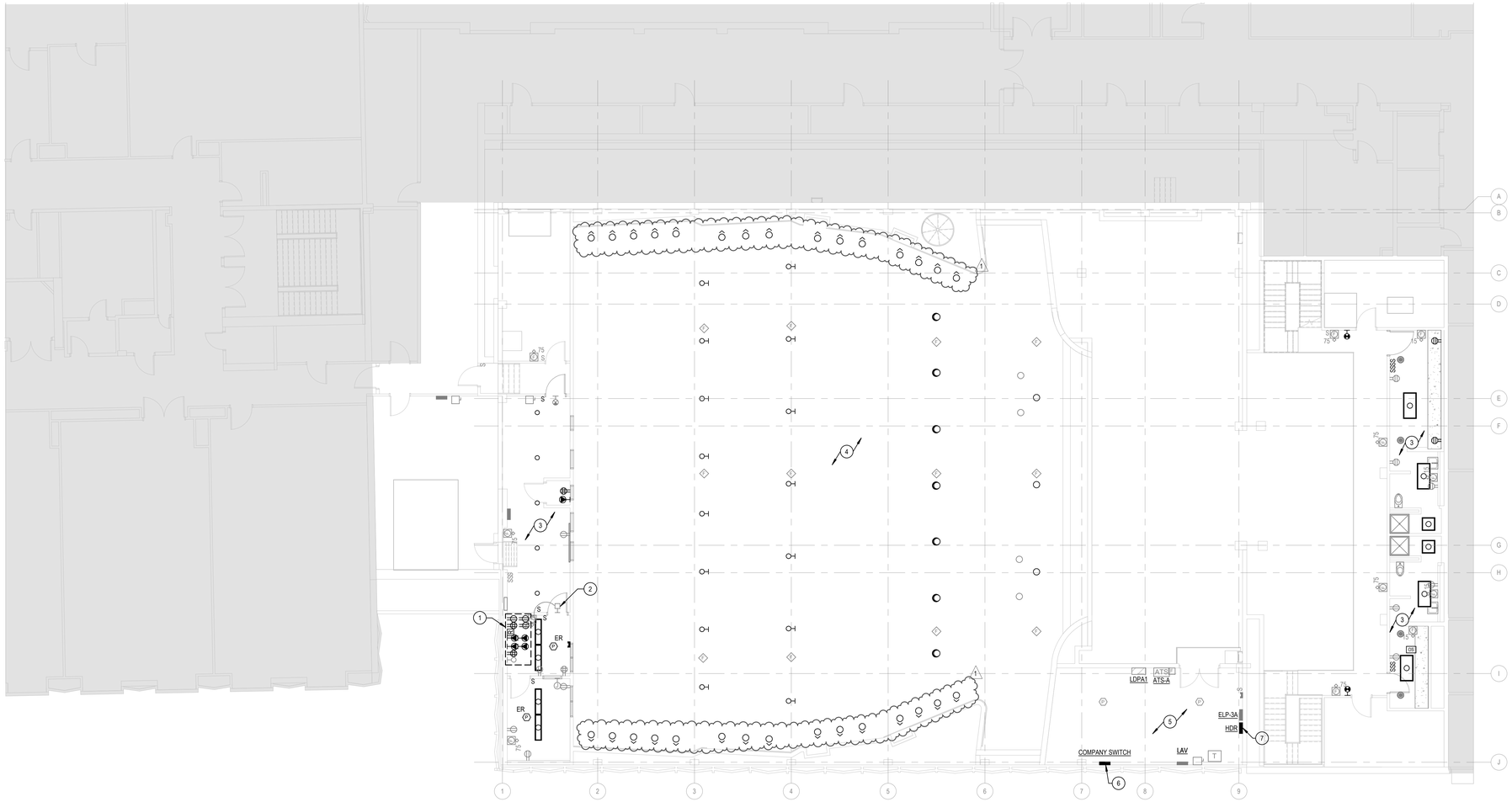

1 LEVEL 03 - ELECTRICAL DEMOLITION PLAN
ED103.00 SCALE: 1/8" = 1'-0"

GENERAL NOTES

A
B

SHEET NOTES

1. AV EQUIPMENT IN THIS SPACE IS BEING MOVED TO THE OTHER SIDE OF THE WALL TO THE NORTH. REMOVE ALL DEVICES, MAINTAIN CIRCUITING AND RECONNECT TO NEW DEVICES. SEE NEW WORK PLAN FOR LOCATIONS.
2. EXISTING CONNECTION TO "ON AIR" FIXTURE.
3. LIGHTING CIRCUITING IN THIS AREA TO BE REUSED FOR NEW LIGHTING.
4. FIXTURE WILL BE REPLACED IN THE AUDIENCE CHAMBER. CIRCUITING TO ALL FIXTURES SHALL REMAIN AND RECONNECT TO NEW FIXTURES. SEE NEW WORK PLAN.
5. ALL ELECTRICAL DISTRIBUTION EQUIPMENT IN THIS AREA IS EXISTING TO REMAIN. SEE THEATER PLANS FOR LIGHTING CONTROLS DEMOLITION SCOPE.
6. REMOVED 200A COMPANY SWITCH AND RERUN FEEDER TO NEW 200A THEATER CONTROL RELAY PANEL. REFER TO THER DRAWINGS FOR MORE INFORMATION.
7. HOUSE DIMMER RACK TO BE REPLACED. RETAIN 60A POWER FEED FROM PANEL ELP-3A TO RECONNECT TO NEW DIMMER RACK. RETAIN POWER SENSE FEED AND CONNECTION TO FIRE ALARM CONTROL MODULE.

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LEVEL 03 - ELECTRICAL DEMOLITION PLAN

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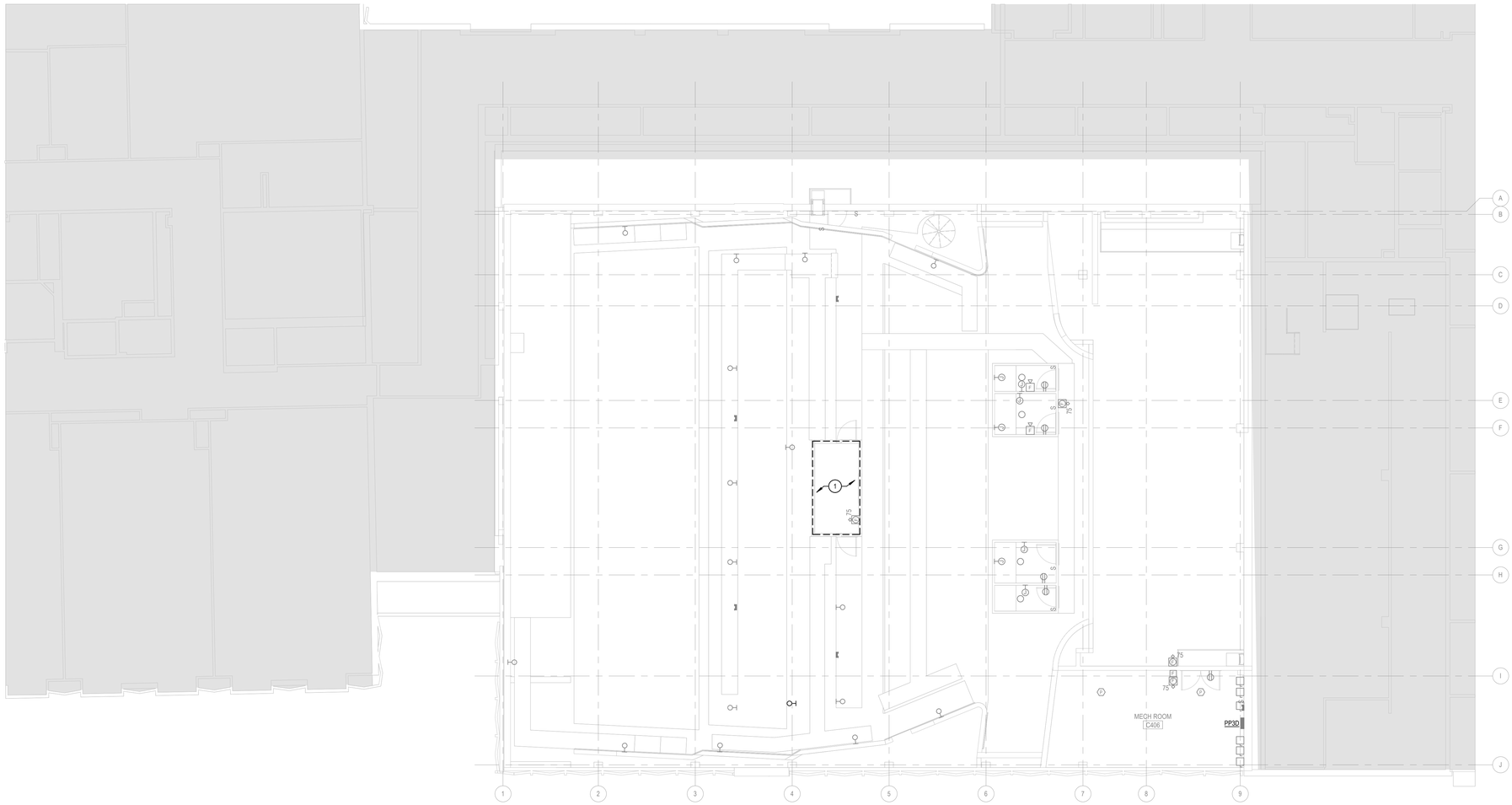

1 LEVEL 03M MEZZANINE - ELECTRICAL DEMOLITION PLAN
ED103M.00 SCALE: 1/8" = 1'-0"

GENERAL NOTES

A
B

SHEET NOTES

1 REMOVE ALL WALL MOUNTED POWER DEVICES AND RACEWAY IN THIS SPACE, UNO. LIGHTING DEVICES TO REMAIN.

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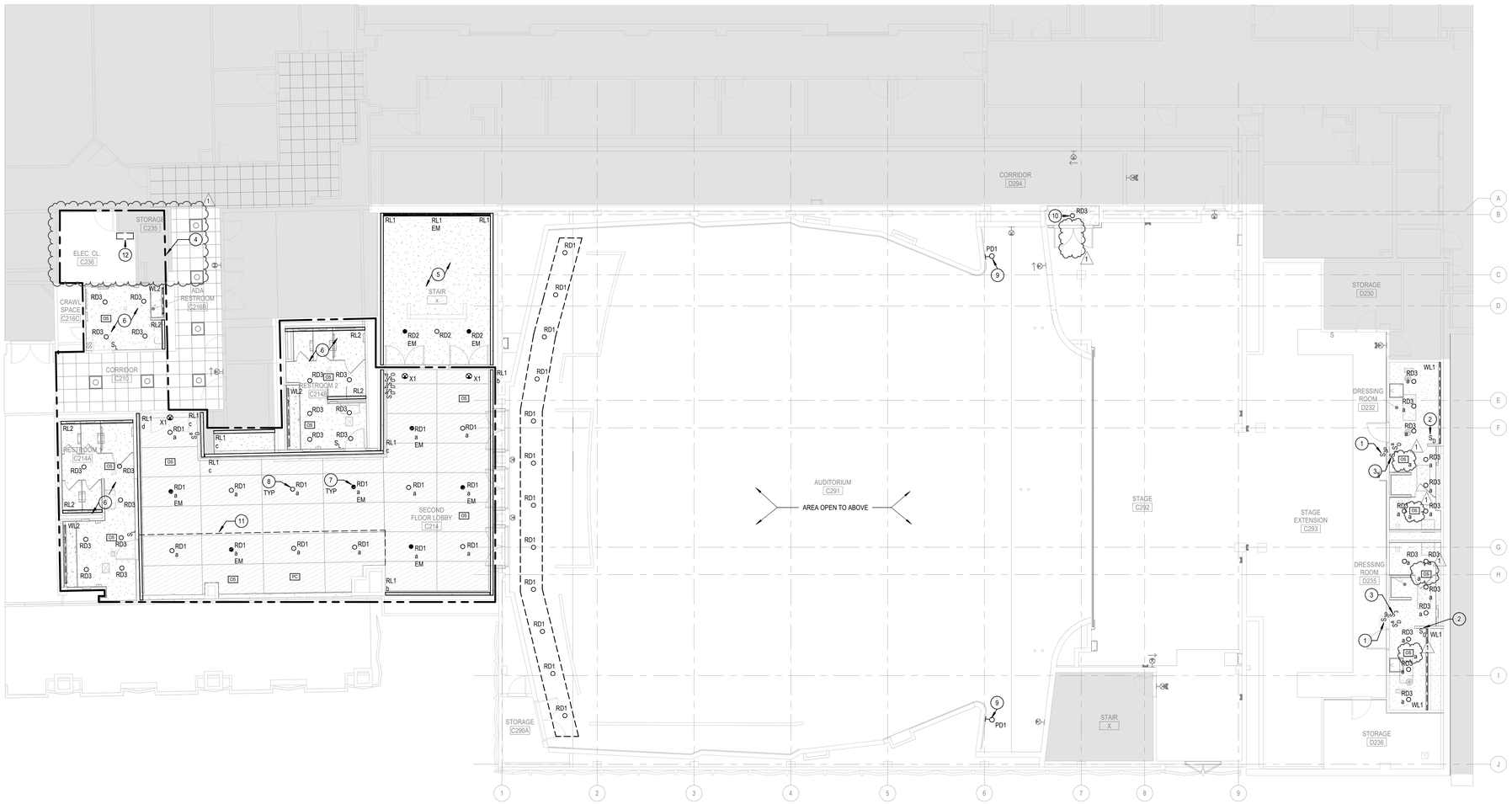

1 LEVEL 02 - LIGHTING PLAN
EL102.00 SCALE: 1/8" = 1'-0"

GENERAL NOTES

A ALL CIRCUITS WITH A TOTAL LENGTH OF 150FT OR LESS SHALL HAVE HOT CONDUCTORS OF #12 AWG. ALL CIRCUITS GREATER THAN 150FT SHALL HAVE HOT CONDUCTORS OF #10 AWG.

B SHADED AREA DENOTES AREA THAT IS NOT IN SCOPE.

C COORDINATE LIGHTING INSTALLATION WITH ALL OTHER TRADES WHERE REQUIRED.

D PROVIDE MINIMUM #10AWG FOR ALL EMERGENCY LIGHTING BRANCH CIRCUITS.

E ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING MOUNTING CAPABILITY AND PLENUM CLEARANCE OF ALL LIGHTING FIXTURES AND SHALL NOTIFY THE ARCHITECT AND EOR OF ANY CONFLICTS.

F COORDINATE ALL WALL MOUNTED LIGHT SWITCHES, DIMMERS, AND PRESET CONTROL STATIONS WITH ALL ARCHITECTURAL INTERIOR ELEVATIONS AND DETAILS PRIOR TO ROUGH-IN.

G ALL ADJACENT SWITCHES, DIMMERS, AND PRESET CONTROL STATIONS SHALL BE GANGED TOGETHER TO THE EXTENT PHYSICAL CONDITIONS AND NEC CODE REQUIREMENTS WILL ALLOW.

SHEET NOTES

1 3-WAY PILOT LIGHT SWITCH TO CONTROL ALL DRESSING TABLE VANITY LIGHTING PER NEC 520.73-74. SWITCH TO BE WIRED UPSTREAM OF ALL VANITY LIGHTING SWITCHES. PROVIDE LABEL ON SWITCH STATING: "DRESSING TABLE LIGHTING."

2 DIMMER SWITCH TO CONTROL FIXTURES ONLY SURROUNDING ADJACENT MIRROR. SEE E6 SERIES DETAILS FOR MORE INFORMATION.

3 MASTER DRESSING TABLE VANITY SWITCH. SEE E6 SERIES DETAIL FOR MORE INFORMATION. LABEL SWITCH "MASTER DRESSING TABLE LIGHTING."

4 ALL SCOPE PERTAINING TO HAFT LOBBY & PUBLIC RESTROOM UPGRADES. SEE SECTION 012300 FOR MORE INFORMATION.

5 LIGHTING IN THIS AREA TO RECONNECT BACK TO EXISTING CIRCUITING AND CONTROLS SERVING THIS SPACE.

6 RECONNECT LIGHTING TO EXISTING LIGHTING CIRCUIT IN THE SPACE. ENSURE LOAD ON CIRCUIT DOES NOT EXCEED 1920 VA.

7 RECONNECT EMERGENCY LIGHTING IN THIS AREA TO PANEL ELP-3A VIA EXISTING GENERATOR TRANSFER DEVICE. NORMAL SIDE OF GTD DEVICE TO MAINTAIN BRANCH CIRCUIT CONNECTION TO C&S2.

8 RECONNECT NON-EMERGENCY LIGHTING IN THIS AREA TO PANELS C&S2-29,37, AND 39.

9 NEW LIGHT FIXTURE TO BE RECONNECTED TO EXISTING CIRCUITING AND CONTROLS.

10 CONNECT LIGHT FIXTURE TO EXISTING CIRCUIT AND CONTROLS SERVING ADJACENT CORRIDOR.

11 EXTENT OF PRIMARY DAYLIGHT DIMMING ZONE.

12 LOCATION OF NEW HAFT LOBBY LIGHTING CONTROL PANEL

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LEVEL 02 - LIGHTING PLAN

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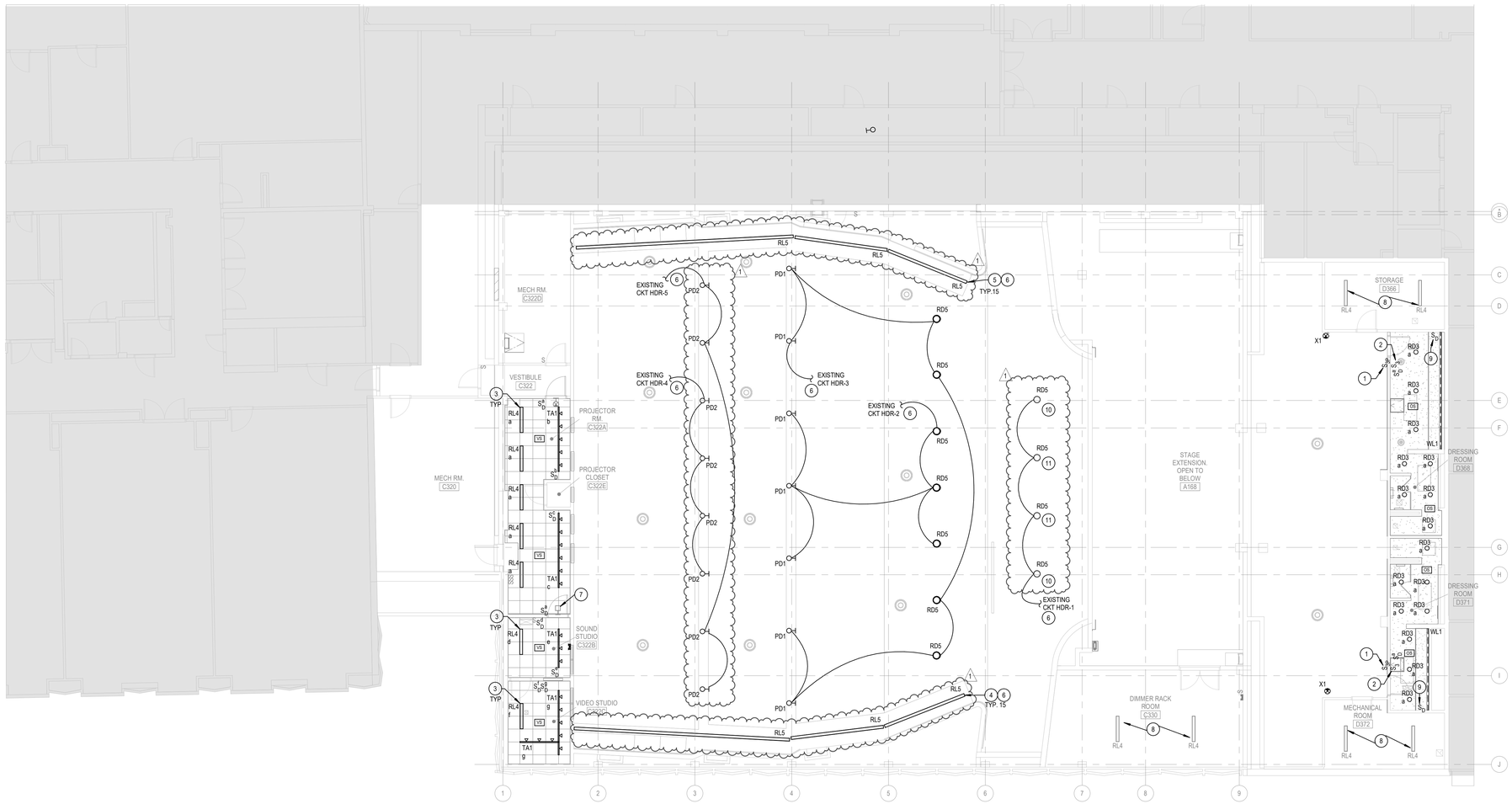

1 LEVEL 03 - LIGHTING PLAN
EL103.00 SCALE: 1/8" = 1'-0"

GENERAL NOTES

A ALL CIRCUITS WITH A TOTAL LENGTH OF 150FT OR LESS SHALL HAVE HOT CONDUCTORS OF #12 AWG. ALL CIRCUITS GREATER THAN 150FT SHALL HAVE HOT CONDUCTORS OF #10 AWG.

B SHADED AREA DENOTES AREA THAT IS NOT IN SCOPE.

C COORDINATE LIGHTING INSTALLATION WITH ALL OTHER TRADES WHERE REQUIRED.

D PROVIDE MINIMUM #10AWG FOR ALL EMERGENCY LIGHTING BRANCH CIRCUITS.

E ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING MOUNTING CAPABILITY AND PLENUM CLEARANCE OF ALL LIGHTING FIXTURES AND SHALL NOTIFY THE ARCHITECT AND EOR OF ANY CONFLICTS.

F COORDINATE ALL WALL MOUNTED LIGHT SWITCHES, DIMMERS, AND PRESET CONTROL STATIONS WITH ALL ARCHITECTURAL INTERIOR ELEVATIONS AND DETAILS PRIOR TO ROUGH-IN.

G ALL ADJACENT SWITCHES, DIMMERS, AND PRESET CONTROL STATIONS SHALL BE GANGED TOGETHER TO THE EXTENT PHYSICAL CONDITIONS AND NEC CODE REQUIREMENTS WILL ALLOW.

SHEET NOTES

1 3-WAY PILOT LIGHT SWITCH TO CONTROL ALL DRESSING TABLE VANITY LIGHTING PER NEC 520.73-74. SWITCH TO BE WIRED UPSTREAM OF ALL VANITY LIGHTING SWITCHES. PROVIDE LABEL ON SWITCH STATING: "DRESSING TABLE LIGHTING."

2 MASTER DRESSING TABLE VANITY SWITCH. SEE E6 SERIES DETAIL FOR MORE INFORMATION. LABEL SWITCH "MASTER DRESSING TABLE LIGHTING."

3 RECONNECT LIGHTING TO EXISTING LIGHTING CIRCUIT IN THE SPACE. ENSURE LOAD ON CIRCUIT DOES NOT EXCEED 1920 VA.

4 RECONNECT TO EXISTING CIRCUIT HDR-7.

5 RECONNECT TO EXISTING CIRCUIT HDR-6.

6 FIXTURE CONTROLS TO BE MODIFIED TO RECONNECT TO NEW THEATRICAL LIGHTING CONTROLS SCHEME . REFER TO THEATER DRAWINGS FOR MORE INFORMATION.

7 EXISTING ON - AIR LIGHT TO REMAIN.

8 LIGHTING IS TO REMAIN.

9 DIMMER SWITCH TO CONTROL FIXTURES ONLY SURROUNDING ADJACENT MIRROR. SEE E6 SERIES DETAILS FOR MORE INFORMATION.

10 EXISTING LIGHT LOCATIONS IN CEILING.

11 NEW LOCATION FOR LIGHTS IN CEILING REQUIRED.

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PAUL H. KEMPANICH
109466
LICENSED PROFESSIONAL ENGINEER
01/15/2025

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

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01.23.25

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#3 01/23/25

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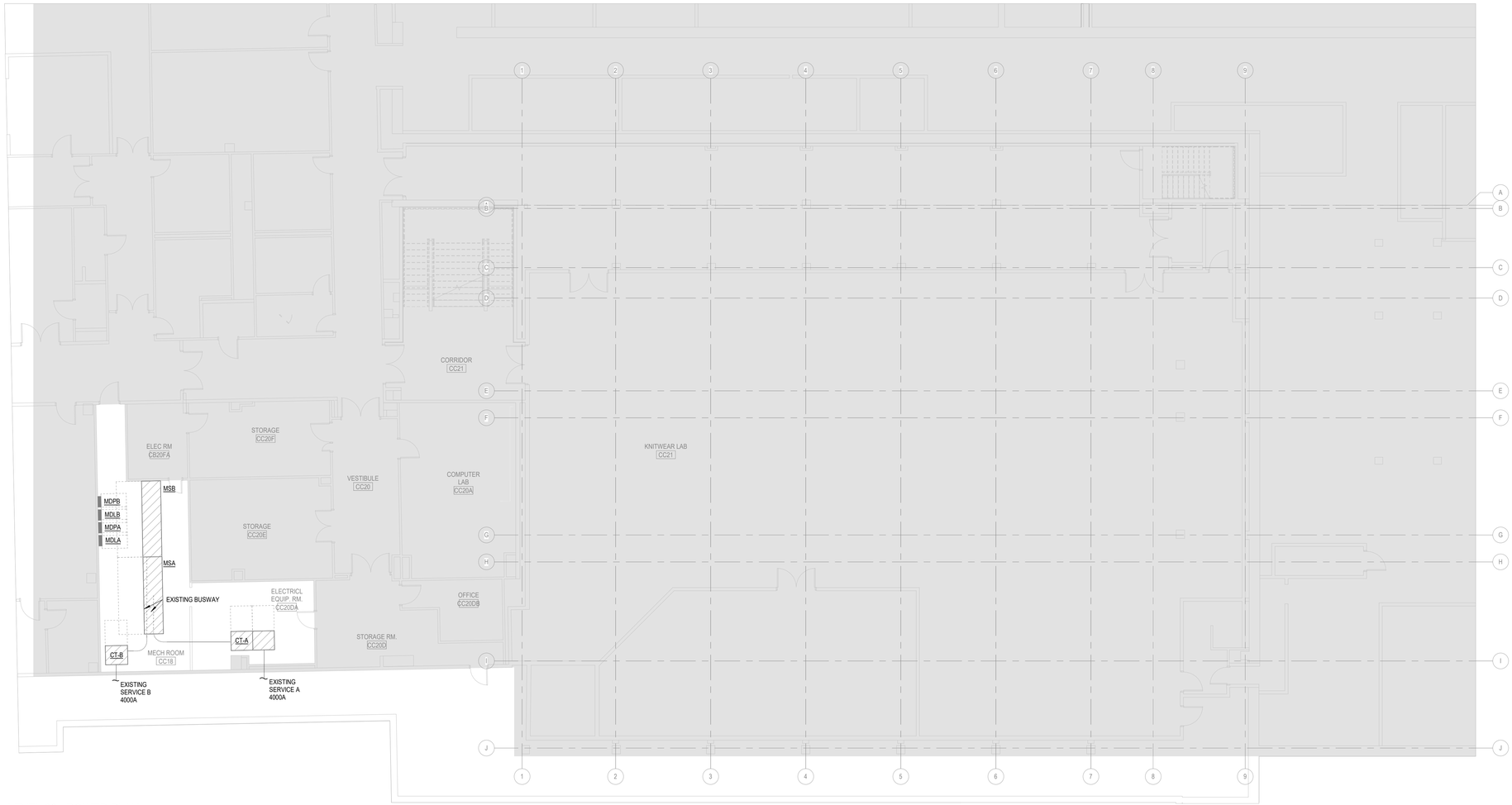

1 E200.00 LEVEL 00 - POWER PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES

A REFER TO ARCHITECTURAL PLANS AND DETAILS FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF OUTLETS AND DEVICES. COORDINATE ALL DEVICE FINISHES AND COVERPLATE FINISHES WITH ARCHITECT PRIOR TO PURCHASE.

B COORDINATE ALL CONDUIT AND CABLE INSTALLATIONS LOCATED ABOVE FINISH DRYWALL CEILINGS. DO NOT LOCATE PULLBOXES OR JUNCTION BOXES ABOVE FINISHED DRYWALL OR OTHER INACCESSIBLE CEILINGS UNLESS A MEANS OF ACCESS IS PROVIDED. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING PLANS.

C ALL RECEPTACLE CIRCUITS THAT ARE A TOTAL LENGTH OF 80FT OR LESS SHALL BE RUN WITH #12AWG U.O.N. ALL RECEPTACLE CIRCUITS THAT ARE A TOTAL LENGTH OF 81FT - 150FT SHALL BE RUN WITH #10AWG U.O.N.

D REFER TO TE SERIES DRAWINGS FOR ADDITIONAL INFORMATION ON DEVICE LOCATIONS, CONDUITS, AND REQUIREMENTS.

E ALL EXPOSED CONDUIT SHALL BE PARALLEL AND TIGHT TO STRUCTURAL AN/OR ARCHITECTURAL ELEMENTS. IF CONDUIT CANNOT BE PARALLEL, IT SHALL BE PERPENDICULAR TO THE ELEMENTS AND RUN TIGHT TO STRUCTURAL ELEMENT OR WALL INTERSECTION. ALL JUNCTIONS TO BE 90 DEGREES IF EXPOSED. ALL EXPOSED CONDUIT TO BE PAINTED TO MATCH THE ITEM TO WHICH IT IS MOUNTED. ALL EXPOSED CONDUIT ROUTINGS IN PUBLIC AREAS SHALL BE COORDINATED WITH THE ARCHITECT AND OTHER TRADES PRIOR TO INSTALLATION.

SHEET NOTES

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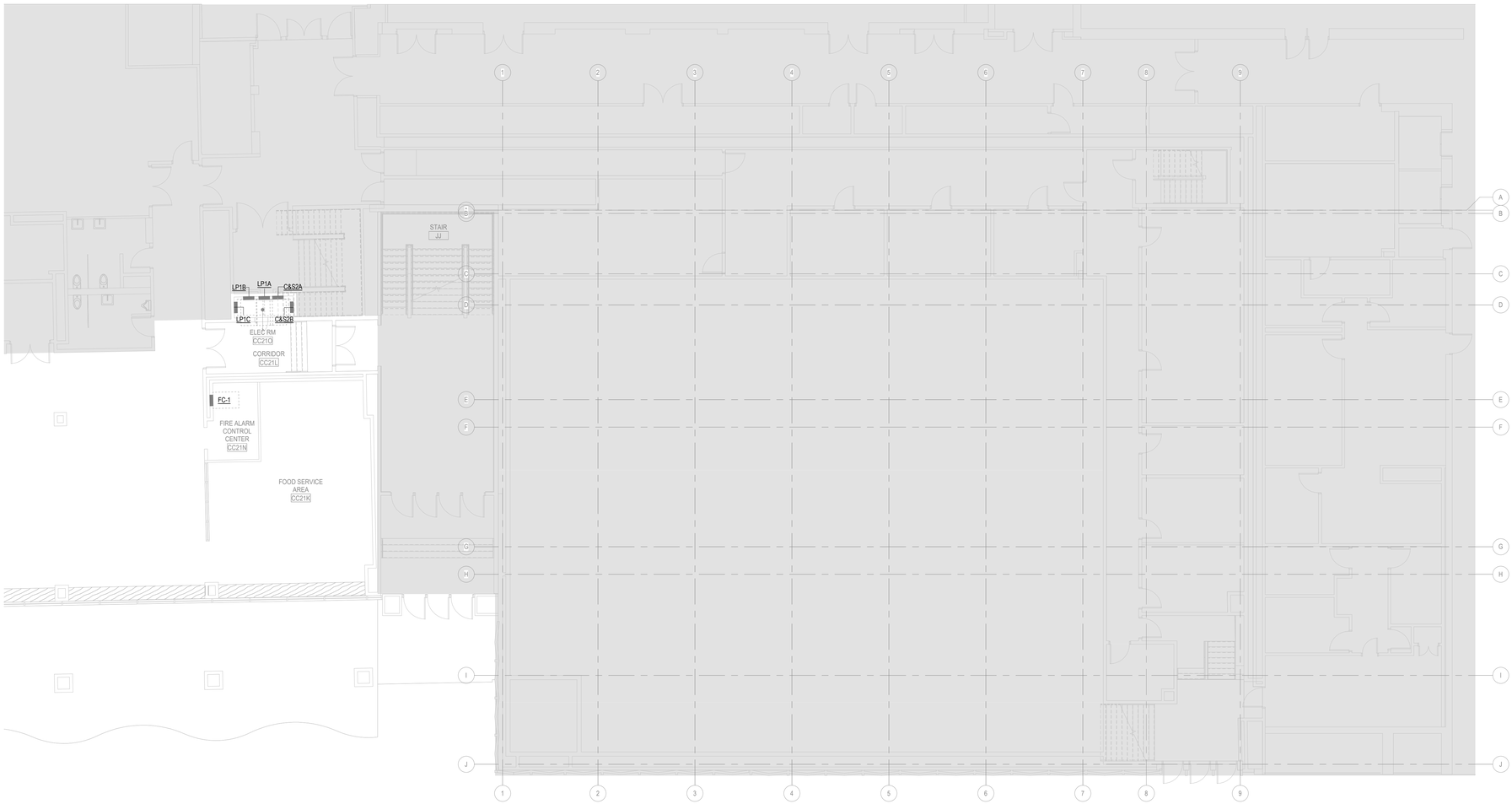

1 E201.00 LEVEL 01 - POWER PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES

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SHEET NOTES

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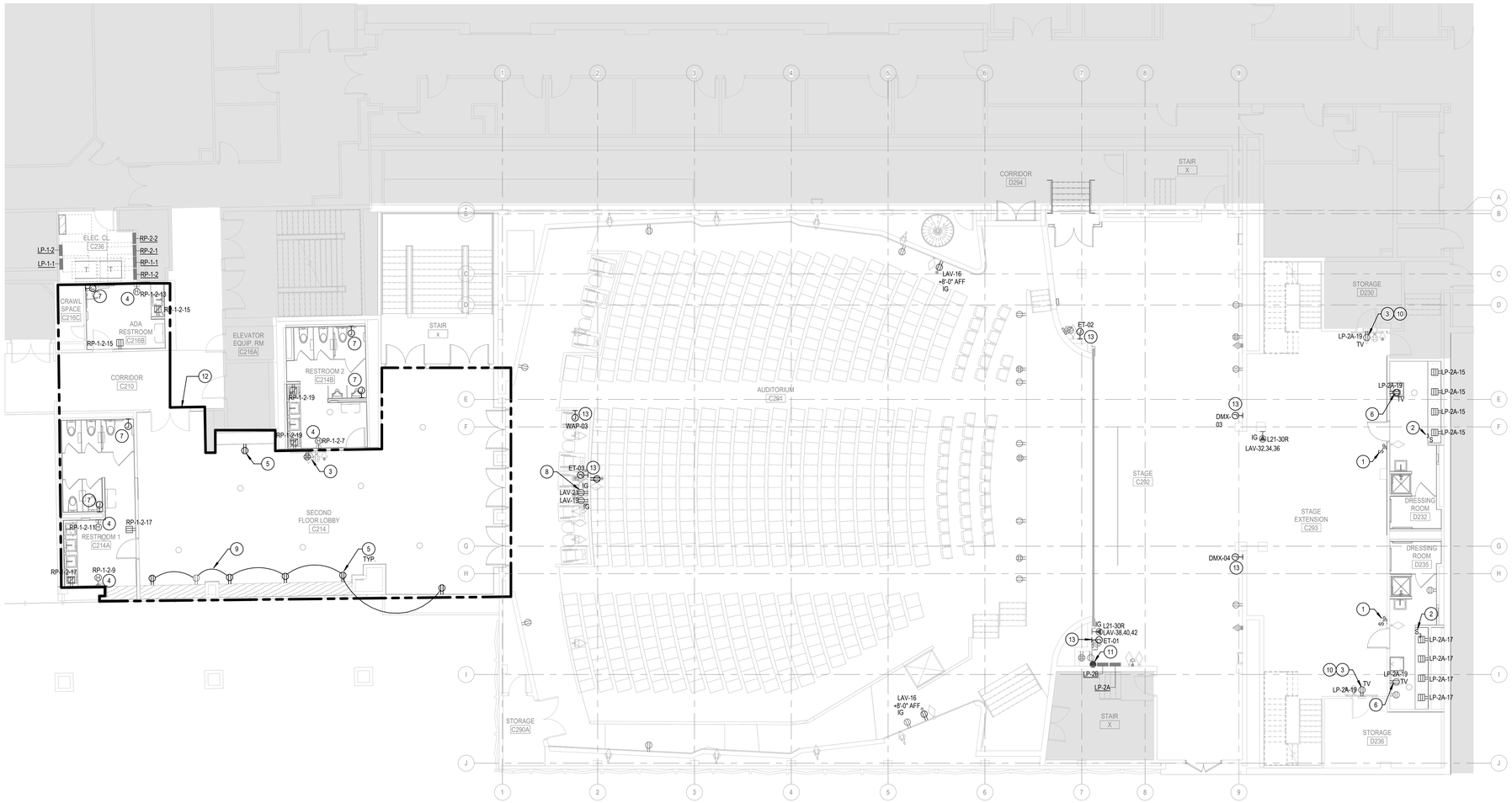

1 LEVEL 02 - POWER PLAN
E202.00 / SCALE: 1/8" = 1'-0"

GENERAL NOTES

A REFER TO ARCHITECTURAL PLANS AND DETAILS FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF OUTLETS AND DEVICES. COORDINATE ALL DEVICE FINISHES AND COVERPLATE FINISHES WITH ARCHITECT PRIOR TO PURCHASE.

B COORDINATE ALL CONDUIT AND CABLE INSTALLATIONS LOCATED ABOVE FINISH DRYWALL CEILINGS. DO NOT LOCATE PULLBOXES OR JUNCTION BOXES ABOVE FINISHED DRYWALL OR OTHER INACCESSIBLE CEILINGS UNLESS A MEANS OF ACCESS IS PROVIDED. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING PLANS.

C ALL RECEPTACLE CIRCUITS THAT ARE A TOTAL LENGTH OF 80FT OR LESS SHALL BE RUN WITH #12AWG U.O.N. ALL RECEPTACLE CIRCUITS THAT ARE A TOTAL LENGTH OF 81FT - 150FT SHALL BE RUN WITH #10AWG U.O.N.

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SHEET NOTES

1 3-WAY PILOT LIGHT SWITCH TO CONTROL ALL DRESSING TABLE RECEPTACLES PER NEC 520.73-74. PROVIDE LABEL ON SWITCH STATING: "DRESSING TABLE OUTLETS."

2 3-WAY SWITCH TO CONTROL ALL DRESSING TABLE RECEPTACLES PER NEC 520.73-74. SWITCH TO CONNECT TO 3-WAY SWITCH ON THE OUTSIDE OF THE ROOM. PROVIDE LABEL ON SWITCH STATING: "DRESSING TABLE OUTLETS."

1 3 RECEPTACLE MOUNTED IN CHIEF AV BACKBOX. COORDINATE DEVICE LOCATIONS WITH AV DRAWINGS AND CONFIRM INSTALLATION WITH AV CONTRACTOR PRIOR TO INSTALL. ENSURE ALL DEVICES ARE CONCEALED FROM VIEW ABOVE CEILING IF A CEILING IS PRESENT. WIRING DOWN TO DISPLAY TO BE COVERED WITH 2 CHANNELS OF WIREMOLD. ONE (1) FOR POWER AND ONE (1) FOR HDMI. WIREMOLD TO BE RUN AT CENTERLINE OF DISPLAY.

4 CONNECTION TO HAND DRYER. COORDINATE INSTALLATION WITH MANUFACTURER.

5 CENTER OF RECEPTACLE TO BE MOUNTED EQUIDISTANT BETWEEN THE FINISH FLOOR AND THE BENCH SEAT. TYPICAL FOR ALL RECEPTACLES ALONG THIS WALL.

6 COORDINATE DEVICE LOCATIONS WITH TV MOUNTING BRACKETS SUCH THAT BOXES AND DEVICES ARE CONCEALED FROM VIEW BEHIND TV.

7 JUNCTION BOX FOR SENSOR OPERATED PLUMBING FIXTURES TO BE LOCATED BEHIND ACCESS PANEL. COORDINATE EXACT ACCESS PANEL LOCATION WITH ARCHITECTURE. CONNECT TO NEAREST 120V CONVENIENCE RECEPTACLE CIRCUIT.

8 RECEPTACLES FOR AV MIX POSITION. COORDINATE WITH AV DRAWINGS. CONDUIT TO TRAVEL DOWN WALL TO LEVEL BELOW. TRAVEL HORIZONTALLY TIGHT TO SLAB BELOW TO RISER LOCATION FOR CONNECTION TO PANEL 'LAV.'

9 CONNECT TO EXISTING RECEPTACLE CIRCUIT IN THIS AREA.

10 TV MOUNTED ABOVE DOOR.

11 CONDUIT ROUTED FROM MIX POSITION IN BACK OF AUDITORIUM ALONG CEILING OF KNITWEAR LAB. FOLLOW EXISTING CONDUIT RISER BACKSTAGE UP TO DIMMING CONTROL ROOM TO CONNECT WITH PANEL LAV. VERIFY EXACT LOCATION IN FIELD.

12 ALL SCOPE PERTAINING TO HAFT LOBBY & PUBLIC RESTROOM UPGRADES. SEE SECTION 012300 FOR MORE INFORMATION.

13 JUNCTION BOX FOR THEATER HARDWARE. REFER TO THEATER PLANS FOR MORE INFORMATION. PROVIDE 3/4" EMT CONDUIT WITH PULLSTRING BACK TO THEATER CONTROLS IN DIMMER RACK ROOM C330.

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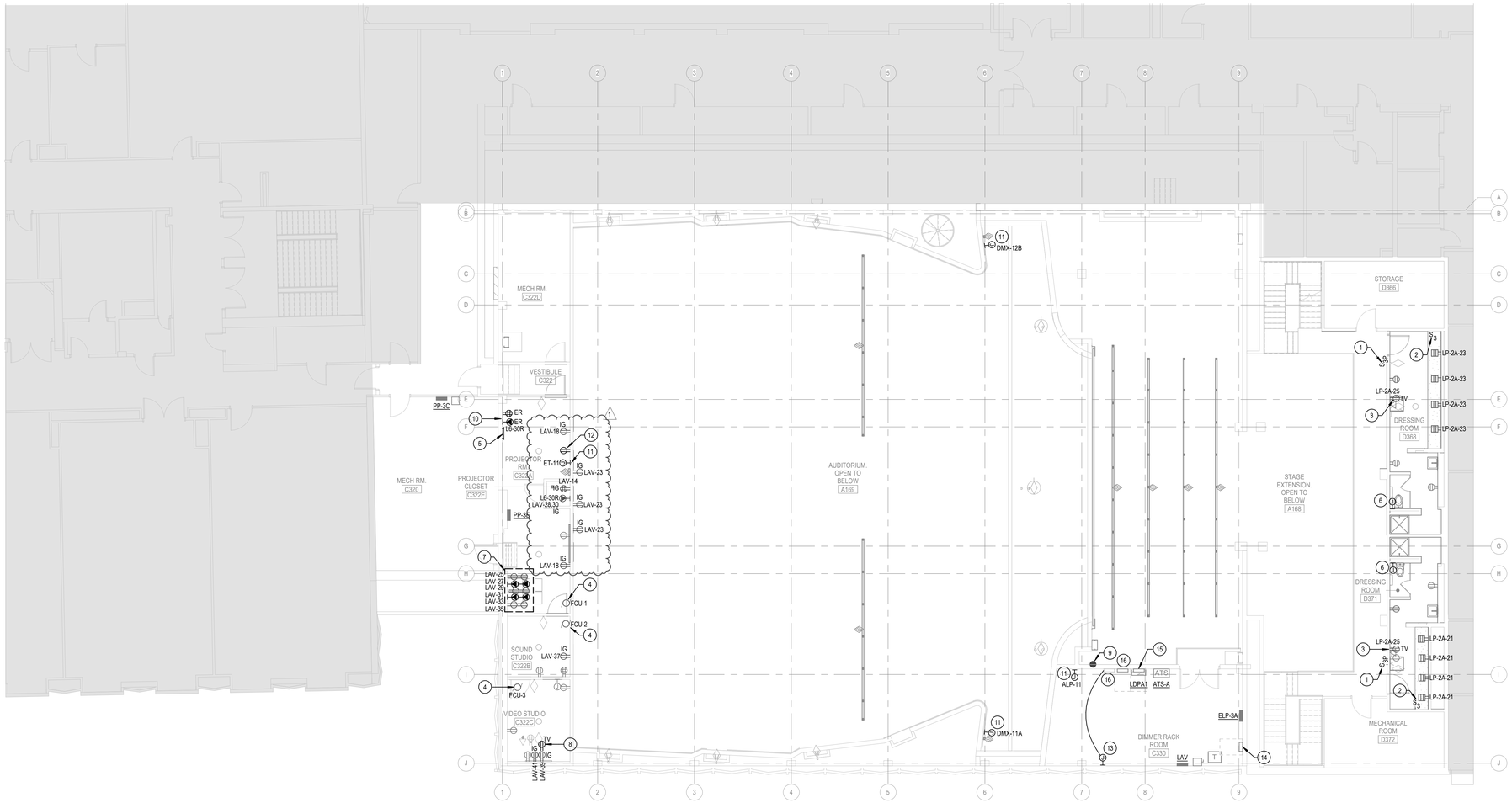

1 LEVEL 03 - POWER PLAN
E203.00 SCALE: 1/8" = 1'-0"

GENERAL NOTES

A REFER TO ARCHITECTURAL PLANS AND DETAILS FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF OUTLETS AND DEVICES. COORDINATE ALL DEVICE FINISHES AND COVERPLATE FINISHES WITH ARCHITECT PRIOR TO PURCHASE.

B COORDINATE ALL CONDUIT AND CABLE INSTALLATIONS LOCATED ABOVE FINISH DRYWALL CEILINGS. DO NOT LOCATE PULLBOXES OR JUNCTION BOXES ABOVE FINISHED DRYWALL OR OTHER INACCESSIBLE CEILINGS UNLESS A MEANS OF ACCESS IS PROVIDED. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING PLANS.

C ALL RECEPTACLE CIRCUITS THAT ARE A TOTAL LENGTH OF 80FT OR LESS SHALL BE RUN WITH #12AWG U.O.N. ALL RECEPTACLE CIRCUITS THAT ARE A TOTAL LENGTH OF 81FT - 150FT SHALL BE RUN WITH #10AWG U.O.N.

D REFER TO TE SERIES DRAWINGS FOR ADDITIONAL INFORMATION ON DEVICE LOCATIONS, CONDUITS, AND REQUIREMENTS.

E ALL EXPOSED CONDUIT SHALL BE PARALLEL AND TIGHT TO STRUCTURAL AN/OR ARCHITECTURAL ELEMENTS. IF CONDUIT CANNOT BE PARALLEL, IT SHALL BE PERPENDICULAR TO THE ELEMENTS AND RUN TIGHT TO STRUCTURAL ELEMENT OR WALL INTERSECTION. ALL JUNCTIONS TO BE 90 DEGREES IF EXPOSED. ALL EXPOSED CONDUIT TO BE PAINTED TO MATCH THE ITEM TO WHICH IT IS MOUNTED. ALL EXPOSED CONDUIT ROUTINGS IN PUBLIC AREAS SHALL BE COORDINATED WITH THE ARCHITECT AND OTHER TRADES PRIOR TO INSTALLATION.

SHEET NOTES

1 3-WAY PILOT LIGHT SWITCH TO CONTROL ALL DRESSING TABLE RECEPTACLES PER NEC 520.73-74. PROVIDE LABEL ON SWITCH STATING: "DRESSING TABLE OUTLETS."

2 3-WAY SWITCH TO CONTROL ALL DRESSING TABLE RECEPTACLES PER NEC 520.73-74. SWITCH TO CONNECT TO 3-WAY SWITCH ON THE OUTSIDE OF THE ROOM. PROVIDE LABEL ON SWITCH STATING: "DRESSING TABLE OUTLETS."

3 RECEPTACLE MOUNTED IN CHIEF AV BACKBOX. COORDINATE DEVICE LOCATIONS WITH AV DRAWINGS AND CONFIRM INSTALLATION WITH AV CONTRACTOR PRIOR TO INSTALL. ENSURE ALL DEVICES ARE CONCEALED FROM VIEW ABOVE CEILING IF A CEILING IS PRESENT. WIRING DOWN TO DISPLAY TO BE COVERED WITH 2 CHANNELS OF WIREMOLD. ONE (1) FOR POWER AND ONE (1) FOR HDMI. WIREMOLD TO BE RUN AT CENTERLINE OF DISPLAY.

4 INDOOR SPLIT SYSTEM UNIT: 0.6 MCA, 208/1, 1PH. UNIT TO BE FED OFF THE OUTDOOR CONDENSING UNIT. PROVIDE NON-FUSED DISCONNECT SWITCH ADJACENT TO UNIT. PROVIDE 2#10, #10G, 3/4"C.

5 1/4" X 4" X 24" COPPER GROUND BUSBAR FOR IT EQUIPMENT GROUNDING. CONNECT TO BUILDING STEEL AND TO MAIN BUILDING GROUNDING SYSTEM.

6 JUNCTION BOX FOR SENSOR OPERATED PLUMBING FIXTURES TO BE LOCATED BEHIND ACCESS PANEL. COORDINATE EXACT ACCESS PANEL LOCATION WITH ARCHITECTURE. CONNECT TO NEAREST 120V CONVENIENCE RECEPTACLE CIRCUIT.

7 REUSE EXISTING CIRCUITS PREVIOUSLY FEEDING RELOCATED AV RACK EQUIPMENT. (6) NEW 20A, 120V CIRCUITS AND (4) NEW 30A, 120V CIRCUITS ARE NEEDED FOR NEW WORK. IT IS ESTIMATED THAT THERE ARE (4) EXISTING 20A,120V CIRCUITS. THE ADDITIONAL (4) 30A CIRCUITS AND (2) 20A CIRCUIT ARE LISTED. ALL (10) DEVICES SHOWN SHALL HAVE A DEDICATED CIRCUIT AND ISOLATED GROUND. CONFIRM WITH AV DRAWINGS.

8 COORDINATE DEVICE LOCATIONS WITH TV MOUNTING BRACKETS SUCH THAT BOXES AND DEVICES ARE CONCEALED FROM VIEW BEHIND TV.

9 CONDUIT ROUTED FROM MIX POSITION IN BACK OF AUDITORIUM ALONG CEILING OF KNITWEAR LAB. FOLLOW EXISTING CONDUIT RISER BACKSTAGE UP TO DIMMING CONTROL ROOM TO CONNECT WITH PANEL LAV. VERIFY EXACT LOCATION IN FIELD.

10 RELOCATED POWER FOR IT RACK. EXTEND CIRCUITING AS REQUIRED TO ACCOUNT FOR RELOCATION.

11 JUNCTION BOX FOR THEATER HARDWARE. REFER TO THEATER PLANS FOR MORE INFORMATION. PROVIDE 3/4" EMT CONDUIT WITH PULLSTRING BACK TO THEATER CONTROLS IN DIMMER RACK ROOM C330.

12 CONNECT NEW RECEPTACLE TO NEAREST EXISTING 120V CONVENIENCE RECEPTACLE CIRCUIT IN THE AREA.

13 PREVIOUS LOCATION OF 200A COMPANY SWITCH. FEEDER TO BE EXTENDED FROM THIS LOCATION AS SHOWN TO NEW THEATRICAL LIGHTING RELAY PANEL.

14 NEW HOUSE LIGHTING RELAY PANEL. REUSE EXISTING 60A FEED FROM DEMOLISHED DIMMER RACK PANEL IN THIS AREA. CONFIRM ALL REQUIREMENTS WITH THEATER DESIGN.

15 PROVIDE NEW 200A, 3 POLE BREAKER IN PANEL LDPA1 FOR CONNECTION TO THEATRICAL LIGHTING RELAY PANEL. SEE THEATER DRAWINGS FOR MORE INFORMATION.

16 THEATRICAL LIGHTING RELAY PANEL. REFER TO THEATER DRAWINGS FOR DETAILS.

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LEVEL 03 - POWER PLAN

E203.00

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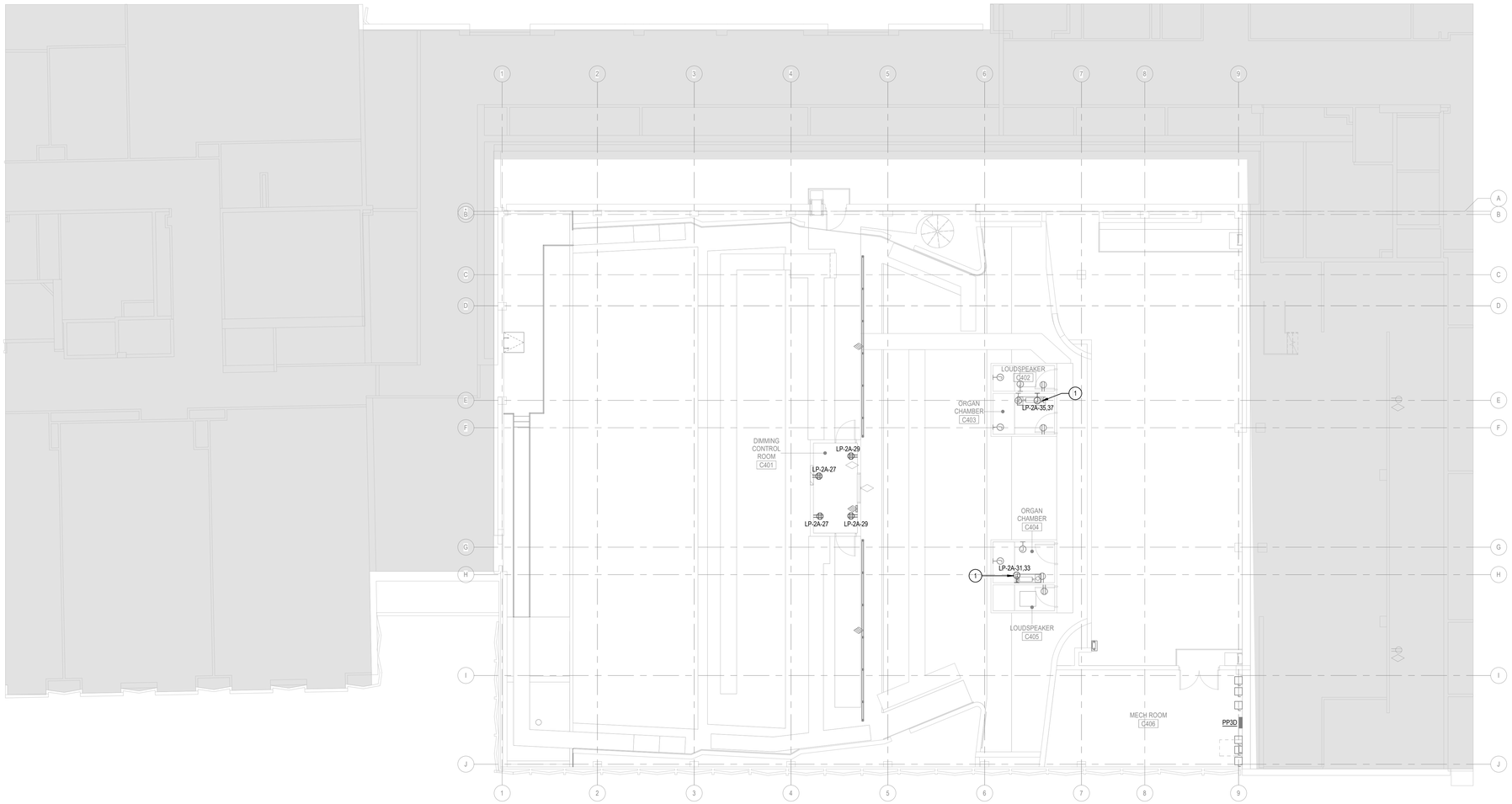

1 LEVEL 03M MEZZANINE - POWER PLAN
E203M.00 SCALE: 1/8" = 1'-0"

GENERAL NOTES

A REFER TO ARCHITECTURAL PLANS AND DETAILS FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF OUTLETS AND DEVICES. COORDINATE ALL DEVICE FINISHES AND COVERPLATE FINISHES WITH ARCHITECT PRIOR TO PURCHASE.

B COORDINATE ALL CONDUIT AND CABLE INSTALLATIONS LOCATED ABOVE FINISH DRYWALL CEILINGS. DO NOT LOCATE PULLBOXES OR JUNCTION BOXES ABOVE FINISHED DRYWALL OR OTHER INACCESSIBLE CEILINGS UNLESS A MEANS OF ACCESS IS PROVIDED. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING PLANS.

C ALL RECEPTACLE CIRCUITS THAT ARE A TOTAL LENGTH OF 80FT OR LESS SHALL BE RUN WITH #12AWG U.O.N. ALL RECEPTACLE CIRCUITS THAT ARE A TOTAL LENGTH OF 81FT - 150FT SHALL BE RUN WITH #10AWG U.O.N.

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SHEET NOTES

1 CONNECTION FOR SPEAKER HOIST. CONFIRM REQUIREMENTS WITH THEATRICAL.

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1 ROOF - POWER PLAN
E204.00 SCALE: 1/8" = 1'-0"

GENERAL NOTES

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SHEET NOTES

1 OUTDOOR CONDENSING UNIT: 15.6 MCA, 208V, 1PH. PROVIDE 2P/30AS/20AF FUSED DISCONNECT SWITCH. PROVIDE 2#10, #10G, 3/4"C.

2 OUTDOOR CONDENSING UNIT: 14.2 MCA, 208V, 1PH. PROVIDE 2P/30AS/20AF FUSED DISCONNECT SWITCH. PROVIDE 2#10, #10G, 3/4"C.

3 EXHAUST FAN: 2.8 FLA, 208V, 1PH. PROVIDE 2P/30AS/15AF FUSED DISCONNECT SWITCH. PROVIDE 2#10, #10G, 3/4"C.

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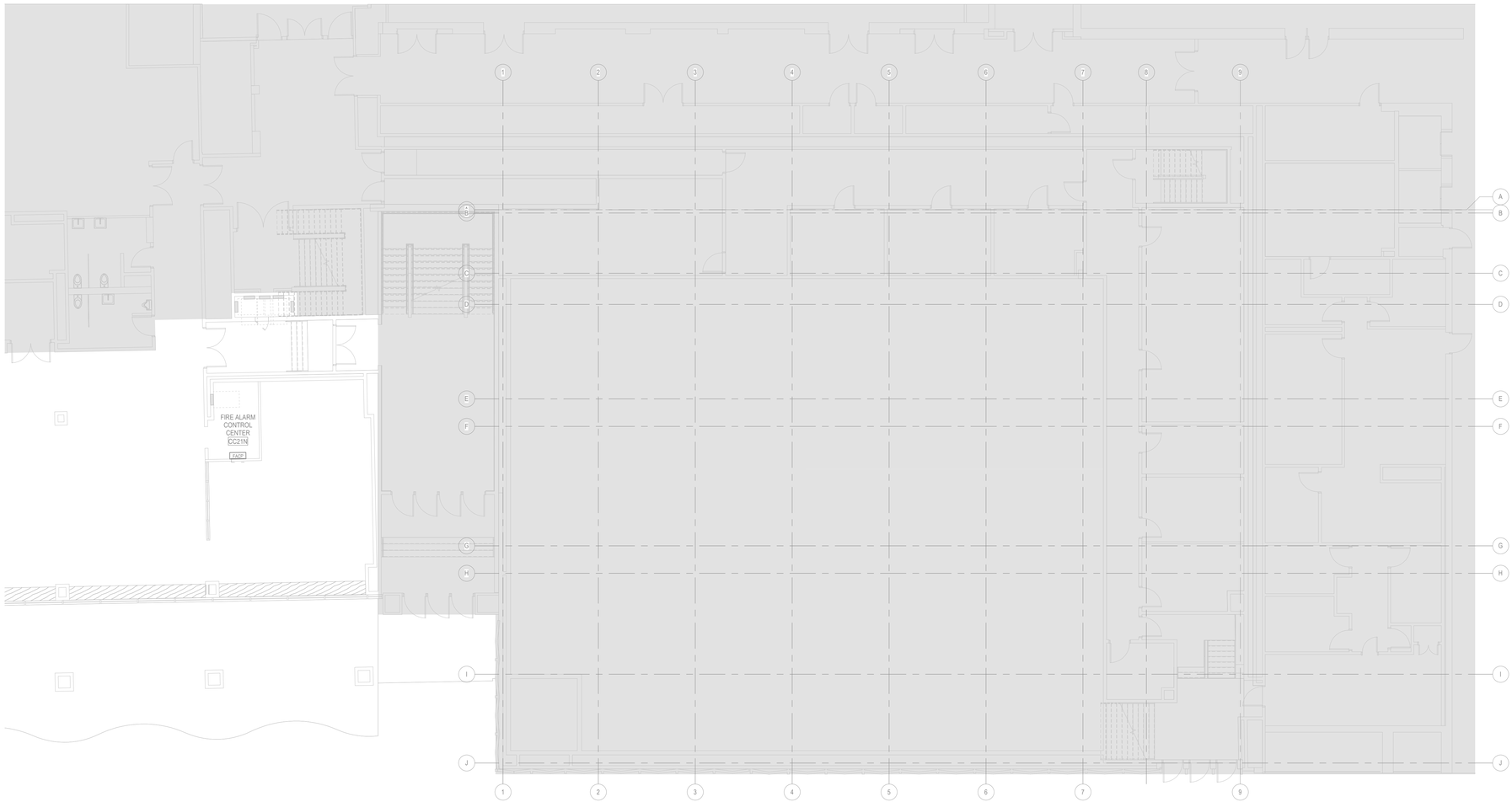

1 E301.00 LEVEL 01 - FIRE ALARM PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES

A CONFIRM ALL MOUNTING HEIGHTS AND LOCATIONS WITH ARCHITECT PRIOR TO ROUGH-IN.

B COORDINATE ALL CONDUIT AND CABLE INSTALLATIONS LOCATED ABOVE FINISH DRYWALL CEILINGS. DO NOT LOCATE PULLBOXES OR JUNCTION BOXES ABOVE FINISHED DRYWALL OR OTHER INACCESSIBLE CEILINGS UNLESS A MEANS OF ACCESS IS PROVIDED. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING PLANS.

C ALIGN ALL FIRE ALARM DEVICES, SWITCHES, RECEPTACLES, AND THERMOSTATS VERTICALLY WHERE APPLICABLE. STROBES SHALL BE CENTERED ON COLUMNS WHERE APPLICABLE.

D PER NFPA 72, ALL FIRE ALARM VISUAL DEVICES SHALL BE SYNCHRONIZED.

E THE CONTRACTOR SHALL PROVIDE A FIELD PROJECT MANAGER THROUGHOUT THE DURATION OF FIRE ALARM INSTALLATION WITH A MINIMUM OF NICET LEVEL III CERTIFICATION IN FIRE ALARM SYSTEM TECHNOLOGY.

F ALL DEVICES NEEDED FOR A COMPLETE AND WORKING FIRE ALARM SYSTEM MAY NOT BE SHOWN ON THESE CONCEPT DRAWINGS. PROVIDE EQUIPMENT AS NECESSARY FOR A FULLY OPERATIONAL SYSTEM.

G THE CONTRACTOR SHALL PREPARE AND SUBMIT SHOP DRAWINGS FOR THE FIRE ALARM SYSTEM INCLUDING A RISER (WITH SEQUENCE OF OPERATION), POWER CONNECTION DETAILS, FLOOR PLANS SHOWING ALL DEVICE ADDRESSES, POWER SUPPLIES, CIRCUITRY AND ZONING PROPOSED FOR THE PROJECT/SYSTEM IN SUFFICIENT DETAIL TO CLEARLY REVIEW AND BUILD THE SYSTEM. PROVIDE INTERIOR PANEL WIRING AND DEVICE POINT-TO-POINT CONNECTION DETAIL DRAWINGS FOR ALL EQUIPMENT.

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SHEET NOTES

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STATE OF NEW YORK
PAUL H KEMPARKER
109466
LICENSED PROFESSIONAL ENGINEER

01/15/2025

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS

57-23140-00

LEVEL 01 - FIRE ALARM PLAN

E301.00

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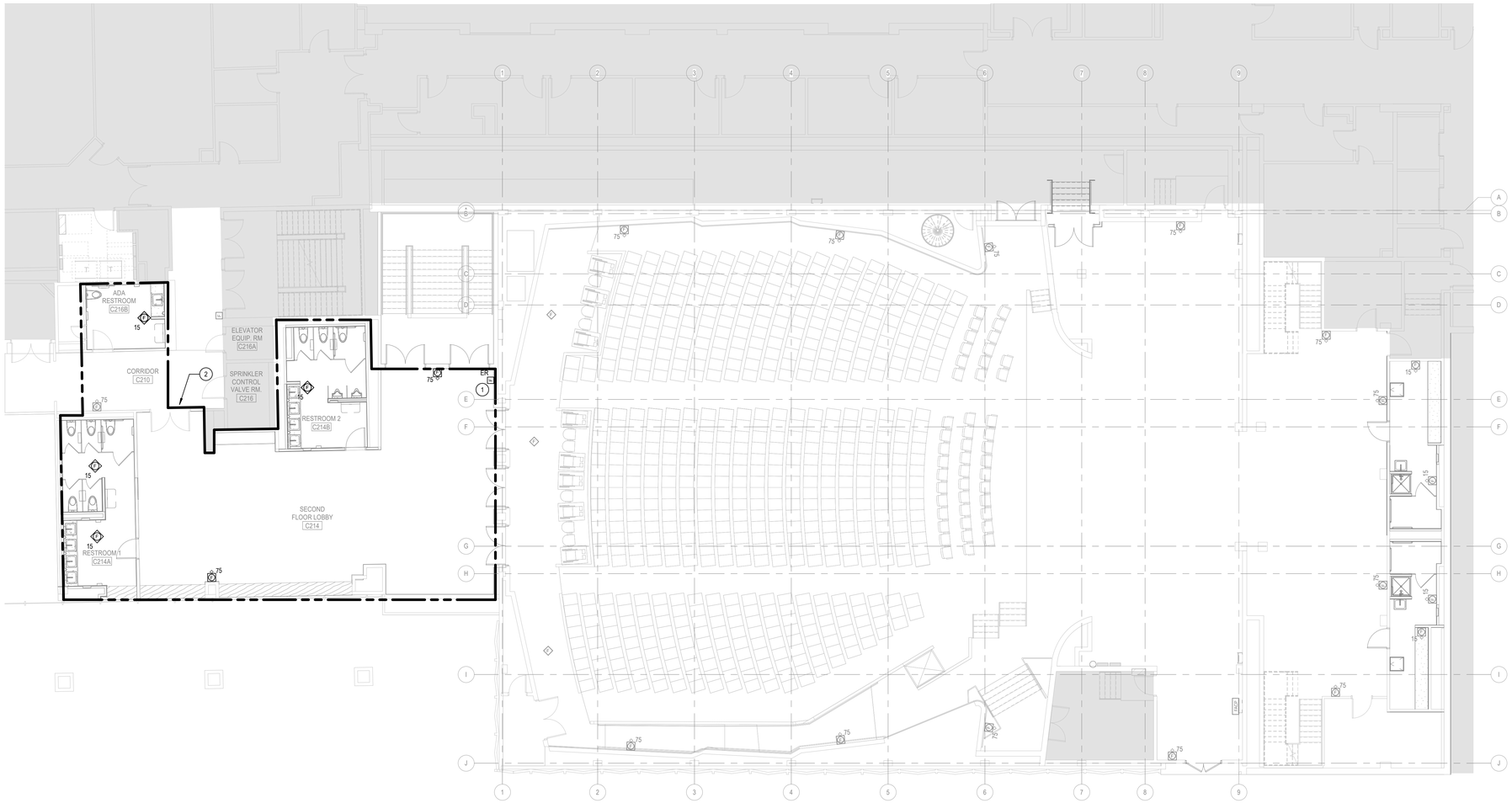

1 E302.00 LEVEL 02 - FIRE ALARM PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES

A CONFIRM ALL MOUNTING HEIGHTS AND LOCATIONS WITH ARCHITECT PRIOR TO ROUGH-IN.

B COORDINATE ALL CONDUIT AND CABLE INSTALLATIONS LOCATED ABOVE FINISH DRYWALL CEILINGS. DO NOT LOCATE PULLBOXES OR JUNCTION BOXES ABOVE FINISHED DRYWALL OR OTHER INACCESSIBLE CEILINGS UNLESS A MEANS OF ACCESS IS PROVIDED. COORDINATE WITH ARCHITECTURAL REFLECTED CEILING PLANS.

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SHEET NOTES

1 REMOUNT EXISTING FIRE ALARM PULL STATION TO +3'-6" AFF. REFER TO ARCHITECTURAL ELEVATIONS FOR MOUNTING DETAILS.

2 ALL SCOPE PERTAINING TO HAFT LOBBY & PUBLIC RESTROOM UPGRADES. SEE SECTION 012300 FOR MORE INFORMATION.

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57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

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LEVEL 02 - FIRE ALARM PLAN

E302.00

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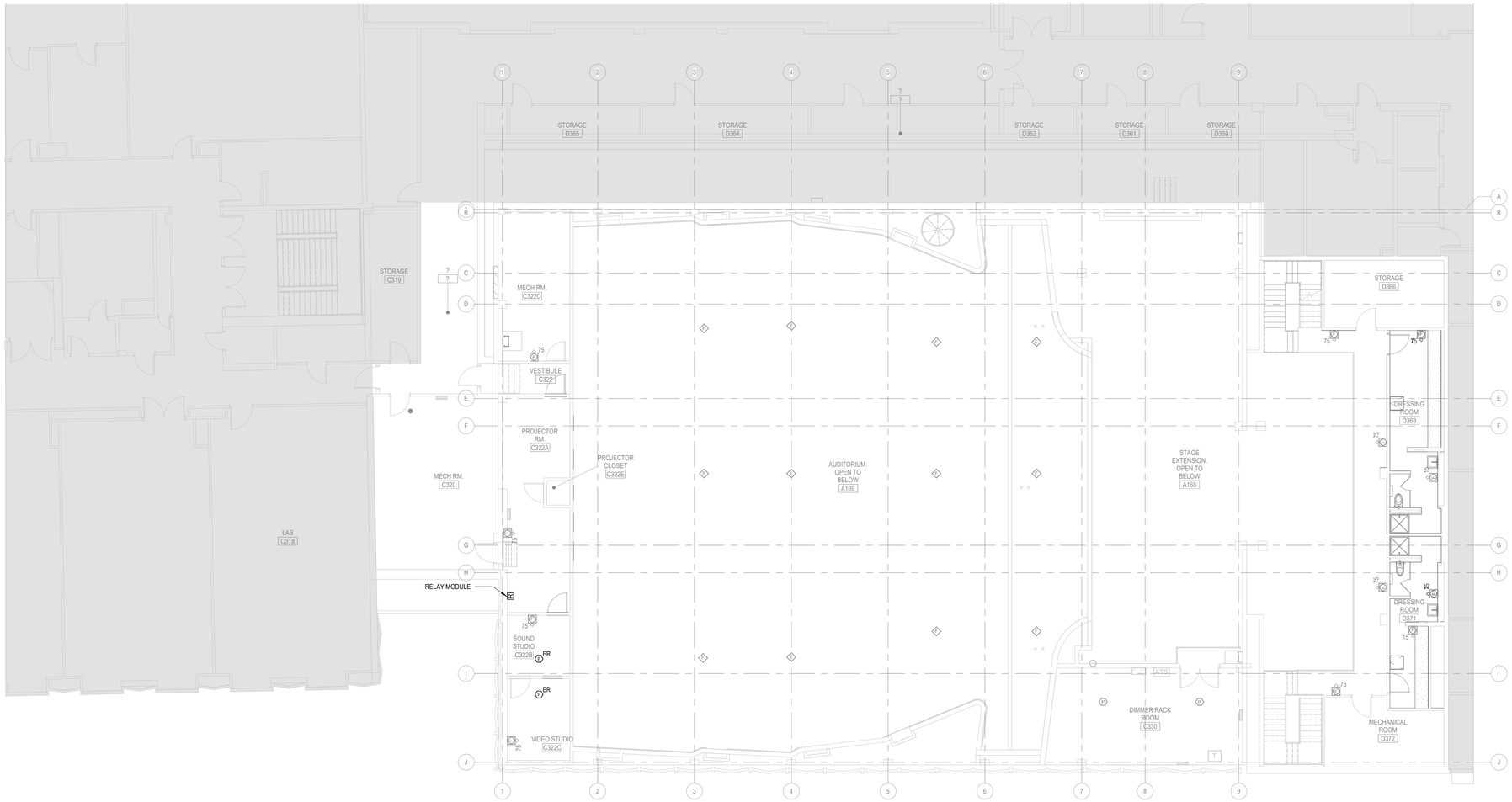

1 E303.00 LEVEL 03 - FIRE ALARM PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES

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SHEET NOTES

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01/15/2025

HAFT THEATER - INTERIOR RENOVATIONS

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343 WEST 27TH STREET
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ISSUE FOR ADDENDUM #3-C1651

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57-23140-00

LEVEL 03 - FIRE ALARM PLAN

E303.00

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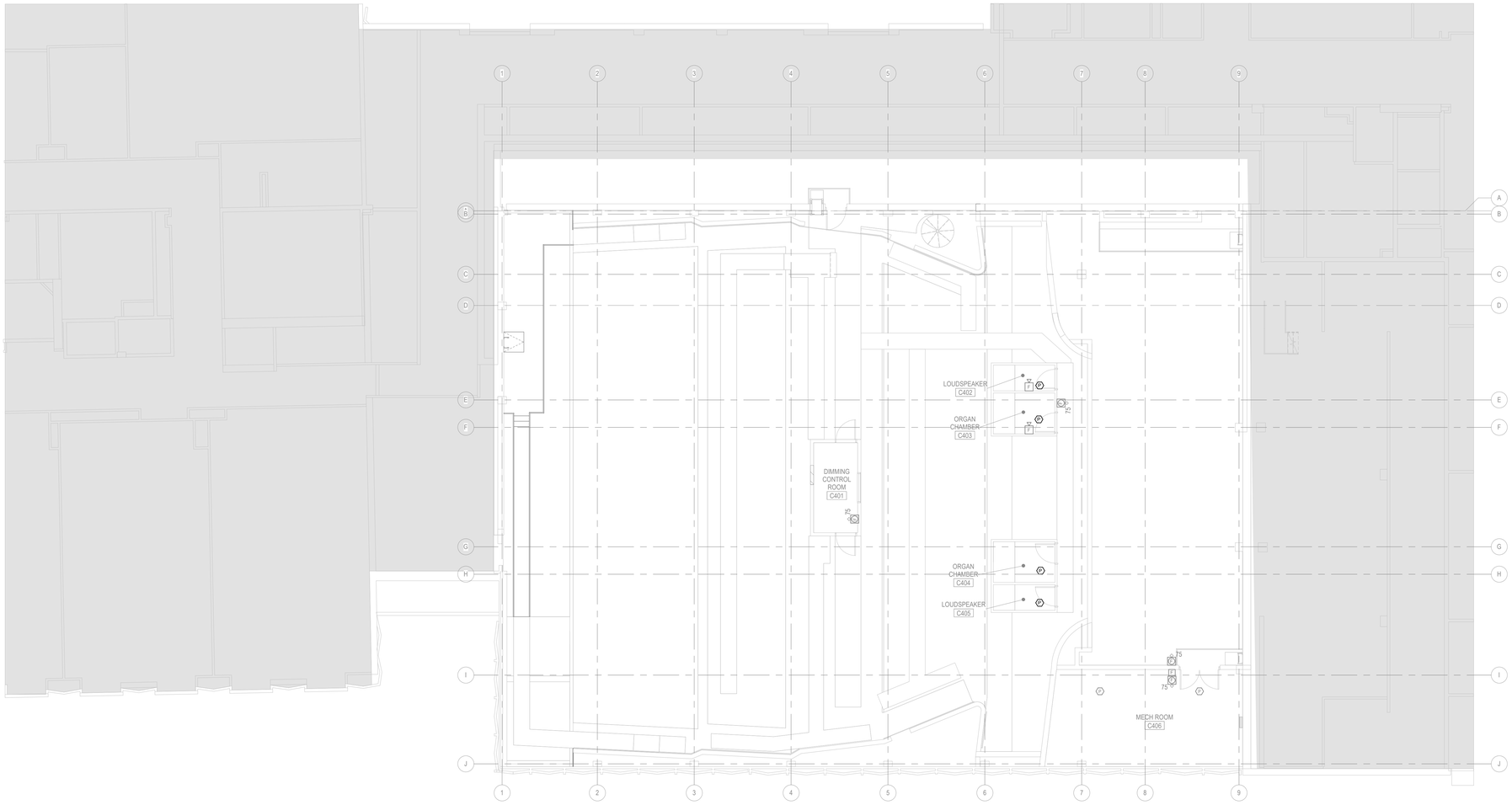

1 E303M.00 LEVEL 03M MEZZANINE - FIRE ALARM PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES

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SHEET NOTES

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01/15/2025

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
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REVISIONS

57-23140-00

LEVEL 03M MEZZANINE - FIRE ALARM PLAN

E303M.00

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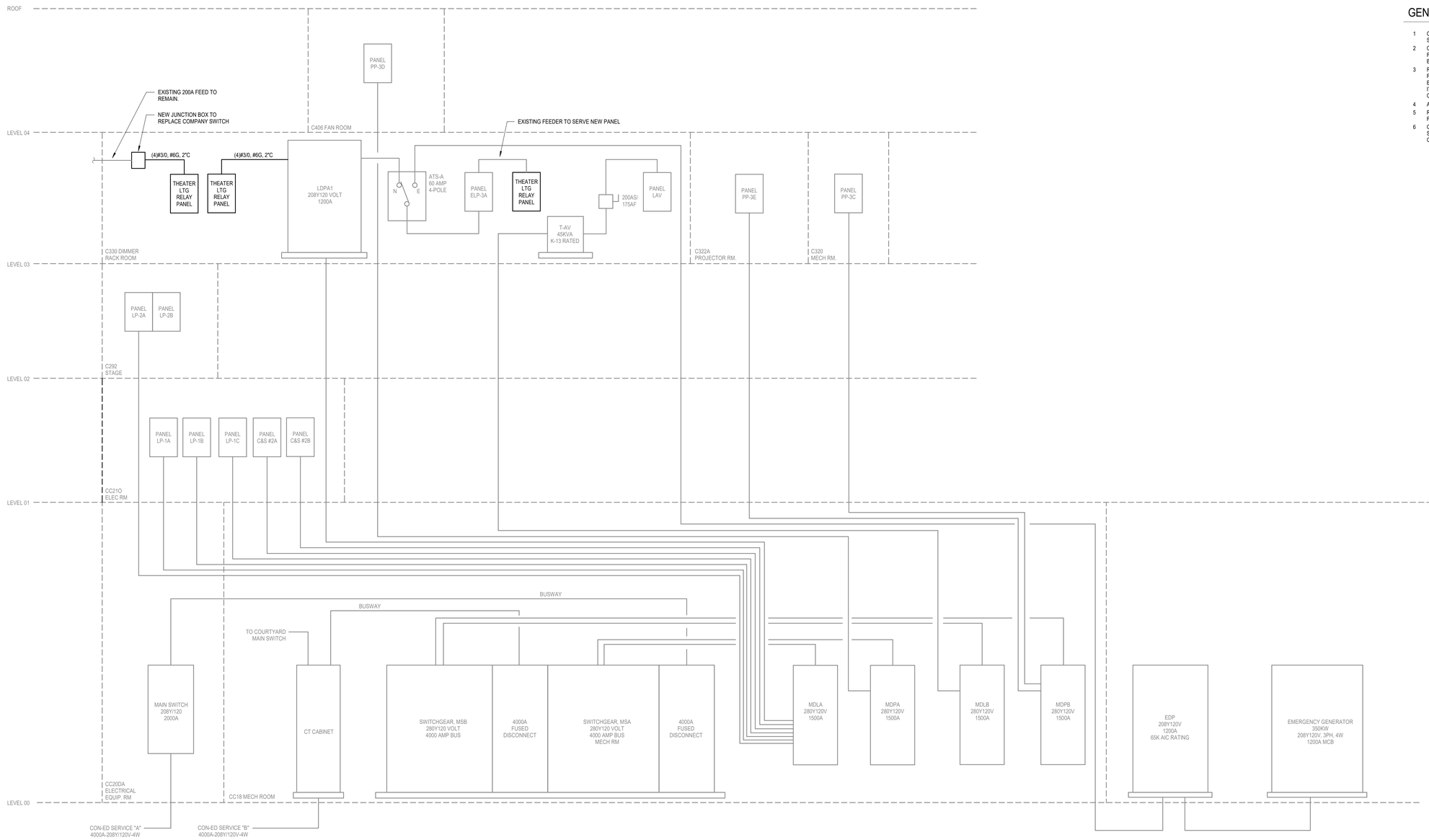

1 E500.00 EXISTING RISER DIAGRAM
NO SCALE

GENERAL SINGLE LINE NOTES

1. OVERCURRENT DEVICES OF ENTIRE DISTRIBUTION SYSTEM SHALL MEET STATED FAULT CURRENT VALUES WITH FULLY RATED EQUIPMENT.
2. CONDUCTOR LENGTHS INDICATED ON THE SINGLE LINE DIAGRAM ARE FOR FAULT CURRENT CALCULATIONS ONLY. ACTUAL LENGTH SHALL BE DETERMINED BY FIELD CONDITIONS AND ACTUAL ROUTES OF FEEDERS.
3. REFER TO SWITCHBOARD SCHEDULES AND DISTRIBUTION PANEL SCHEDULES FOR ADDITIONAL REQUIREMENTS. WHERE A DISCREPANCY EXISTS BETWEEN EQUIPMENT ON THE SINGLE LINE DIAGRAM AND THE DETAILED SCHEDULES, THE ITEM OR ARRANGEMENT WITH BETTER QUALITY, GREATER QUANTITY, OR HIGHER COST SHALL BE USED.
4. ALL DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
5. REFER TO THE MOTOR AND SPECIAL CONNECTION SCHEDULE FOR ALL FEEDERS DESIGNATED "EQ".
6. GROUNDING ELECTRODE CONDUCTORS SIZES ARE NOT INDICATED ON THE SINGLE LINE DIAGRAM ARE. REFER TO THE GROUNDING RISER DIAGRAM FOR CONNECTIONS AND CONDUCTOR SIZES.

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ELECTRICAL RISER

E500.00

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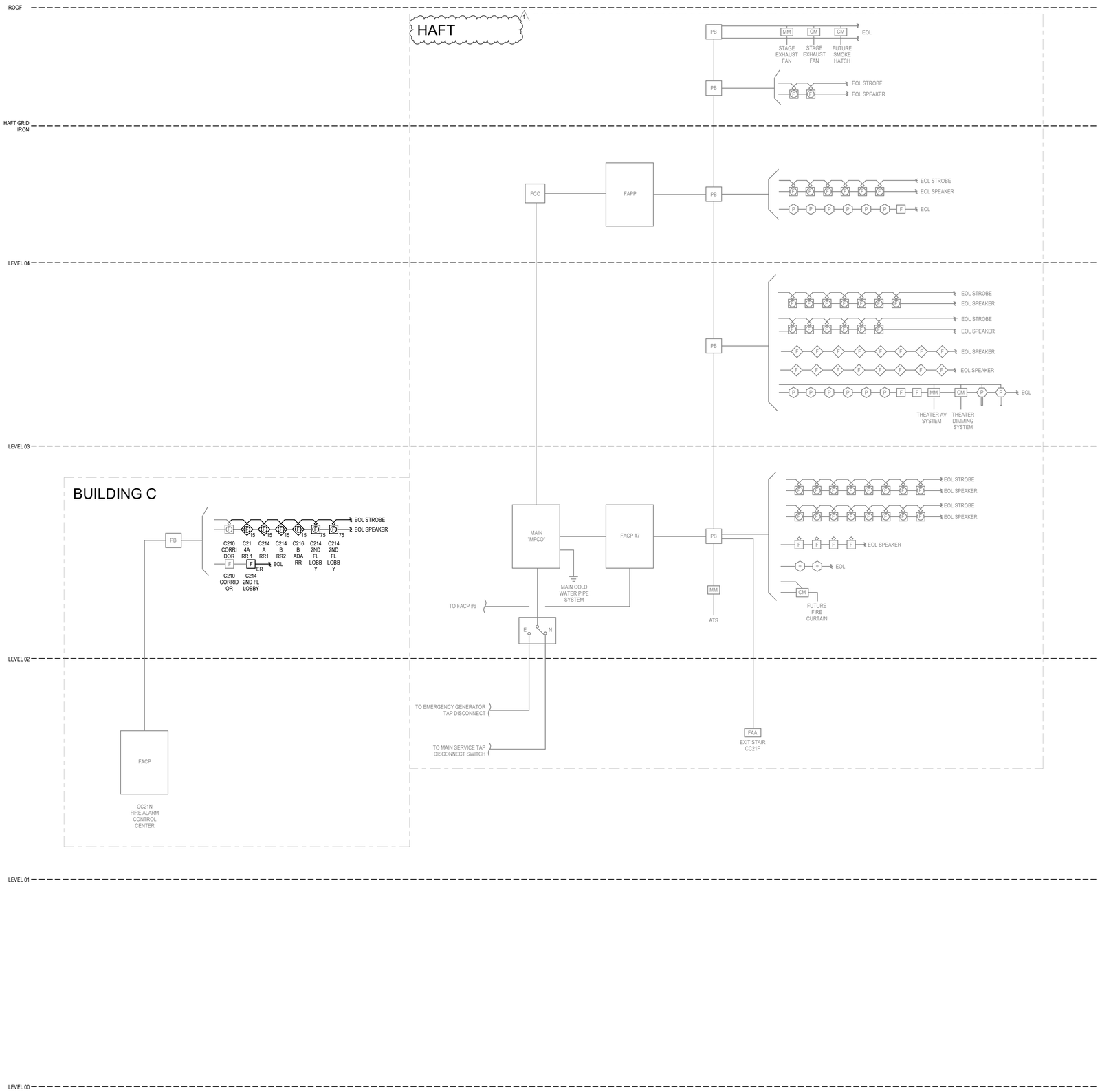

1 FIRE ALARM RISER DIAGRAM - EXISTING & NEW
E501.00 NO SCALE

FIRE ALARM RISER DIAGRAM GENERAL NOTES:

A) ALL NEW FIRE ALARM DEVICES TO BE CONNECTED TO EXISTING FIRE ALARM CONTROL PANEL AS SHOWN ON THE RISER DIAGRAM.

B) ENSURE SUFICCIENT BATTERY CAPACITY IS AVAILABLE IN EXISTING CONTROL PANELS FOR ALL ADDED NOTIFICATION DEVICES.

C) ENSURE SUFFICIENT SPACE IS AVAILABLE IN EXISTING FIRE ALARM CONTROL PANELS FOR ANY ADDITIONAL INITIATION DEVICES.

FIRE ALARM SYMBOL LEGEND

FACP	FIRE ALARM CONTROL PANEL.
FATP	FIRE ALARM TRANSPONDER PANEL
FAA	FIRE ALARM ANNUNCIATOR PANEL
NAC	NOTIFICATION APPLIANCE CIRCUIT CABINET
FCO	FUSE CUT OUT
MFCO	MAIN FUSE CUT OUT
P	PHOTOELECTRIC SMOKE DETECTOR
	COMBINATION FIXED TEMPERATURE / RISE OF HEAT DETECTOR
P	DUCT TYPE PHOTOELECTRIC SMOKE DETECTOR
FS	SPRINKLER WATER FLOW SWITCH, FBO, WIRED BY EC
TS	SPRINKLER TAMPER SWITCH, FBO, WIRED BY EC
F	FIRE ALARM PULL STATION
R	FIRE ALARM AV RELAY
CM	FIRE ALARM CONTROL MODULE
MM	FIRE ALARM MONITOR MODULE
F	FIRE ALARM SPEAKER - WALL MOUNTED
	FIRE ALARM SPEAKER WITH VISUAL WARNING SIGNAL - WALL MOUNTED
	FIRE ALARM SPEAKER WITH VISUAL WARNING SIGNAL - CEILING
F	FIRE ALARM SPEAKER - FLUSH IN CEILING
	FIRE ALARM VISUAL WARNING SIGNAL - CEILING
EOL	END OF LINE RESISTOR

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57-23140-00

FIRE ALARM RISER

E501.00

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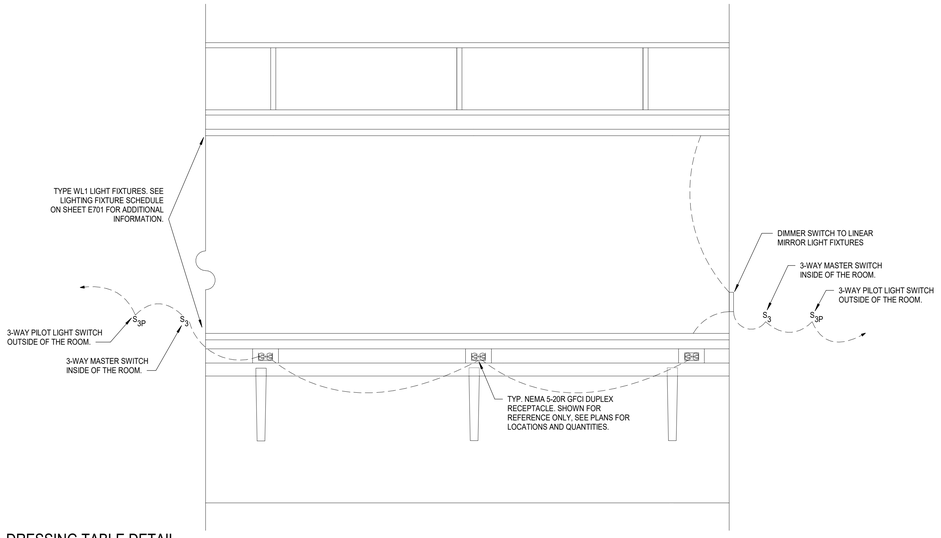
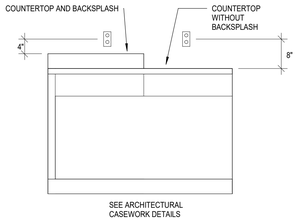
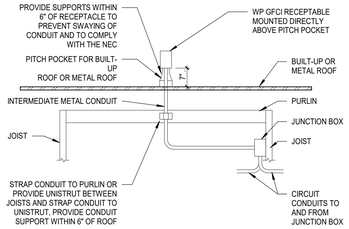


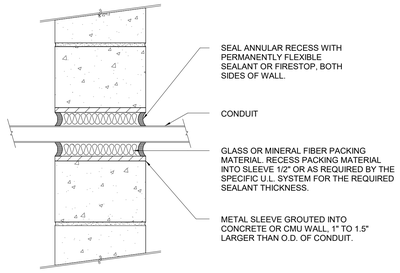
1 E601.00 DRESSING TABLE DETAIL
NO SCALE



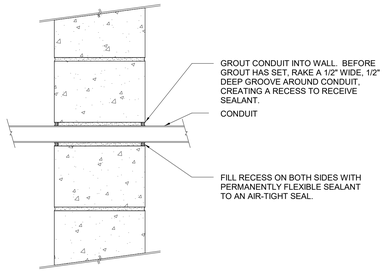
1F E601.00 ABOVE COUNTER RECEPTACLES
NO SCALE



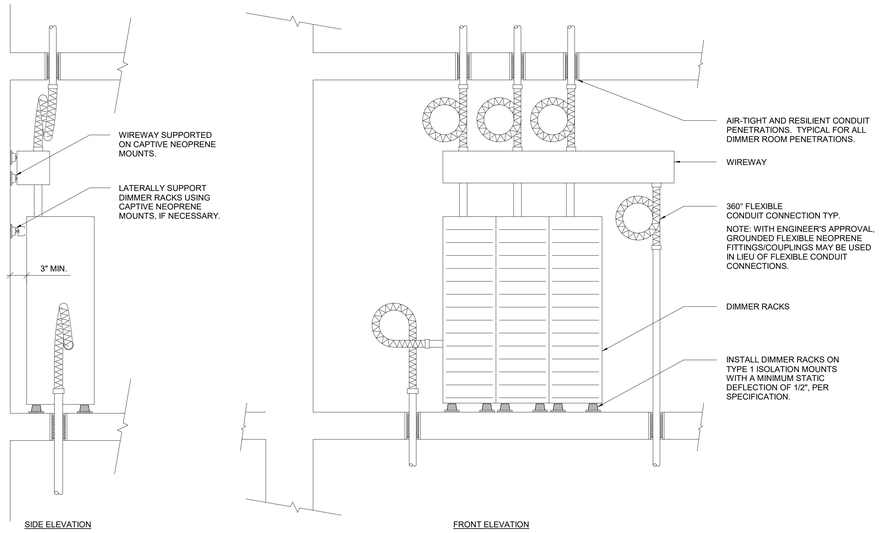
42 E601.00 ROOF RECEPTABLE MOUNTING DETAIL
NO SCALE



2 E601.00 BLOCK / CONCRETE WALL AIR-TIGHT & RESILIENT
NO SCALE



3 E601.00 BLOCK / CONCRETE WALL SLAB
NO SCALE



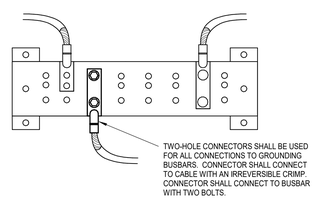
NOTES:

1. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. CONDUIT SHALL NOT PASS DIRECTLY FROM NOISE PRODUCING ROOMS INTO ACOUSTICALLY SENSITIVE ROOMS. CONDUIT SHOULD PASS THROUGH TWO WALLS OR SLAB AND WALL PRIOR TO ENTERING ASRs.
3. ALL CONDUIT PENETRATIONS IN THE STRUCTURE SURROUNDING NOISE PRODUCING ROOMS SHALL BE AIR-TIGHT AND RESILIENT. THIS INCLUDES ALL SLAB PENETRATIONS, WALL PENETRATIONS AND ROOF OR CEILING PENETRATIONS.
4. MULTIPLE CONDUIT PENETRATIONS ARE NOT ALLOWED AT NOISE PRODUCING ROOMS, EXCEPT AS EXPRESSLY INDICATED. PACK AND SEAL EVERY CONDUIT INDIVIDUALLY. REFER TO SPECIFICATION FOR NOISE & VIBRATION CONTROL OF ELECTRICAL SYSTEMS.
5. CONDUIT SHALL PENETRATE PERPENDICULARLY THROUGH WALLS AND SLABS OF ACOUSTICALLY SENSITIVE ROOMS AND NOISE PRODUCING ROOMS.

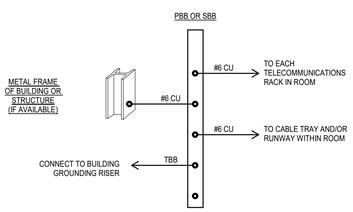
6 E601.00 DIMMER RACK ISOLATION
NO SCALE

5 E601.00 GYPSUM WALL AIR-TIGHT & RESILIENT
NO SCALE

4 E601.00 GYPSUM WALL
NO SCALE



7 E601.00 GROUNDING BUSBAR CONNECTIONS
NO SCALE



TELECOM ROOM GROUNDING NOTES:

1. PROVIDE A TELECOMMUNICATIONS GROUNDING BUSBAR (MTGB OR TGB) IN AREA DESIGNATED FOR TELECOMMUNICATIONS EQUIPMENT.

8 E601.00 TELECOMMUNICATIONS GROUNDING
NO SCALE

TELECOMMUNICATION BONDING BACKBONE SIZING (EIA 607D)

MAX PBB TO SBB LENGTH (FT)	TBB SIZE
13	#6
21	#4
26.5	#3
33	#2
42	#1
53	#1/0
66.5	#2/0
84	#3/0
106	#4/0
125	250 KCMIL
150	300 KCMIL
175	350 KCMIL
250	500 KCMIL
300	600 KCMIL
375	750 KCMIL

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ELECTRICAL DETAILS

E601.00

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1/10/2025 10:57:02 AM

PANEL: ELP-3A

LOCATION: DIMMER RACK ROOM C330 | BUS RATING: 100.0 A | MAIN BREAKER: 60 A
VOLTS: 208Y/120 | PHASES: 3 | WIRES: 4 | SCCR: EXISTING
MOUNTING: SURFACE | FED FROM: LDPA1 (60A BREAKER) | INTEGRAL SPD: NO | LUG ACCESSORIES:

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1						4,300	0					--	E	1	20	SPARE	2
3	HDR	60	3	E	--			4,300	0			--	E	1	20	SPARE	4
5										4,300	0	--	E	1	20	SPARE	6
7	GTD DEVICE	20	1	E	--	1,100	0					--	E	1	20	SPARE	8
9	GTD DEVICE	20	1	E	--			300	0			--	E	1	20	SPARE	10
11	EXIT LTS & EMERGENCY CTS	20	1	E	--					300	0	--	E	1	20	SPARE	12
13	GTD DEVICE	--	1	E	--	--	0					--	E	1	20	SPARE	14
15	GTD DEVICE	--	1	E	--			--	0			--	E	1	20	SPARE	16
17	EXIT LT IN ROOM	--	1	E	--					--	0	--	E	1	20	SPARE	18
19	SPARE	20	1	E	--	0	0					--	E	1	20	SPARE	20
21	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	22
23	SPARE	20	1	E	--					0	0	--	E	1	20	SPARE	24
25	SPARE	20	1	E	--	0	0					--	E	1	20	SPARE	26
27	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	28
29	SPARE	20	1	E	--					0	0	--	E	1	20	SPARE	30
31	SPARE	20	1	E	--	0	0					--	E	1	20	SPARE	32
33	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	34
35	SPARE	20	1	E	--					0	0	--	E	1	20	SPARE	36
					TOTAL LOAD:	5400 VA		4600 VA		4600 VA							
					TOTAL AMPS	45.0 A		38.3 A		38.3 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 15 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 15 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 40.5 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 40.5 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	14600 VA	100.00%	14600 VA			

NOTES:

PANEL: LP-2A

LOCATION: STAGE C292 | BUS RATING: 100.0 A | MAIN BREAKER: MLO
VOLTS: 208Y/120 | PHASES: 3 | WIRES: 4 | SCCR: EXISTING
MOUNTING: SURFACE | FED FROM: MDLA (100A BREAKER) | INTEGRAL SPD: NO | LUG ACCESSORIES: FEED THRU FOR LP-2B

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	DIMMER ROOM LTS	20	1	E	--	400	700					--	E	1	20	RECEPT	2
3	DIMMER ROOM LTS	20	1	E	--			400	500			--	E	1	20	RECEPT BACK AUDITORIUM	4
5	EM LIGHTING REAR STAGE	20	1	E	--					800	800	--	E	1	20	RECEPT BACK AUDITORIUM	6
7	FLYBRIDGE LIGHT	20	1	E	--	800	800					--	E	1	20	STAGE FRONT RECEPT	8
9	RECEPT	20	1	E	--			800	800			--	E	1	20	NORTH WALL RECEPT	10
11	RECEPT	20	1	E	--					800	800	--	E	1	20	STAGE FRONT RECEPT	12
13	RECEPT	20	1	E	--	800	800					--	E	1	20	UNKNOWN	14
15	232 DRESSING TABLE RECEPT.	20	1	NE	R			720	0			--	E	1	20	STAGE FRONT RECEPT	16
17	235 DRESSING TABLE RECEPT.	20	1	NE	R					720	540	M	ER	2	20	ROOF CONDENSING UNIT CU-1	18
19	DRESSING AND BACKSTAGE TVS	20	1	NE	R	720	540										20
21	371 DRESSING TABLE RECEPT.	20	1	NE	R			720	360			M	ER	2	20	ROOF CONDENSING UNIT CU-2	22
23	368 DRESSING TABLE RECEPT.	20	1	NE	R					720	360						24
25	LEVEL 3 DRESSING ROOM TVS	20	1	NE	R	360	180					M	ER	2	20	ROOF EXHAUST FAN EF-1	26
27	DIMMING CONTROL ROOM QUADS	20	1	NE	R			720	180								28
29	DIMMING CONTROL ROOM QUADS	20	1	NE	R					720	0	--	E	1	20	SPARE	30
31	CATWALK SPEAKER HOIST	20	2	ER	M	1,250	0					--	E	1	20	SPARE	32
33								1,250	0			--	E	1	20	SPARE	34
35	CATWALK SPEAKER HOIST	20	2	ER	M					1,250	0	--	E	1	20	SPARE	36
37						1,250	0					--	E	1	20	SPARE	38
39	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	40
41	SPARE	20	1	E	--					0	0	--	E	1	20	SPARE	42
					TOTAL LOAD:	8600 VA		6450 VA		7510 VA							
					TOTAL AMPS	73.0 A		53.8 A		63.9 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	5400 VA	100.00%	5400 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 23 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 23 kVA
M	MOTOR	6080 VA	110.28%	6705 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 62.6 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 64.4 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	10000 VA	100.00%	10000 VA			

NOTES:

PANEL: LP1C

LOCATION: ELEC RM CC21O | BUS RATING: 225.0 A | MAIN BREAKER: MLO
VOLTS: 208Y/120 | PHASES: 3 | WIRES: 4 | SCCR: EXISTING
MOUNTING: FLUSH | FED FROM: | INTEGRAL SPD: NO | LUG ACCESSORIES:

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	SPACE ONLY	--	1		--	--	500					--	E	1	15	EXSITING LOAD	2
3	EXSITING LOAD	20	1	E	--			500	--			--		1	--	SPACE ONLY	4
5	EXSITING LOAD	20	1	E	--					500	500	--	E	1	15	EXSITING LOAD	6
7	SPACE ONLY	--	1		--	--	500					--	E	1	15	EXSITING LOAD	8
9	EXSITING LOAD	15	1	E	--			500	500			--	E	1	15	EXSITING LOAD	10
11	EXSITING LOAD	15	1	E	--					500	500	--	E	1	15	EXSITING LOAD	12
13	EXSITING LOAD	15	1	E	--	500	500					--	E	1	15	EXSITING LOAD	14
15	EXSITING LOAD	20	1	E	--			500	500			--	E	1	15	EXSITING LOAD	16
17	EXSITING LOAD	20	1	E	--					500	500	--	E	1	15	EXSITING LOAD	18
19	EXSITING LOAD	20	1	E	--	500	500					--	E	1	15	EXSITING LOAD	20
21	EXSITING LOAD	20	1	E	--			500	500			--	E	1	15	EXSITING LOAD	22
23	SPACE ONLY	--	1		--					--	500	--	E	1	15	EXSITING LOAD	24
25	EXSITING LOAD	20	1	E	--	0	500					--	E	1	15	EXSITING LOAD	26
					TOTAL LOAD:	3500 VA		3500 VA		3500 VA							
					TOTAL AMPS	29.2 A		29.2 A		29.2 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 11 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 11 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 29.1 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 29.1 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	10500 VA	100.00%	10500 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: LAV

LOCATION: DIMMER RACK ROOM C330 | BUS RATING: 225.0 A | MAIN BREAKER: 175A
VOLTS: 208Y/120 | PHASES: 3 | WIRES: 4 | SCCR: EXISTING
MOUNTING: SURFACE | FED FROM: MDLB (200A BREAKER) | INTEGRAL SPD: NO | LUG ACCESSORIES: 200% NEUTRAL, ISOLATED GROUND BUS

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	PROJECTOR RM AV SOUND RACK	20	1	E	--	500	1,000					--	E	1	20	SOUND STUDIO	2
3	PROJECTOR RM AV SOUND RACK	20	1	E	--			500	400			--	E	1	20	PROJECTOR RM	4
5	BACK OF HOUSE	20	1	E	--					1,000	1,000	--	E	1	20	CENTER MIX	6
7	STAGE FACE	20	1	E	--	1,000	1,000					--	E	1	20	STAGE FACE	8
9	STAGE FACE	20	1	E	--			1,000	1,000			--	E	1	20	STAGE RIGHT	10
11	STAGE RIGHT	20	1	E	--					1,000	1,000	--	E	1	20	STAGE LEFT	12
13	STAGE EXTENSION	20	1	E	--	1,000	360					R	NE	1	20	PROJECTOR CLOSET QUAD	14
15	PROJECTOR RM AV SOUND RACK	20	1	E	--			500	360			R		1	20	FOH AV DEVICES	16
17	PROJECTOR RM AV SOUND RACK	20	1	E	--					500	500	R		1	20	PROJECTION BOTH AV DEVICES	18
19	MIX POSITION RECEPT.	20	1	NE	R	180											20
21	MIX POSITION RECEPT.	20	1	NE	R			180									22
23	LEVEL 3 CAMERA	20	1	NE	R					750							24
25	PROJECTOR RM AV SOUND RACK	30	1	N	R	1,000	--					--		1	--	SPACE ONLY	26
27	PROJECTOR RM AV SOUND RACK	30	1	N	R			1,000	90			R	N	2	20	PROJECTOR CLOSET L6-30R	28
29	PROJECTOR RM AV SOUND RACK	30	1	N	R					1,000	90						30
31	PROJECTOR RM AV SOUND RACK	30	1	N	R	1,000	1,800										32
33	PROJECTOR RM AV SOUND RACK	20	1	N	R			180	1,800			R	N	3	30	STAGE RIGHT EXTENSION L21-30R	34
35	PROJECTOR RM AV SOUND RACK	20	1	N	R					180	1,800						36
37	SOUND STUDIO RECEPT.	20	1		R	180	1,800										38
39	C322C SOUND DEDICATED RECEPT.	20	1		R			180	1,800			R	N	3	30	STAGE LEFT L21-30R	40
41	C322C SOUND DEDICATED RECEPT.	20	1		R					180	1,800						42
					TOTAL LOAD:	10820 VA		8990 VA		10800 VA							
					TOTAL AMPS	92.5 A		74.9 A		92.3 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	18210 VA	77.46%	14105 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 31 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 27 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 85.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 73.6 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	12400 VA	100.00%	12400 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: LP-2B

LOCATION: STAGE C292 | BUS RATING: 100.0 A | MAIN BREAKER: MLO
VOLTS: 208Y/120 | PHASES: 3 | WIRES: 4 | SCCR: EXISTING
MOUNTING: SURFACE | FED FROM: MDLA (100A BREAKER) | INTEGRAL SPD: NO | LUG ACCESSORIES: FEED THRU FOR LP-2A

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	LIGHTS	20	1	E	--	800	200					--	E	1	20	CATWALK OLD LTS & SPIRAL STAIR LTS	2
3	PROJECTOR ROOMS LIGHTS	20	1	E	--			800	800			--	E	1	20	CATWALK OLD LTS & SPIRAL STAIR LTSK LTG	4
5	STORAGE RM LIGHTS	20	1	E	--					800	800	--	E	1	20	SOUTHWEST CATWALK LTS	6
7	WALL SCONCES REAR STAGE	20	1	E	--	200	180					--	E	1	20	NEW CATWALK RECEPT.	8
9	RECEPT.	20	1	E	--			180	500			--	E	1	20	NEW CATWALK RECEPT.	10
11	SOUTHWEST WALL RECEPT	20	1	E	--					180	200	--	E	1	20	NEW CATWALK LIGHTS	12
13	RECEPT.	20	1	E	--	700	500					--	E	1	20	ORGAN & SPEAKER CHAMBER RECEPT	14
15	SPARE	20	1	E	--			0	700			--	E	1	20	HANDICAP LIFT	16
17	SPARE	20	1	E	--					0	800	--	E	1	20	ORGAN RECEPT.	18
19	SPARE	20	1	E	--	0	0					--	E	1	20	SPARE	20
21	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	22
23	SPARE	20	1	E	--					0	0	--	E	1	20	SPARE	24
25	SPARE	20	1	E	--	0	0					--	E	1	20	SPARE	26
27	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	28
29	SPARE	20	1	E	--					0	0	--	E	1	20	SPARE	30
31	SPARE	20	1	E	--	0	0					--	E	1	20	SPARE	32
33	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	34
35	SPARE	20	1	E	--					0	0	--	E	1	20	SPARE	36
37	SPARE	20	1	E	--	0	0					--	E	1	20	SPARE	38
39	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	40
41	SPARE	20	1	E	--					0	0	--	E	1	20	SPARE	42
					TOTAL LOAD:	2580 VA		2980 VA		2780 VA							
					TOTAL AMPS	21.5 A		25.1 A		23.4 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 8 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 8 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 23.1 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 23.1 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	8340 VA	100.00%	8340 VA			

NOTES:

PANEL: LP1B

LOCATION: ELEC RM CC21O | BUS RATING: 225.0 A | MAIN BREAKER:
VOLTS: 208Y/120 | PHASES: 3 | WIRES: 4 | SCCR: EXISTING
MOUNTING: FLUSH | FED FROM: | INTEGRAL SPD: NO | LUG ACCESSORIES:

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	A		B		C		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	EXISTING LOAD	15	1	E	--	500	500					--	E	1	20	EXISTING LOAD	2
3	EXISTING LOAD	15	1	E	--			500	500			--	E	1	20	EXISTING LOAD	4
5	EXISTING LOAD	20	1	E	--					500	500	--	E	1	15	EXISTING LOAD	6
7	EXISTING LOAD	15	1	E	--	500	500					--	E	1	20	EXISTING LOAD	8
9	EXISTING LOAD	20	1	E	--			500	500			--	E	1	15	EXISTING LOAD	10
11	EXISTING LOAD	20	1	E	--					500	500	--	E	1	20	EXISTING LOAD	12
13	EXISTING LOAD	15	1	E	--	500	500					--	E	1	20	EXISTING LOAD	14
15	EXISTING LOAD	20	1	E	--			500	500			--	E	1	15	EXISTING LOAD	16
17	EXISTING LOAD	15	1	E	--					500	500	--	E	1	20	EXISTING LOAD	18
19	EXISTING LOAD	20	1	E	--	500	500					--	E	2	20	EXISTING LOAD	20
21	EXISTING LOAD	20	1	E	--			500	0								22
23	EXISTING LOAD	20	1	E	--					500	500	--	E	2	30	EXISTING LOAD	24
25	EXISTING LOAD	15	1	E	--	500	0										26
					TOTAL LOAD:	4500 VA		3500 VA		4000 VA							
					TOTAL AMPS	38.1 A		29.2 A		34.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 12 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 12 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 33.3 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 33.3 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	12000 VA	100.00%	12000 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: PP-3E

LOCATION: PROJECTOR RM. C322A | BUS RATING: 100.0 A | MAIN BREAKER: MLO
VOLTS: 208Y/120 | PHASES: 3 | WIRES: 4 | SCCR: EXISTING
MOUNTING: SURFACE | FED FROM: MDPB (90A BREAKER) | INTEGRAL SPD: NO | LUG ACCESSORIES:

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	CONV. RECEPT.	20	1	E	--	200	300					--	E	1	20	CONV. RECEPT. SC. RM	2
3	CONV. RECEPT. AUD. STUDIO	20	1	E	--			300	300			--	E	1	20	CONV. RECEPT. SC. RM.	4
5	CONV. RECEPT. AUD. STUDIO	20	1	E	--					280	300	--	E	1	20	CONV. RECEPT. FAN RM.	6
7	CONV. RECEPT. AUD. STUDIO	20	1	E	--	200	1,440										8
9	PROJECTOR	20	1	E	--			900	1,440			--	E	3	20	PROJECTOR RM EXHAUST	10
11	PROJECTOR	20	1	E	--					900	1,440						12
13	SPARE	20	1	E	--	0	180					R		1	20	WP	14
15	SPARE	20	1	E	--			0	0			--	E	1	20	UNKNOWN	16
17	SPARE	20	1	E	--					0	0	--	E	1	20	UNKNOWN	18
19	SPARE	20	1	E	--	0	0					--	E	1	20	SPARE	20
21	SPARE	20	1	E	--			0	0			--	E	1	20	SPARE	22
23	SPACE ONLY	--	1		--					--	0	--	E	1	20	SPARE	24
25	SPACE ONLY	--	1		--	--	--					--		1	--	SPACE ONLY	26
27	SPACE ONLY	--	1		--			--	--			--		1	--	SPACE ONLY	28
29	SPACE ONLY	--	1		--					--	--	--		1	--	SPACE ONLY	30
31	SPACE ONLY	--	1		--	--	--					--		1	--	SPACE ONLY	32
33	SPACE ONLY	--	1		--			--	--			--		1	--	SPACE ONLY	34
35	SPACE ONLY	--	1		--					--	--	--		1	--	SPACE ONLY	36
37	SPACE ONLY	--	1		--	--	--					--		1	--	SPACE ONLY	38
39	SPACE ONLY	--	1		--			--	--			--		1	--	SPACE ONLY	40
41	SPACE ONLY	--	1		--					--	--	--		1	--	SPACE ONLY	42
					TOTAL LOAD:	2320 VA		2940 VA		2920 VA							
					TOTAL AMPS	19.3 A		25.3 A		25.1 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	180 VA	100.00%	180 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 8 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 8 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 22.7 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 22.7 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	8000 VA	100.00%	8000 VA			

NOTES:

PANEL: PP3D

LOCATION: MECH ROOM C406 | BUS RATING: 100.0 A | MAIN BREAKER: MLO
VOLTS: 208Y/120 | PHASES: 3 | WIRES: 4 | SCCR: EXISTING
MOUNTING: SURFACE | FED FROM: MDPA (70A BREAKER) | INTEGRAL SPD: NO | LUG ACCESSORIES:

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1						800	800										2
3	EXISTING LOAD	20	3	E	--			800	800			--	E	3	20	EXISTING LOAD	4
5										800	800						6
7						800	800										8
9	EXISTING LOAD	20	3	E	--			800	800			--	E	3	20	EXISTING LOAD	10
11										800	800						12
13						800	800										14
15	EXISTING LOAD	20	3	E	--			800	800			--	E	3	20	EXISTING LOAD	16
17										800	800						18
19						800	800										20
21	EXISTING LOAD	20	3	E	--			800	800			--	E	3	20	EXISTING LOAD	22
23										800	800						24
25						800	800										26
27	EXISTING LOAD	20	3	E	--			800	800			--	E	3	20	EXISTING LOAD	28
29										800	800						30
					TOTAL LOAD:	8000 VA		8000 VA		8000 VA							
					TOTAL AMPS	66.7 A		66.7 A		66.7 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 24 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 24 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 66.6 A
C	COOLING	0 VA	0.00%	0 VA			EMD CURRENT: 66.6 A
H	HEATING	0 VA	0.00%	0 VA			
O	OTHER	0 VA	0.00%	0 VA			
	EXISTING	24000 VA	100.00%	24000 VA			

NOTES:

ELP-3A	LAV	PP-3E
LP-2A	LP-2B	PP3D
LP-1C	LP-1B	

DLRGROUP
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STATE OF NEW YORK
PAUL H KEMPAINEN
109466
LICENSED PROFESSIONAL ENGINEER
01/15/2025

HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS

57-23140-00
ELECTRICAL SCHEDULES
E701.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_EL_24.rvt
1/10/2025 10:57:03 AM

PANEL: RP-1-1

LOCATION: ELEC. CL. C236 **VOLTS:** 208Y/120 **MOUNTING:** SURFACE
BUS RATING: 0.0 A **PHASES:** 3 **FED FROM:**
MAIN BREAKER: **WIRES:** 4 **INTEGRAL SPD:**
SCCR: **LUG ACCESSORIES:**

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1						0	0										2
3	SPARE	100	3		--			0	0			--		3	30	EXISTING LOAD	4
5										0	0						6
7	EXISTING LOAD	20	1		--	0	0					--		1	20	EXISTING LOAD	8
9	EXISTING LOAD	20	1		--			0	0			--		1	20	EXISTING LOAD	10
11	EXISTING LOAD	20	1		--					0	0	--		1	20	EXISTING LOAD	12
13	EXISTING LOAD	20	1		--	0	0					--		1	20	EXISTING LOAD	14
15	EXISTING LOAD	20	1		--			0	0			--		1	20	EXISTING LOAD	16
17	EXISTING LOAD	20	1		--					0	0	--		1	20	EXISTING LOAD	18
19	EXISTING LOAD	20	1		--	0	0					--		1	20	EXISTING LOAD	20
21	EXISTING LOAD	20	1		--			0	0			--		1	20	EXISTING LOAD	22
23	EXISTING LOAD	20	1		--					0	0	--		1	20	EXISTING LOAD	24
25	EXISTING LOAD	20	1		--	0	0					--		1	20	EXISTING LOAD	26
27	EXISTING LOAD	20	1		--			0	0			--		1	20	EXISTING LOAD	28
29	EXISTING LOAD	20	1		--					0	0	--		1	20	EXISTING LOAD	30
					TOTAL LOAD:	0 VA		0 VA		0 VA							
					TOTAL AMPS	0.0 A		0.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 0.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 0.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: RP-1-2

LOCATION: ELEC. CL. C236 **VOLTS:** 208Y/120 **MOUNTING:** SURFACE
BUS RATING: 225.0 A **PHASES:** 3 **FED FROM:**
MAIN BREAKER: **WIRES:** 4 **INTEGRAL SPD:**
SCCR: **LUG ACCESSORIES:**

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1						0	0					--		1	20	SPARE	2
3	SPARE	100	3		--			0	0			--		1	20	SPARE	4
5										0	0	--		1	20	SPARE	6
7	C214B RESTROOM HAND DRYER	20	1	NE	M	800	0					--		1	20	SPARE	8
9	C214A RESTROOM HAND DRYER	20	1	NE	M			800	0			--		1	20	SPARE	10
11	C214A RESTROOM HAND DRYER	20	1	NE	M					800	0	--		1	20	SPARE	12
13	C216B RESTROOM HAND DRYER	20	1	NE	M	0	0					--		1	20	SPARE	14
15	C216B RECEPTS	20	1	NE	R			360	0			--		1	20	SPARE	16
17	C214A RECEPTS	20	1	NE	R					360	0	--		1	20	SPARE	18
19	C214B RECEPTS	20	1	NE	R	360	0					--		1	20	SPARE	20
21	SPARE	20	1		--			0	0			--		2	20	SPARE	22
23	SPARE	20	1		--					0	0						24
25	SPARE	20	1		--	0	0										26
27	SPARE	20	1		--			0	0			--		3	30	SPARE	28
29	SPARE	20	1		--					0	0						30
					TOTAL LOAD:	1160 VA		1160 VA		1160 VA							
					TOTAL AMPS	9.7 A		9.7 A		9.7 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	1080 VA	100.00%	1080 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 3 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 4 kVA
M	MOTOR	2400 VA	108.33%	2600 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 9.7 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 10.2 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: RP-2-1

LOCATION: ELEC. CL. C236 **VOLTS:** 208Y/120 **MOUNTING:** SURFACE
BUS RATING: 0.0 A **PHASES:** 3 **FED FROM:**
MAIN BREAKER: **WIRES:** 4 **INTEGRAL SPD:**
SCCR: **LUG ACCESSORIES:**

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1						0	--					--		1	--	SPACE ONLY	2
3	SPARE	100	3		--			0	--			--		1	--	SPACE ONLY	4
5										0	--	--		1	--	SPACE ONLY	6
7	SPARE	20	1		--	0	0					--		1	20	SPARE	8
9	SPARE	20	1		--			0	0			--		1	20	SPARE	10
11	SPARE	20	1		--					0	0	--		1	20	SPARE	12
13	SPARE	20	1		--	0	0					--		1	20	SPARE	14
15	SPARE	20	1		--			0	0			--		1	20	SPARE	16
17	SPARE	20	1		--					0	0	--		1	20	SPARE	18
19	SPARE	20	1		--	0	0					--		1	20	SPARE	20
21	SPARE	20	1		--			0	0			--		1	20	SPARE	22
23	SPARE	20	1		--					0	0	--		1	20	SPARE	24
25	SPARE	20	1		--	0	0										26
27	SPARE	20	1		--			0	0			--		3	30	SPARE	28
29	SPARE	20	1		--					0	0						30
					TOTAL LOAD:	0 VA		0 VA		0 VA							
					TOTAL AMPS	0.0 A		0.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 0.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 0.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: RP-2-2

LOCATION: ELEC. CL. C236 **VOLTS:** 208Y/120 **MOUNTING:** SURFACE
BUS RATING: 0.0 A **PHASES:** 3 **FED FROM:**
MAIN BREAKER: **WIRES:** 4 **INTEGRAL SPD:**
SCCR: **LUG ACCESSORIES:**

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	A		B		C		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1						0	--					--		1	--	SPACE ONLY	2
3	SPARE	100	3	E	--			0	--			--		1	--	SPACE ONLY	4
5										0	--	--		1	--	SPACE ONLY	6
7	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	8
9	EXISTING LOAD	20	1	E	--			0	0			--	E	1	20	EXISTING LOAD	10
11	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	12
13	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	14
15	EXISTING LOAD	20	1	E	--			0	0			--	E	1	20	EXISTING LOAD	16
17	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	18
19	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	20
21	EXISTING LOAD	20	1	E	--			0	0			--	E	1	20	EXISTING LOAD	22
23	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	24
25	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	26
27	EXISTING LOAD	20	1	E	--			0	0			--	E	1	20	EXISTING LOAD	28
29	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	30
31	SPARE	20	1		--	0	0										32
33	SPARE	20	1		--			0	0			--	E	3	30	EXISTING LOAD	34
35	SPARE	20	1		--					0	0						36
					TOTAL LOAD:	0 VA		0 VA		0 VA							
					TOTAL AMPS	0.0 A		0.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 0.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 0.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: LP-1-1

LOCATION: ELEC. CL. C236 **VOLTS:** 208Y/120 **MOUNTING:** SURFACE
BUS RATING: 0.0 A **PHASES:** 3 **FED FROM:**
MAIN BREAKER: 90 A **WIRES:** 4 **INTEGRAL SPD:**
SCCR: **LUG ACCESSORIES:**

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	A		B		C		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1						0	--					--	E	1	--	SPACE ONLY	2
3	EXISTING LOAD	90	3	E	--			0	--			--	E	1	--	SPACE ONLY	4
5										0	--	--	E	1	--	SPACE ONLY	6
7	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	8
9	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	10
11	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	12
13	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	14
15	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	16
17	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	18
19	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	20
21	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	22
23	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	24
25	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	26
27	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	28
29	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	30
31	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	32
33	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	34
35	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	36
37	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	38
39	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	40
41	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	42
					TOTAL LOAD:	0 VA		0 VA		0 VA							
					TOTAL AMPS	0.0 A		0.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 0.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 0.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: LP-1-2

LOCATION: ELEC. CL. C236 **VOLTS:** 208Y/120 **MOUNTING:** SURFACE
BUS RATING: 0.0 A **PHASES:** 3 **FED FROM:**
MAIN BREAKER: **WIRES:** 4 **INTEGRAL SPD:**
SCCR: **LUG ACCESSORIES:**

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	A		B		C		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1						0	0					--	E	1	20	EXISTING LOAD	2
3	EXISTING LOAD	90	3	E	--			0	0			--	E	1	20	EXISTING LOAD	4
5										0	0	--	E	1	20	EXISTING LOAD	6
7	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	8
9	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	10
11	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	12
13	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	14
15	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	16
17	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	18
19	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	20
21	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	22
23	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	24
25	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	26
27	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	28
29	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	30
31	EXISTING LOAD	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	32
33	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	34
35	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	36
37	EXISTING LOAD	15	1	E	--	0	0					--	E	1	20	EXISTING LOAD	38
39	EXISTING LOAD	15	1	E	--			0	0			--	E	1	20	EXISTING LOAD	40
41	SPARE	15	1	E	--					0	0	--	E	1	20	SPARE	42
					TOTAL LOAD:	0 VA		0 VA		0 VA							
					TOTAL AMPS	0.0 A		0.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 0.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 0.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: C&S2B

LOCATION: ELEC RM CC21O **VOLTS:** 208Y/120 **MOUNTING:** FLUSH
BUS RATING: 0.0 A **PHASES:** 3 **FED FROM:**
MAIN BREAKER: **WIRES:** 4 **INTEGRAL SPD:**
SCCR: **LUG ACCESSORIES:**

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	EXISTING LOAD	15	1		--	0	0					--		1	15	EXISTING LOAD	2
3	EXISTING LOAD	15	1		--			0	0			--		1	15	EXISTING LOAD	4
5	EXISTING LOAD	20	1		--					0	0	--		1	15	EXISTING LOAD	6
7	EXISTING LOAD	15	1		--	0	0					--		1	15	EXISTING LOAD	8
9	EXISTING LOAD	15	1		--			0	0			--		1	15	EXISTING LOAD	10
11	EXISTING LOAD	15	1		--					0	0	--		1	15	EXISTING LOAD	12
13	EXISTING LOAD	15	1		--	0	0					--		1	15	EXISTING LOAD	14
15	EXISTING LOAD	15	1		--			0	0			--		1	15	EXISTING LOAD	16
17	EXISTING LOAD	15	1		--					0	0	--		1	15	EXISTING LOAD	18
19	EXISTING LOAD	15	1		--	0	0					--		1	15	EXISTING LOAD	20
21	EXISTING LOAD	15	1		--			0	0			--		1	15	EXISTING LOAD	22
23	EXISTING LOAD	15	1		--					0	0	--		1	15	EXISTING LOAD	24
25	EXISTING LOAD	15	1		--	0	0					--		1	15	EXISTING LOAD	26
27	EXISTING LOAD	20	1		--			0	0			--		1	15	EXISTING LOAD	28
29	EXISTING LOAD	20	1		--					0	0	--		1	15	EXISTING LOAD	30
31	EXISTING LOAD	15	1		--	0	0					--		1	15	EXISTING LOAD	32
33	EXISTING LOAD	15	1		--			0	0			--		1	15	EXISTING LOAD	34
35	EXISTING LOAD	15	1		--					0	0	--		1	15	EXISTING LOAD	36
37	EXISTING LOAD	15	1		--	0	--					--		1	--	SPACE ONLY	38
					TOTAL LOAD:	0 VA		0 VA		0 VA							
					TOTAL AMPS	0.0 A		0.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 0.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 0.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

PANEL: LP1A

LOCATION: ELEC RM CC21O **VOLTS:** 208Y/120 **MOUNTING:** FLUSH
BUS RATING: 225.0 A **PHASES:** 3 **FED FROM:**
MAIN BREAKER: **WIRES:** 4 **INTEGRAL SPD:** NO
SCCR: **LUG ACCESSORIES:**

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	2
3	EXISTING LOAD	20	1	E	--			0	0			--	E	1	20	EXISTING LOAD	4
5	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	6
7	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	8
9	EXISTING LOAD	20	1	E	--			0	0			--	E	1	20	EXISTING LOAD	10
11	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	12
13	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	14
15	EXISTING LOAD	20	1	E	--			0	0			--	E	1	20	EXISTING LOAD	16
17	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	18
19	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	20
21	EXISTING LOAD	20	1	E	--			0	0			--	E	1	20	EXISTING LOAD	22
23	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	24
25	EXISTING LOAD	20	1	E	--	0	0					--	E	1	20	EXISTING LOAD	26
					TOTAL LOAD:	0 VA		0 VA		0 VA							
					TOTAL AMPS	0.0 A		0.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	CONNECTED LOAD: 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	ESTIMATED DEMAND: 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	CONNECTED CURRENT: 0.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	EMD CURRENT: 0.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

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01/15/2025

HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS

57-23140-00

ELECTRICAL SCHEDULES

E702.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_EL_24.rvt
1/10/2025 10:57:04 AM

PANEL: LP-BC-1

LOCATION: KNITWEAR LAB CC21
BUS RATING: 225.0 A
MAIN BREAKER:
VOLTS: 208Y/120
PHASES: 3
WIRES: 4
SCCR:
MOUNTING: SURFACE
FED FROM:
INTEGRAL SPD:
LUG ACCESSORIES:

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	EXISTING LOAD	15	1	E...	--	0	0					--	E	1	15	EXISTING LOAD	2
3	EXISTING LOAD	20	1	E	--			0	0			--	E	1	15	EXISTING LOAD	4
5	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	6
7	EXISTING LOAD	20	1	E	--	0	0					--	E	1	15	EXISTING LOAD	8
9	EXISTING LOAD	20	1	E	--			0	0			--	E	1	15	EXISTING LOAD	10
11	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	12
13	EXISTING LOAD	20	1	E	--	0	0					--	E	1	15	EXISTING LOAD	14
15	EXISTING LOAD	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	16
17	EXISTING LOAD	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	18
19	EXISTING LOAD	20	1	E	--	0	0										20
21	LOBBY FLOOR BOXES	20	1	N	R			360	0			--	E	3	15	EXISTING LOAD	22
23	SPARE	20	1	N	--					0	0						24
					TOTAL LOAD:	0 VA		360 VA		0 VA							
					TOTAL AMPS	0.0 A		3.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	360 VA	100.00%	360 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	**CONNECTED LOAD:** 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	**ESTIMATED DEMAND:** 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	**CONNECTED CURRENT:** 1.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	**EMD CURRENT:** 1.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:

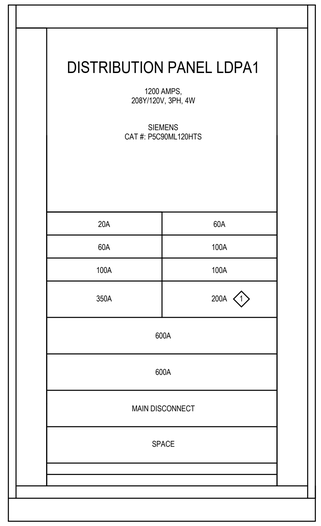
PANEL: LP-BC-2

LOCATION: KNITWEAR LAB CC21
BUS RATING: 225.0 A
MAIN BREAKER:
VOLTS: 208Y/120
PHASES: 3
WIRES: 4
SCCR:
MOUNTING: SURFACE
FED FROM:
INTEGRAL SPD:
LUG ACCESSORIES:

CKT	CIRCUIT DESCRIPTION	BKR TRIP	P	BKR TYPE	LOAD TYPE	PHASE A (VA)		PHASE B (VA)		PHASE C (VA)		LOAD TYPE	BKR TYPE	P	BKR TRIP	CIRCUIT DESCRIPTION	CKT
1	SPARE	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	2
3	SPARE	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	4
5	SPARE	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	6
7	SPARE	15	1	E	--	0	0					--	E	1	15	EXISTING LOAD	8
9	SPARE	20	1	E	--			0	0			--	E	1	15	EXISTING LOAD	10
11	SPARE	15	1	E	--					0	0	--	E	1	15	EXISTING LOAD	12
13	SPARE	20	1	E	--	0	0					--	E	1	15	EXISTING LOAD	14
15	SPARE	15	1	E	--			0	0			--	E	1	15	EXISTING LOAD	16
17										0	0	--	E	1	15	EXISTING LOAD	18
19	EXISTING LOAD	15	3	E	--	0	0					--	E	1	20	EXISTING LOAD	20
21								0	0			--	E	1	20	EXISTING LOAD	22
23	EXISTING LOAD	20	1	E	--					0	0	--	E	1	20	EXISTING LOAD	24
					TOTAL LOAD:	0 VA		0 VA		0 VA							
					TOTAL AMPS	0.0 A		0.0 A		0.0 A							

LOAD TYPE	LOAD DESCRIPTION	CONNECTED LOAD (VA)	DEMAND FACTOR	ESTIMATED DEMAND (VA)	DEMAND FACTOR NOTES	BKR TYPE	PANEL TOTALS
L	LIGHTING	0 VA	0.00%	0 VA	CONTINUOUS LOAD @ 125%	G = GFCI (5mA)	
R	RECEPTACLES	0 VA	0.00%	0 VA	FIRST 10KVA @ 100%, REMAINDER @ 50%	GP = GFP (30mA)	**CONNECTED LOAD:** 0 kVA
K	KITCHEN	0 VA	0.00%	0 VA	NON-DWELLING KITCHEN LOADS, NEC ART. 220	ST = SHUNT TRIP	**ESTIMATED DEMAND:** 0 kVA
M	MOTOR	0 VA	0.00%	0 VA	LARGEST MOTOR, NEC ART. 430	LO = LOCK OUT	**CONNECTED CURRENT:** 0.0 A
C	COOLING	0 VA	0.00%	0 VA		E = EXISTING	**EMD CURRENT:** 0.0 A
H	HEATING	0 VA	0.00%	0 VA		NE = NEW CIRCUIT ON EXISTING SPARE	
O	OTHER	0 VA	0.00%	0 VA		ER = EXISTING BKR REPLACED WITH SHOWN	
	EXISTING	0 VA	0.00%	0 VA		N = NEW BREAKER IN EXISTING SPACE	

NOTES:



1 NEW BREAKER IN EXISTING SPACE FOR CONNECTION TO LIGHTING RELAY PANEL. MATCH EXISTING BREAKER TYPE USED IN THE PANEL.

LIGHTING SEQUENCE OF OPERATIONS

1

ENERGY CODE: 2020 NYC ENERGY CONSERVATION CODE	CONTROL TYPE							
SPACE TYPE	OCCUPANCY (AUTO ON)	VACANCY (MANUAL ON)	MANUAL SWITCH	DIMMED	TIME OUT PERIOD (MIN)	TIMECLOCK CONTROL	NETWORKED	SCHEDULE NOTES
LOBBY	X				15	X		3
STAGEHOUSE			X	X				1
RESTROOMS	X				15			
DRESSING ROOM	X		X	X	15			2

GENERAL NOTES:
A. LIGHTING CONTROLS INDICATED ARE FOR REFERENCE ONLY AND MUST BE COORDINATED WITH CONTROLS SHOP DRAWINGS FOR EXACT QUANTITIES OF SENSORS, DEVICES, AND ALL NECESSARY CONNECTIVITY EQUIPMENT.
B. REFERENCE LIGHTING CONTROL ZONE DESIGNATIONS ON PLANS INDICATING WHERE EMERGENCY LIGHTING IS CONTROLLED WITH NORMAL LIGHTING. EMERGENCY LUMINAIRES SHALL TURN FULL "ON" UPON LOSS OF NORMAL POWER.
C. PROVIDE NUMBER OF ZONES AS INDICATED ON PLANS.
D. PROVIDE DIMMING PROTOCOL PER LUMINAIRE TYPE AS INDICATED ON LUMINAIRE SCHEDULE
E. COMPLETE COMMISSIONING OF CONTROL SYSTEM AND PROVIDE REPORT TO ENGINEER OF REVIEW
F. VERIFY ALL ON/OFF, OCCUPIED/UNOCCUPIED TIMES WITH OWNER PRIOR TO PROGRAMMING.
G. LIGHTING CONTROL SYSTEM IS DISTRIBUTED, NETWORKED CONTROL UTILIZING CENTRAL HUBS AND DISTRIBUTED MULTIZONE LOAD CONTROLLERS. PRIMARY USE OF WIRELESS SWITCHES AND SENSORS
H. TIE LIGHTING CONTROL SYSTEM INTO BAS SYSTEM
I. TIE LIGHTING CONTROL SYSTEM INTO FIRE ALARM SYSTEM

SCHEDULE NOTES:
1. ALL LIGHTING IN HAFT STAGEHOUSE TO BE CONTROLLED BY THE THEATRICAL CONTROL SYTEM.
2. DRESSING ROOM MIRROR FIXTURES TO BE CONTROLLED BY LOCAL DIMMING SWITCHES AT EACH MIRROR AND ARE OVERRIDED BY PILOT SWITCH OUTSIDE OF DRESSING ROOM DOOR.
3. PROVIDE BACNET CAPABILITIES FOR FUTURE CONNECTION TO BAS.

COM*check* Software Version COMcheckWeb

Interior Lighting Compliance Certificate

Project Information

Energy Code: 2021 IECC
Project Title: Haft AUD
Project Type: New Construction

Construction Site: Owner/Agent: Designer/Contractor:

Additional Efficiency Package(s)

Credits: 10.0 Required 0.0 Proposed

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts
1-DRESSING ROOM D36B (Retail:Dressing/Fitting Room)	237	0.51	121
2-AUDITORIUM LEVEL 3 (Common Space Types:Audience Seating Area - Other)	6085	0.33	2008
3-DRESSING ROOM D371 (Retail:Dressing/Fitting Room)	172	0.51	88
4-DRESSING ROOM D232 (Retail:Dressing/Fitting Room)	194	0.51	99
5-STAIR X (Common Space Types:Stairwell)	404	0.49	198
6-SECOND FLOOR LOBBY C214 (Common Space Types:Lobby - General)	1536	0.84	1290
7-RESTROOM2 C214B (Common Space Types:Restrooms)	244	0.63	154
8-RESTROOM1 C214A (Common Space Types:Restrooms)	330	0.63	208
9-SOUND STUDIO C322C (Common Space Types:Office - Enclosed)	126	0.74	93
10-SOUND STUDIO C322B (Common Space Types:Office - Enclosed)	92	0.74	68
11-PROJECTOR RM C322A (Common Space Types:Office - Enclosed)	311	0.74	230
12-DRESSING ROOM D235 (Retail:Dressing/Fitting Room)	170	0.51	87
13-ADA RESTROOM C216B (Common Space Types:Restrooms)	119	0.63	75
14-STAGE EXTEN. OPEN TO BELOW (Common Space Types:Auditorium Seating Area)	6085	0.61	3712
15-WAT TO CORRIDOR (Common Space Types:Corridor/Transition >=8 ft wide)	39	0.71	28
		Total Allowed Watts =	8458

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
1-DRESSING ROOM D36B (Retail:Dressing/Fitting Room)				
WL1: Other:	1	18	11	198
WL1: Other:	1	18	11	198
RD3: Other:	1	8	12	96
2-AUDITORIUM LEVEL 3 (Common Space Types:Audience Seating Area - Other)				
RD4: Other:	1	30	13	390
PD1: Other:	1	15	35	525

Project Title: Haft AUD Report date: 11/25/24
Data filename: Page 2 of 10

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
RD5: Other:	1	11	20	220
3-DRESSING ROOM D371 (Retail:Dressing/Fitting Room)				
WL1: Other:	1	13	11	143
RD3: Other:	1	8	12	96
WL1: Other:	1	13	11	143
4-DRESSING ROOM D232 (Retail:Dressing/Fitting Room)				
RD3: Other:	1	7	12	84
WL1: Other:	1	13	11	143
WL1: Other:	1	13	11	143
5-STAIR X (Common Space Types:Stairwell)				
RD2: Other:	1	3	16	48
RL1: Other:	1	24	6	144
RL1: Other:	1	16	6	96
RL1: Other:	1	24	6	144
6-SECOND FLOOR LOBBY C214 (Common Space Types:Lobby - General)				
RD1: Other:	1	15	16	240
RL1: Other:	1	29	6	174
RL1: Other:	1	7	6	42
RL1: Other:	1	10	6	60
RL1: Other:	1	28	6	168
RL1: Other:	1	13	6	78
RL1: Other:	1	35	6	210
RL1: Other:	1	16	6	96
7-RESTROOM2 C214B (Common Space Types:Restrooms)				
RD3: Other:	1	6	12	72
RL2: Other:	1	12	5	60
WL2: Other:	1	9	5	45
RL2: Other:	1	6	5	30
8-RESTROOM1 C214A (Common Space Types:Restrooms)				
RD3: Other:	1	7	12	84
RL2: Other:	1	11	5	55
WL2: Other:	1	9	5	45
RL2: Other:	1	6	5	30
9-SOUND STUDIO C322C (Common Space Types:Office - Enclosed)				
RL4: Other:	1	1	38	38
TRACK LIGHT: Wattage based on 10 feet of track	0	0	80	80
TRACK LIGHT: Wattage based on 6 feet of track	0	0	48	48
10-SOUND STUDIO C322B (Common Space Types:Office - Enclosed)				
RL4: Other:	1	1	38	38
TRACK LIGHT: Wattage based on 6 feet of track	0	0	48	48
11-PROJECTOR RM C322A (Common Space Types:Office - Enclosed)				
RL4: Other:	1	5	38	190
TRACK LIGHT: Wattage based on 10 feet of track	0	0	80	80
TRACK LIGHT: Wattage based on 12 feet of track	0	0	96	96
12-DRESSING ROOM D235 (Retail:Dressing/Fitting Room)				
RD3: Other:	1	7	12	84
WL1: Other:	1	13	11	143
WL1: Other:	1	13	11	143
13-ADA RESTROOM C216B (Common Space Types:Restrooms)				
RD3: Other:	1	4	12	48
WL2: Other:	1	4	5	20
RL2: Other:	1	5	5	25
14-STAGE EXTEN. OPEN TO BELOW (Common Space Types:Auditorium Seating Area)				
PD1: Other:	1	2	35	70
RD1: Other:	1	12	16	192

Project Title: Haft AUD Report date: 11/25/24
Data filename: Page 3 of 10

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
15-WAT TO CORRIDOR (Common Space Types:Corridor/Transition >=8 ft wide)				
RD3: Other:	1	1	12	12
			Total Proposed Watts =	5655

Interior Lighting PASSES: Design 33% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2021 IECC requirements in COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Paul Kempainen, PE — Name - Title
Paul Kempainen — Signature
11/25/2024 — Date

Project Title: Haft AUD Report date: 11/25/24
Data filename: Page 4 of 10

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STATE OF NEW YORK · PAUL H. KEMPAINEN · 109466 · LICENSED PROFESSIONAL ENGINEER
01/15/2025

HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

ELECTRICAL SCHEDULES

E703.00

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1/10/2025 10:57:05 AM

LUMINAIRE SCHEDULE

LUMINAIRE CRITERIA		PRODUCT INFORMATION						ELECTRICAL INFORMATION					ADDITIONAL INFORMATION			
TYPE	DESCRIPTION	MANUFACTURER	MODEL OR SERIES	LUMENS	FT	COLOR TEMP	CRI	DIMMING TYPE	POWER SUPPLY	VOLTAGE	WATTAGE	FT	MOUNTING	MOUNTING HEIGHT	COMMENTS	ACCESSORIES
PD1	WALL/PENDANT MOUNT LED DOWNLIGHT; NOMINAL 19 INCH HEIGHT BY 9 INCH DIAMETER; WIDE FLOOD OPTIC	KIRLIN	SYMPHONY SWR-09630-2500L-30K-(BLANK)-38-WALL)-SYM-DMXPS	2500		3000K	90+	DMX	REMOTE ELECTRONIC DIMMING DRIVER	UNV	35W		WALL OR PENDANT	N/A	PROVIDE WITH WALL CONFIGURATION OR PENDANT MOUNT CONFIGURATION AS REQUIRED BY EXISITING CONDITIONS	
PD2	SAME AS TYPE PD1 EXCEPT LAMPING	KIRLIN	SYMPHONY SWR-09630-5000L-30K-(BLANK)-38-WALL)-SYM-DMXPS	5000		3000K	90+	DMX	REMOTE ELECTRONIC DIMMING DRIVER	UNV	55W		WALL OR PENDANT	N/A	PROVIDE WITH WALL CONFIGURATION OR PENDANT MOUNT CONFIGURATION AS REQUIRED BY EXISITING CONDITIONS	
RD1	RECESSED LED ROUND DOWNLIGHT; NOMINAL 4 INCH APERATURE; DEEP REGRESS LENS FOR GLARE CONTROL; WOOD CEILING; WIDE FLOOD BEAM SPREAD	USAI	B4RC-M-16C3-30KH-40-S-BL-BL-NC-UNV-D6E	1424 LUMENS		3000K	90+	0-10V	INTEGRAL ELECTRONIC DIMMING DRIVER	UNV	16W		RECESSED	N/A		
RD2	SAME AS TYPE RD1 EXCEPT CEILING TYPE	USAI	B4RC-F-16C3-30KH-40-S-WH-WH-NC-UNV-D6E	1424 LUMENS		3000K	90+	0-10V	INTEGRAL ELECTRONIC DIMMING DRIVER	UNV	16W		RECESSED	N/A		
RD3	RECESSED LED ROUND DOWNLIGHT; NOMINAL 4 INCH APERATURE; 40 DEGREE BEAM SPREAD	USAI	B4RD-F-16C3-30KH-40-S-WH-WH-NC-UNV-D6E	1300 LUMENS		3000K	80+	N/A	INTEGRAL ELECTRONIC DRIVER	UNV	12W		RECESSED	N/A		
RD5	RECESSED LED DOWNLIGHT; NOMINAL 4 INCH APEARTURE; WIDE FLOOD DISTRIBUTION	KIRLIN	SRR-04100-2500L-30K-NFL-70T-DVR-1400A	2500 LUMENS		3000K	90+	DMX	REMOTE ELECTRONIC DIMMING DRIVER	UNV	35W		RECESSED	N/A		
RL1	COVE MOUNTED LINEAR LED; NOMINAL 0.5 INCH HEIGHT BY 0.5 INCH WIDTH BY LENGTHS AS SHOWN ON DRAWINGS	Q-TRAN	TH1SW-6.0HE-30-DRY-STD-DF-X-SRL-X-N/A-N/A-SST-ST-XX	696 LUMENS	FT	3000K	90+	0-10V	REMOTE ELECTRONIC DIMMING DRIVER	24V	6W	FT	COVE	N/A	PROVIDE WITH 0-10V POWER SUPPLY	
RL2	RECESSED LINEAR LED LUMINAIRE; PERIMETER SLOT WITH 3 INCH REGRESSED DIFFUSE LENS	PRUDENTIAL	BIONICPRO 4 SERIES	710 LUMENS	FT	3000K	90+	0-10V	INTEGRAL ELECTRONIC DIMMING DRIVER	120V	5W	FT	RECESSED	N/A		
RL4	RECESSED LED LINEAR LUMINAIRE; NOMINAL 4 FEET LENGTH BY 4 INCH WIDTH; DIFFUSE ACRYLIC LNS	AXIS	BEAM 4 RECESSED SERIES	4800 LUMENS		3000K	90+	0-10V	INTEGRAL ELECTRONIC DIMMING DRIVER	120V	38W		RECESSED	N/A		
RL5	SURFACE MOUNT LINEAR WALL GRAZE LUMINAIRE; NOMINAL 0.5 INCH HEIGHT BY 0.5 INCH WIDTH BY LENGTHS AS SHOWN ON DRAWINGS	LUMINII	KENDO GRAZE KGW-XX-HE64VHO-30K-W-A-BK	218 LUMENS	FT	3000K	90+	0-10V	REMOTE ELECTRONIC DIMMING DRIVER	120V	4.5W	FT	SURFACE	N/A		
TA1	SURFACE MOUNTED TRACK LED ADJUSTABLE LUMAINRE; NOMINAL 6 INCH LENGTH AND 3 INCH DIAMETER; SPOT OPTIC REFLECTOR WITH BLUE COLOR FILTER AND HEX CELL LOUVER	HALO	L-8-08-08-SP-90-30-MB-120V-SREF-808302-PK-F33-20-LND-LVR	850 LUMENS		3000K	90+	0-10V	INTEGRAL ELECTRONIC DIMMING DRIVER	120V	12W		SURFACE	N/A	PROVIDE WITH SURFACE MOUNT HALO SINGLE CIRCUIT POWER TRAC - LENGTHS AS SHOWN ON DRAWINGS - CONTRACTOR TO CONFIRM LENGTHS BEFORE ORDERING	PROVIDE WITH SPOT REFELECTOR; BLUE COLOR FILTER AND HEX CELL LOUVER.
WL1	SURFACE MOUNT LED LINEAR; NOMINAL 1 INCH HEIGHT BY 1 INCH WIDTH BY LENGTHS AS SHOWN ON DRAWINGS; ROUND ACRYLIC LENS; 1 INCH FLOATING CANOPY	PURE EDGE	TW2-T1-1RE-X-27D-X-	400 LUMENS	FT	3000K	90+	FORWARD PHASE	INTEGRAL ELECTRONIC DIMMING DRIVER	120V	11W	FT	WALL	REFER TO ELEVATIONS		
WL2	SURFACE MOUNT LED LINEAR RIGID TAPELIGHT MOUNTED IN CHANNEL BEHIND MIRROR; LENGTHS AS SHOWN ON DRAWINGS	Q-TRAN	Q-LINK-SST-DRY-30-DF-ST-XX	450 LUMENS	FT	3000K	90+	N/A	INTEGRAL ELECTRONIC DRIVER	120V	5W	FT	SURFACE	REFER TO ELEVATIONS		
X1	CEILING MOUNT EDGE LIT EXIT SIGN; RED LETTERS; ARROWS AS SHOWN ON DRAWINGS	LITHONIA	LRP-X-X-RMR-X-120/277	N/A		RED	N/A	N/A	INTEGRAL ELECTRONIC DRIVER	UNV	4W		SURFACE	N/A	PROVIDE SINGLE OR DOUBLE FACE AS REQUIRED	MAINTAIN 6 INCH SPACING FROM WALL

GENERAL NOTES:

A. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF ALL LUMINAIRES; INFORM LIGHTING DESIGNER OF CONFLICTS AND COORDINATE ALL LOCATIONS WITH DUCTWORK AND PIPING.

B. CONTRACTOR IS RESPONSIBLE TO REVIEW ARCHITECTRUAL DRAWINGS TO CONFIRM CEILING TYPES IN ALL ROOMS (ACCESSIBLE, EXPOSED OR "HARD") AND TO USE THE APPROPRIATE WIRING METHOD FOR EACH TYPE. ENSURE ALL J-BOXES ARE ACCESSIBLE AFTER ALL OTHER TRADE'S WORK IS COMPLETED. DO NOT LOCATE ANY J-BOXES ON "HARD" CEILINGS; ALL WIRING MUST BE ACCESSIBLE THROUGH LUMINAIRE ONLY IN "DAISY-CHAIN" METHOD OR WITH DEDICATED HOMERUNSTO EACH LUMINAIRE. J-BOXES MAY BE LOCATED ABOVE OTHER TRADE'S ACCESS DOORS IF FEASIBLE AND DOES NOT INTERFERE WITH ACCESS.

C. ALL LOW VOLTAGE CABLING TO LIGHTING FIXTURES AND CONTROL DEVICES SHALL BE PLENUM RATED.

D. EXIT SIGNS TO BE CIRCUITED TO NEAREST EMERGENCY CIRCUIT SERVING THE SPACE.

SCHEDULE NOTES

DLRGROUP

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STATE OF NEW YORK
PAUL H KEMPARKER
109466
LICENSED PROFESSIONAL ENGINEER
01/15/2025

HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS
#3 01/23/25

57-23140-00

LIGHTING SCHEDULES

EL701.00

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TELECOM ABBREVIATIONS

#	NUMBER
&	AND
@	AT
ACT	ACOUSTIC CEILING TILE
ADA	AMERICANS WITH DISABILITY ACT
ADDN	ADDITION OR ADDITIONAL
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
ALS	ASSISTED LISTENING SYSTEM
ALT	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AP	WIRELESS ACCESS POINT
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
AUTO	AUTOMATIC
AWG	AMERICAN WIRE GAUGE
BAS	BUILDING AUTOMATION SYSTEM
BLDG	BUILDING
BMS	BUILDING MANAGEMENT SYSTEM
BSMT	BASEMENT
C	CONDUIT
CATV	CABLE / COMMUNITY ANTENNA TELEVISION
CCTV	CLOSED CIRCUIT TELEVISION
CF	CUBIC FEET
CKT	CIRCUIT
CL	CENTER LINE
CLG	CEILING
CM	CONSTRUCTION MANAGER
COMM	COMMUNICATIONS
CONC	CONCRETE
CONN(S)	CONNECTION(S)
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACT(OR)
CTR	CENTER
D	DEPTH
DC	DIRECT CURRENT
DEG	DEGREE
DEMO	DEMOLISH OR DEMOLITION
DET	DETAIL
DIA	DIAMETER
DIM	DIMENSION
DIV	SPECIFICATION DIVISION
DN	DOWN
DWG(S)	DRAWING(S)
E	EAST
EA	EACH
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
ENG	ENGINEER
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
EXIST	EXISTING
EXT	EXTERIOR
F.V.	FIELD VERIFY
FB	FLOOR BOX
FBO	FURNISHED BY OTHERS
FFE	FURNITURE FIXTURES & EQUIPMENT
FIN	FINISHED
FL	FLOOR
FT	FEET
FUT	FUTURE
GC	GENERAL CONTRACTOR
GOVT	GOVERNMENT
H	HEIGHT
HD	HIGH DEFINITION
HL	TO THE LEFT FROM AUDIENCE PERSPECTIVE
HORIZ	HORIZONTAL
HR	TO THE RIGHT FROM AUDIENCE PERSPECTIVE
HV	HIGH VOLTAGE
HZ	HERTZ (FREQUENCY)
i.e.	THAT IS
IBC	INTERNATIONAL BUILDING CODE
IC	INTERCOM
IN	INCH
INT	INTERIOR
JB	JUNCTION BOX
LB(S)	POUND(S)
LV	LOW VOLTAGE
M	THOUSAND
MAX	MAXIMUM
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
N	NORTH
N/A	NOT APPLICABLE
NEC	NATIONAL ELECTRIC CODE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OC	ON CENTER
OPP	OPPOSITE
OVHD	OVERHEAD
PA	PUBLIC ADDRESS
PAR	PARALLEL
PB	PULL BOX
PENT	PENTHOUSE
PERP	PERPENDICULAR
PLYWD	PLYWOOD
PNL	PANEL
POTS	PLAIN OLD TELEPHONE SERVICE
PWR	POWER
QTY	QUANTITY
RCP	REFLECTED CEILING PLAN
REF	REFERENCE
REQ(D)	REQUIRE(D)
REV	REVISION(S)
RM	ROOM
RND	ROUND
RSC	RIGID STEEL CONDUIT
S	SOUTH
SATV	SATELLITE TELEVISION
SBD	SCHEMATIC BLOCK DIAGRAM
SCHED	SCHEDULE
SCRN	PROJECTION SCREEN
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SL	TO THE LEFT FROM ACTOR PERSPECTIVE
SPEC	SPECIFICATION(S)
SPKR	SPEAKER
SR	TO THE RIGHT FROM ACTOR PERSPECTIVE
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SUSP	SUSPENDED
SWBD	SWITCHBOARD
SYM	SYMETRICAL
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TEMP	TERMPORARY
TGB	TELECOMMUNICATIONS GRONDING BUSBAR
TMGB	TELECOMMUNICATIONS MAIN GRONDING BUSBAR
TO	TELECOMMUNICATIONS OUTLET
TR	TELECOMMUNICATIONS ROOM
TV	TELEVISION
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITERS LABORATORIES
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
V	VOLT
VA	VOLT-AMPERE
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VTC	VIDEO TELECONFERENCING
W	WIRE
W	WEST
W	WATT
W/	WITH
W/O	WITHOUT
WA	TELECOMMUNICATIONS WORK AREA
WG	WIRE GUARD
WP	WEATHER-PROOF (NEMA 3R)

SHEET INDEX

TE001.00	TELECOM GENERAL NOTES, SYMBOLS & ABBREVIATIONS
TE102.00	LEVEL 02 TELECOM/ SECURITY PLAN
TE103.00	LEVEL 03 TELECOM/ SECURITY PLAN
TE103M.00	LEVEL 03M TELECOM/ SECURITY PLAN

TELECOM & SECURITY SYMBOLS

SECURITY

- CR — CARD READER
- SS — SECURITY SYSTEM CALL BUTTON
- I — VIDEO INTERCOM
- MD — MOTION DETECTOR
- K — SECURITY KEYPAD
- C — MAGNETIC CONTACT (DOOR POSTION SENSOR)
- ES — ELECTRIC STRIKE ON SECURITY ACCESS DOOR
- EL — ELECTRIC LATCH ON SECURITY ACCESS DOOR
- X — REQUEST-TO-EXIT MOTION SENSOR
- X — REQUEST-TO-EXIT BUTTON
- VIDEO CAMERA - CEILING
- VIDEO CAMERA - WALL
- DCP — DOOR CONTROL PANEL
- ACC — ACCESS CONTROL COMPUTER

COMMUNICATIONS

TELECOMMUNICATIONS OUTLETS: MOUNT 18-INCHES AFF, UNO, AND WITHIN 8-INCHES OF ADJACENT RECEPTACLE

- X — TELECOMMUNICATIONS OUTLET: X = QTY OF DATA JACKS
- X — FLUSH FLOOR BOX WITH TECHNOLOGY OUTLET: X = QTY OF DATA JACKS
- AP — WIRELESS ACCESS POINT, CEILING MOUNTED

TELECOMMUNICATION DEVICES: MOUNT 94-INCHES AFF, UNO

- P — CLOCK
- S — SPEAKER, WALL
- S — SPEAKER, CEILING
- C — INTERCOM CALLBACK STATION MOUNT 42-INCHES AFF

TELECOMMUNICATIONS ROOM EQUIPMENT:

- FLOOR-MOUNTED TELECOMMUNICATIONS RACK
- WALL-MOUNTED TELECOMMUNICATIONS RACK
- TELECOMMUNICATIONS GROUNDING BAR (TGB)
- PLYWOOD BACKBOARD, SIZE AS SHOWN
- WIRE CABLE TRAY, SIZE PER PLAN
- LADDER CABLE TRAY, SIZE PER PLAN

GENERAL SYMBOLS

- ? / ??? / SIM — DETAIL NUMBER / CROSS REFERENCE / SHEET NUMBER / SIMILAR OR TYPICAL REFERENCE
- ? / ??? / SIM — WALL SECTION
- ? / ??? / SIM — DETAIL REFERENCE
- SIM ? ??? ? ??? SIM — BUILDING SECTION
- BUILDING ELEVATION / INTERIOR ELEVATION
- XX / A11.X — CASEWORK ELEVATION
- NO — KEYNOTE
- ? — COLUMN GRID LINE
- ROOM NUMBER/NAME
- ? — DOOR NUMBER / INTERIOR WINDOW
- 11 — EXTERIOR WINDOW NUMBER
- ? — WALL TYPE
- Description — REVISION NUMBER

- EARTH
- GRAVEL
- SAND
- CONCRETE
- PRECAST CONCRETE
- STEEL
- GYM FLOOR
- WOOD (CONTINUOUS BLOCKING)
- WOOD (NON-CONTINUOUS BLOCKING)
- WOOD (TRIM/FINISH)
- GLASS
- STONE
- SHINGLES
- CONCRETE MASONRY UNIT
- BRICK VENEER
- STEEL (LARGE SCALE)
- PLYWOOD (LARGE SCALE)
- GYPSUM WALL BOARD
- BATT INSULATION
- RIGID INSULATION
- SPRAY FOAM INSULATION
- FIRE SAFING INSULATION
- PROTECTION BOARD
- CARPET (LARGE SCALE)
- ACOUSTIC TILE (LARGE SCALE)
- TILE (LARGE SCALE)

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TELECOM GENERAL NOTES, SYMBOLS & ABBREVIATIONS

TE001.00

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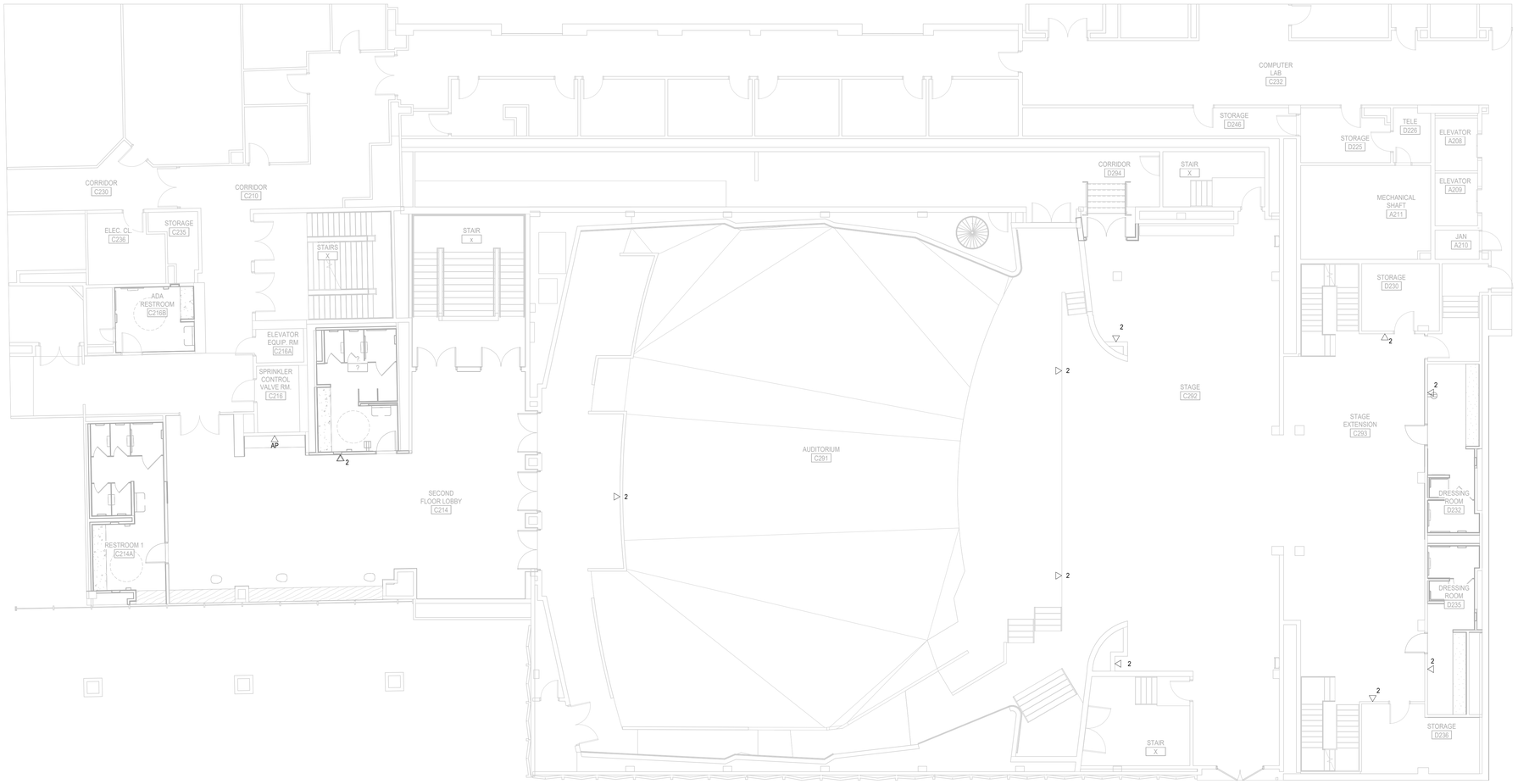

SECOND FLOOR TELECOM/SECURITY PLAN

SCALE: 1/8" = 1'-0"

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LEVEL 02
TELECOM/
SECURITY PLAN

TE102.00

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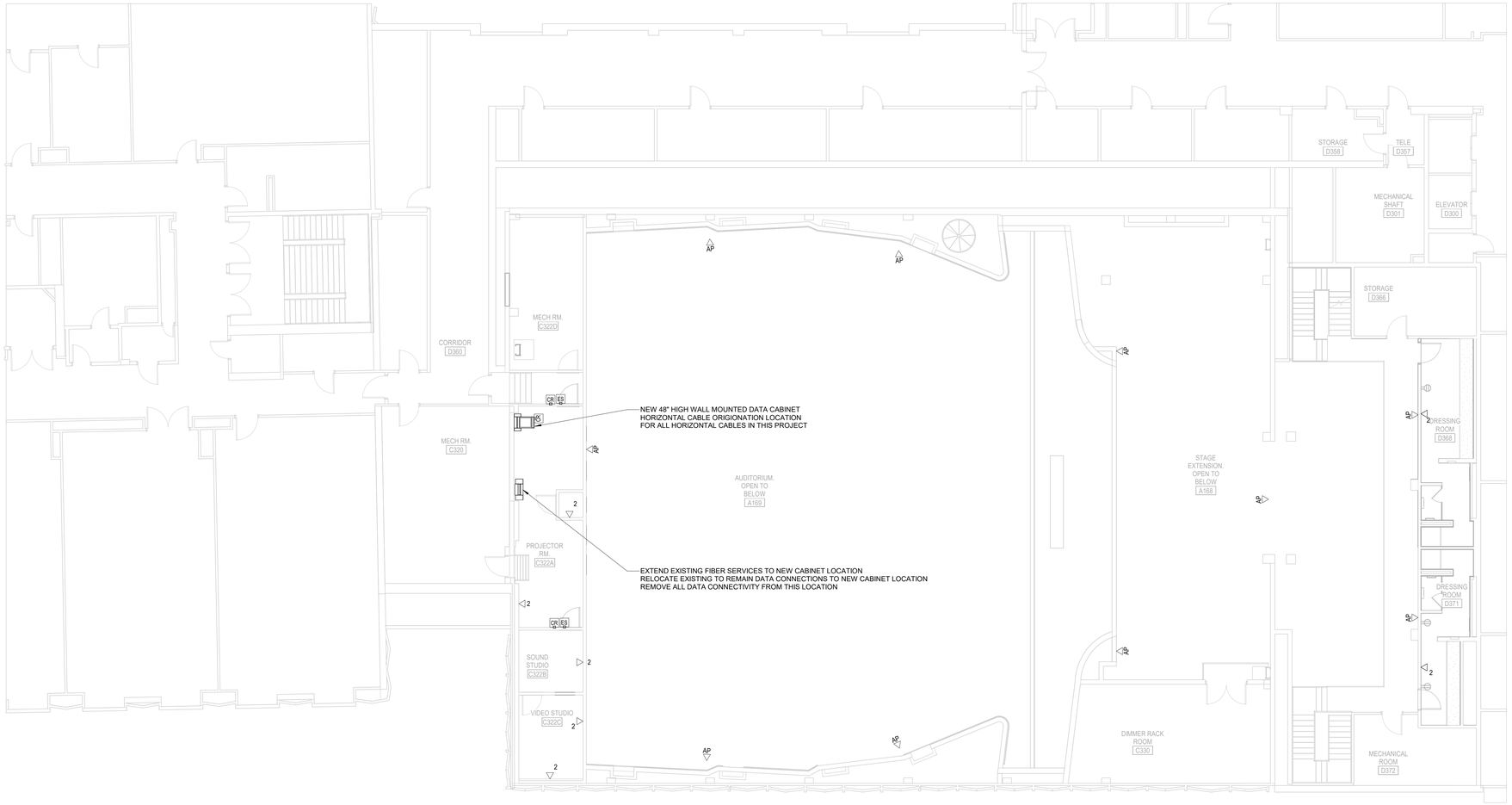

THIRD FLOOR TELECOM/SECURITY PLAN

SCALE: 1/8" = 1'-0"

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LEVEL 03
TELECOM/
SECURITY PLAN

TE103.00

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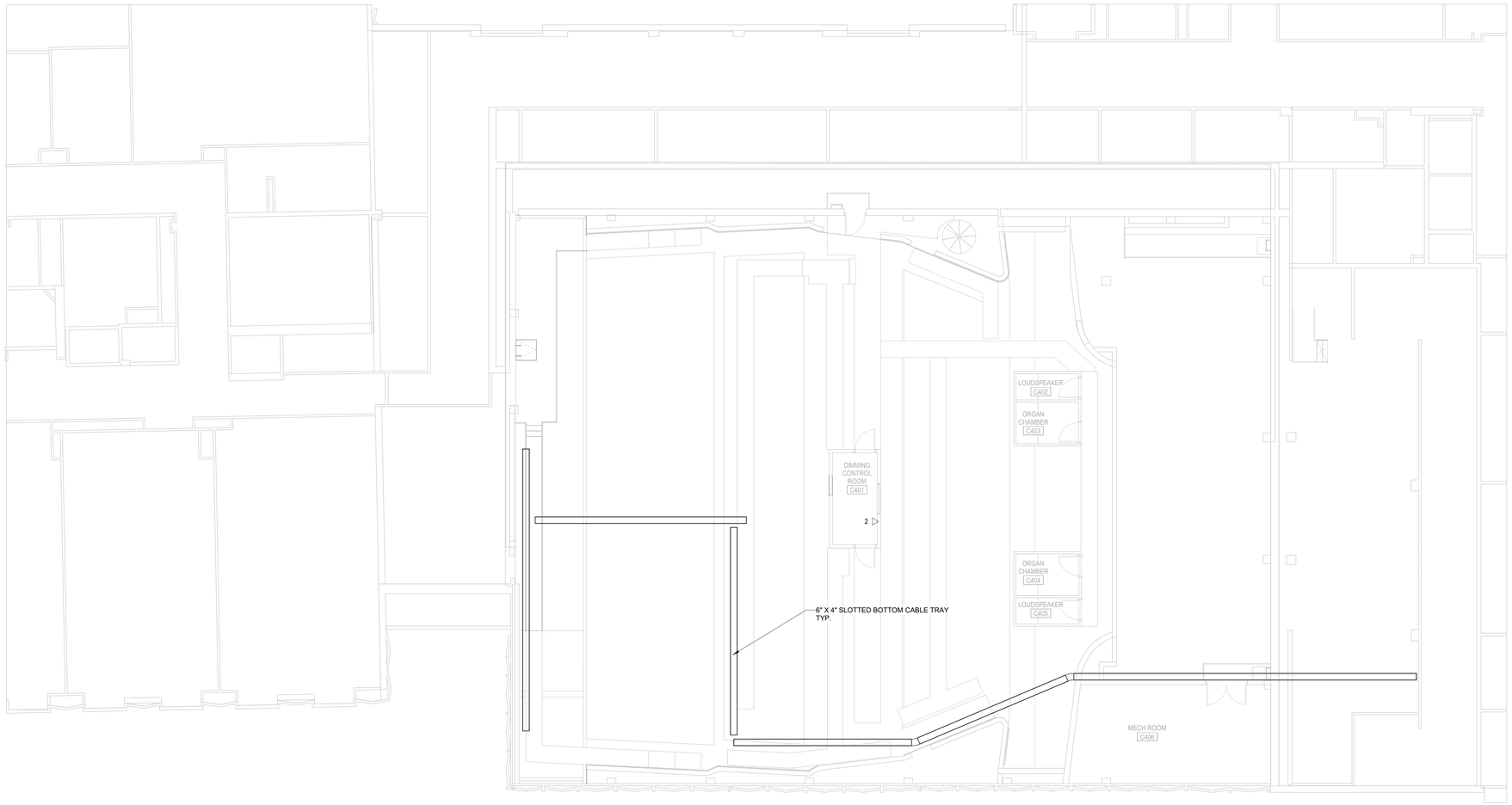

LEVEL 03M TELECOM PLAN

SCALE: 1/8" = 1'-0"

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LEVEL 03M TELECOM/ SECURITY PLAN

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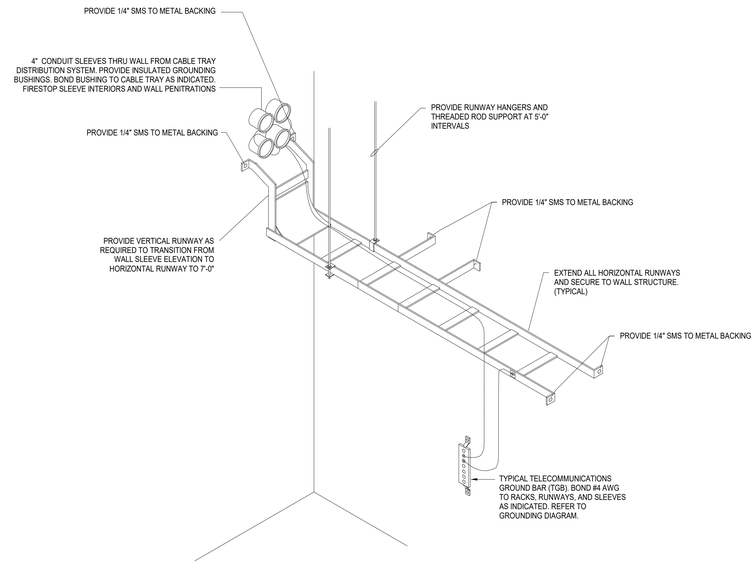
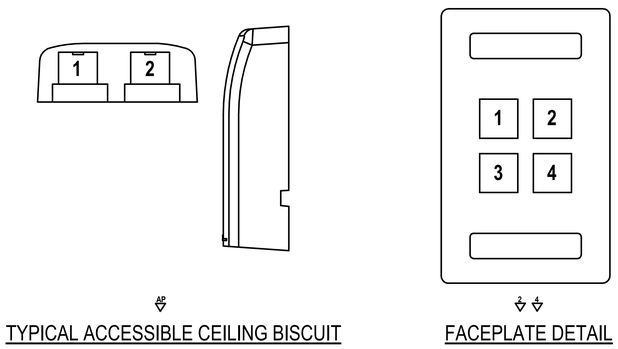


GENERAL NOTES

1. DETAIL INDICATES GENERAL RUNWAY ARRANGEMENT FOR ELEVATION CHANGE IN TELECOM ROOM. REFER TO FLOOR PLANS FOR CONFIGURATIONS & QUANTITIES.
2. CONTRACTOR SHALL PROVIDE ALL CABLE RUNWAYS, CONDUITS SLEEVES, FIRESTOPPING, GROUNDING, AND HARDWARE.

1 / TE601.00 TECHNOLOGY CABLE TRAY GROUNDING DETAIL
NO SCALE



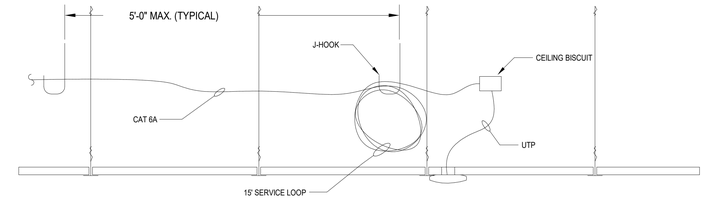
TYPICAL ACCESSIBLE CEILING BISCUIT

FACEPLATE DETAIL

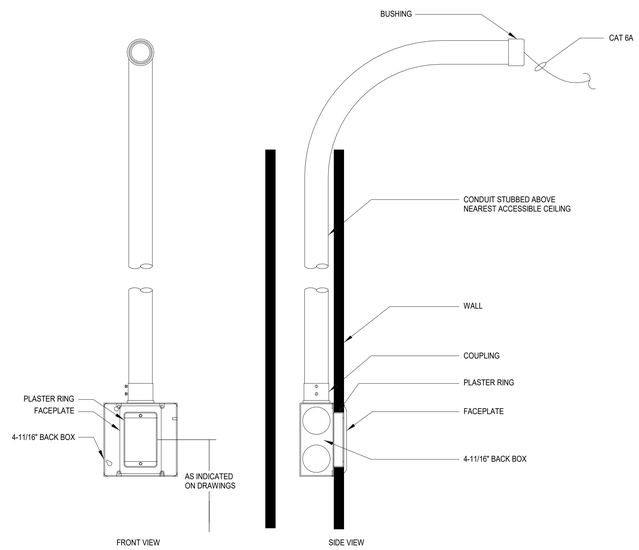
2 / TE601.00 DATA FACEPLATE DETAIL
NO SCALE

FACEPLATE TERMINATIONS

COMMENTS	BACK BOX	CONDUIT	TAG	JACK TYPE	JACK COLOR	CABLE TYPE	CABLE COLOR	USE
			2					
	4-11/16"	1-1/4"	1	CAT 6A RJ45	WHITE	CAT 6A UTP	BLUE	DATA
			2	CAT 6A RJ45	WHITE	CAT 6A UTP	BLUE	DATA
			3	BLANK INSERT	WHITE	-	-	-
			4	BLANK INSERT	WHITE	-	-	-
			4					
			1	CAT 6A RJ45	WHITE	CAT 6A UTP	BLUE	DATA
			2	CAT 6A RJ45	WHITE	CAT 6A UTP	BLUE	DATA
			3	CAT 6A RJ45	WHITE	CAT 6A UTP	BLUE	DATA
			4	BLANK INSERT	WHITE	CAT 6A UTP	BLUE	DATA
			AP					
	4-11/16"	1-1/4"	1	CAT 6A RJ45	WHITE	CAT 6A UTP	BLUE	DATA
			2	CAT 6A RJ45	WHITE	CAT 6A UTP	BLUE	DATA

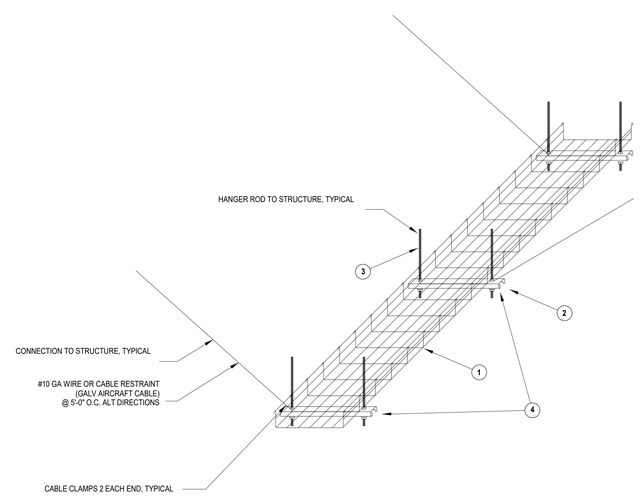


4 / TE601.00 TYPICAL ACCESSIBLE CEILING MOUNTED WAP DETAIL
NO SCALE



NOTE:
1. INSTALL 4" SQUARE BACK BOX WITH SINGLE GANG PLASTER RING AND 3/4" CONDUIT AT ALL CARD READER LOCATIONS.

5 / TE601.00 TYPICAL TELECOMMUNICATION BACK BOX DETAIL
NO SCALE



KEYED NOTES:

1. VERIFY CABLETRAY TYPE AND SIZE WITH DRAWINGS AND SPECIFICATIONS. REFER TO SPECIFICATIONS FOR ADDITIONAL MOUNTING REQUIREMENTS.
2. 3/4"H UNISTRUT. TO FASTEN, FIELD DRILL, AND ATTACH STRUT DIRECTLY TO UNDERSIDE OF TRAY BY MEANS OF NUT, BOLT, AND APPROPRIATE CLAMPING HARDWAYRE AS RECOMMENDED BY MANUFACTURER.
3. TYPICAL (2) 5/8" (MIN.) THREADED RODS PER UNISTRUT TRAPEZE. UTILIZE A DOUBLE NUT CONFIGURATION TO ASSURE MAINTENANCE OF SUPPORT. PROVIDE ANCHOR HARDWARE CAPABLE OF SUPPORTING THE CABLE TRAY AS RECOMMENDED BY THE MANUFACTURER.
4. PROVIDE A UNISTRUT TRAPEZE EVERY FIVE FEET, OR AT A SPAN NO GREATER SPAN THAN MAXIMUM SPAN RECOMMENDED BY MANUFACTURER WHICHEVER IS LESS.

NOTES:

1. CONTRACTOR SHALL BOND ALL CABLETRAY SO AS TO ASSURE A CONTINUOUS GROUND THROUGHOUT THE CABLETRAY SYSTEM. WHERE BONDING JUMPERS ARE UTILITZED, THE CONTRACTOR SHALL UTILIZE PAINT PIERCING WASHERS AS SPECIFIED IN SECTION 17070 TO BRIDGE ANY INCONTINUITIES. NOTE THAT GROUND MUST TEST OUT TO LESS THAN 5 OHMS PER TECHNOLOGY GROUNDING SPECIFICATIONS, AND SHALL BE CAPABLE OF BEARING A CONTINUOUS LOAD EQUIVALENT TO A #6 AWG WIRE.
2. CONTRACTOR SHALL COORDINATE CABLETRAY PATHWAY WITH ANY POTENTIAL IMPEDIMENT, INCLUDING, BUT NOT LIMITED TO, CONDUIT, PLUMBING, HVAC, STRUCTURAL, AND OTHER CABLE TRAY. CONTRACTOR SHALL ADAPT CABLETRAY PATHWAY AS REQUIRED, TO FULFILL THE INTENT OF THE DESIGN. THE CONTRACTOR SHALL NOTIFY THE ENGINEER WHERE REREOUTING OF THE CABLETRAY DUE TO FIELD CONDITIONS PROVIDES A SIGNIFICANT IMPACT ON CABLE LENGTHS ROUTED IN CABLETRAY. A SIGNIFICANT IMPACT SHALL BE CONSIDERED ANY INCREASE IN CABLE LENGTH OF MORE THAN 10 FEET. ADDITIONAL, THE CONTRACTOR SHALL MAINTAIN THE FOLLOWING CLEARANCES WHEN ROUTING CABLETRAY: 8 INCHES FROM ANY LIGHTING FIXTURE, 4 FEET FROM ANY TRANFORMER OR LARGE MOTOR, 12 INCHES FROM ANY FEEDER, 6 INCH CLEARANCE ABOVE CABLETRAY, AND CLEARANCE BELOW TO PROVIDE SUFFICIENT SPACE FOR MOUNTING HARDWARE AS INDICATED ON THIS DETAIL.
3. WHERE THREADED ROD IS GREATER THAN 12" LONG, PROVIDE P1000 UNISTRUT ROD STIFFENER @ 2" MAX. FROM EACH END OF THREADED ROD WITH SPRING NUT AND BOLT @ 12" O.C.. TYPICAL.

6 / TE601.00 TYPICAL TRAY MOUNTING DETAIL
NO SCALE

ADD #2

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HAFT PH II - INTERIOR
57-23140-00
343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS
#3 01/23/25

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TELECOM DETAILS

TE601.00

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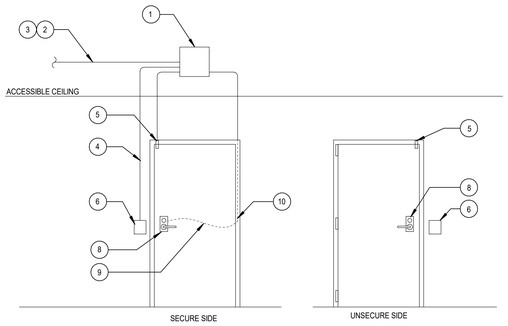

TYPICAL SOLID SINGLE DOOR

1. 12"x12"x6" J-BOX WITH TAMPER PROOF COVER (SECURE SIDE).
2. 1" EMT CONDUIT
3. MULTI-CONDUCTOR CABLE BELDEN - 658AFJ OR EQUAL.
4. 3/4" EMT CONDUIT, TYPICAL UNO.
5. RECESSED DOOR CONTACT.
6. CARD READER.
7. ELECTROMAGNETIC LOCK (SECURE SIDE OF DOOR).
8. ELECTRIFIED MORTISE LOCKSET WITH REQUEST TO EXIT SWTICH, SHOWN FOR COORDINATION.
9. WIRING TO ELECTRIFIED LOCKSET.
10. POWER TRANSFER HINGE, SHOWN FOR COORDINATION.

1 / TE602.00 SECURITY DOOR DETAILS
NO SCALE

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TELECOM DETAILS

TE602.00

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TA.103M.00	AUDIOVISUAL WIRING DEVICE PLAN, FOURTH LEVEL
TA.112.00	AUDIOVISUAL EQUIPMENT PLAN, SECOND LEVEL
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AUDIOVISUAL ABBREVIATIONS

#	NUMBER
&	AND
@	AT
ABV	ABOVE
AC	ABOVE COUNTER
ACT	ACOUSTIC CEILING TILE
ADA	AMERICANS WITH DISABILITY ACT
ADDN	ADDITION OR ADDITIONAL
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
ALS	ASSISTED LISTENING SYSTEM
ALT	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
AUTO	AUTOMATIC
AV	AUDIOVISUAL
AVIG	AUDIOVISUAL ISOLATED GROUND
AWG	AMERICAN WIRE GAUGE
BAS	BUILDING AUTOMATION SYSTEM
BLDG	BUILDING
BRI	BASIC RATE INTERFACE
BSMT	BASEMENT
BTU	BRITISH THERMAL UNIT
C	CONDUIT
CATV	CABLE / COMMUNITY ANTENNA TELEVISION
CCTV	CLOSED CIRCUIT TELEVISION
CKT	CIRCUIT
CL	CENTER LINE
CLG	CEILING
CM	CONSTRUCTION MANAGER
COMM	COMMUNICATIONS
CONC	CONCRETE
CONN(S)	CONNECTION(S)
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACT(OR)
CTR	CENTER
D	DEPTH
DB	DECIBEL
DC	DIRECT CURRENT
DEG	DEGREE
DEMO	DEMOLISH OR DEMOLITION
DET	DETAIL
DIA	DIAMETER
DIM	DIMENSION
DIV	SPECIFICATION DIVISION
DN	DOWN
DWG(S)	DRAWING(S)
E	EAST
EA	EACH
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EMT	ELECTRICAL METALLIC TUBING
ENG	ENGINEER
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
EXIST	EXISTING
EXT	EXTERIOR
F.V.	FIELD VERIFY
FB	FLOOR BOX
FBO	FURNISHED BY OTHERS
FFE	FURNITURE FIXTURES & EQUIPMENT
FIB	FIBER
FIN	FINISHED
FL	FLOOR
FT	FEET
FUT	FUTURE
GC	GENERAL CONTRACTOR
GOVT	GOVERNMENT
H	HEIGHT
HD	HIGH DEFINITION
HIL	TO THE LEFT FROM AUDIENCE PERSPECTIVE
HORIZ	HORIZONTAL
HR	TO THE RIGHT FROM AUDIENCE PERSPECTIVE
HV	HIGH VOLTAGE
HZ	HERTZ (FREQUENCY)
i.e.	THAT IS
IBC	INTERNATIONAL BUILDING CODE
IG	ISOLATED GROUND
IMC	INTERMEDIATE METAL CONDUIT
IN	INCH
INT	INTERIOR
IR	INFRARED
ISDN	INTEGRATED SERVICES DIGITAL NETWORK
JB	JUNCTION BOX
LAN	LOCAL AREA NETWORK
LB(S)	POUND(S)
LV	LOW VOLTAGE

AUDIOVISUAL ABBREVIATIONS

MATV	MASTER ANTENNA TELEVISION
MAX	MAXIMUM
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MIC	MICROPHONE
MIN	MINIMUM
MISC	MISCELLANEOUS
MON	MONITOR
MTD	MOUNTED
MTG	MOUNTING
N	NORTH
N/A	NOT APPLICABLE
NEC	NATIONAL ELECTRIC CODE
NIC	NOT IN CONTRACT
NOM	NOMINAL
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFE	OWNER FURNISHED EQUIPMENT
OFOI	OWNER FURNISHED OWNER INSTALLED
OI	OWNER INSTALLED
OPP	OPPOSITE
OVHD	OVERHEAD
PA	PUBLIC ADDRESS
PAR	PARALLEL
PB	PULL BOX
PENT	PENTHOUSE
PERP	PERPENDICULAR
PHX	PHOENIX CONNECTOR
PLYWD	PLYWOOD
PNL	PANEL
POTS	PLAIN OLD TELEPHONE SERVICE
PRI	PRIMARY RATE INTERFACE
PWR	POWER
QTY	QUANTITY
RAD	RADIUS
RCP	REFLECTED CEILING PLAN
REF	REFERENCE
REFL	REFLECTOR
REQ(D)	REQUIRE(D)
REV	REVISION(S)
RM	ROOM
RND	ROUND
RSC	RIGID STEEL CONDUIT
S	SOUTH
SATV	SATELLITE TELEVISION
SBD	SCHEMATIC BLOCK DIAGRAM
SCHED	SCHEDULE
SCRN	PROJECTION SCREEN
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SL	TO THE LEFT FROM ACTOR PERSPECTIVE
SPEC	SPECIFICATION(S)
SPKR	SPEAKER
SR	TO THE RIGHT FROM ACTOR PERSPECTIVE
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SUSP	SUSPENDED
SWBD	SWITCHBOARD
SYM	SYMETRICAL
TBC	TO BE COORDINATED
TBD	TO BE DETERMINED
TEMP	TERMPORARY
TRM	TERMINAL STRIP/LUG
TV	TELEVISION
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITERS LABORATORIES
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
V	VOLT
VA	VOLT-AMPERE
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VTC	VIDEO TELECONFERENCING
W	WIRE
W	WEST
W	WATT
W/	WITH
W/O	WITHOUT
WAN	WIDE AREA NETWORK
WG	WIRE GUARD
WP	WEATHER-PROOF (NEMA 3R)

AUDIOVISUAL CONNECTORS

	KEYSTONE	PANEL MOUNT	DESCRIPTION
			BLANK PLATE
AUDIO			3.5mm STEREO UNBALANCED AUDIO
AUDIO			RCA CONNECTOR (RECESSED)
AUDIO			RCA CONNECTOR (STEREO)
AUDIO			XLR PIN
AUDIO			XLR SOCKET
AUDIO			XLR COMBO RECEPTACLE
LOUDSPEAKER			TWIST-LOCK LOUDSPEAKER CONNECTOR - 2 POLE
LOUDSPEAKER			TWIST-LOCK LOUDSPEAKER CONNECTOR - 4 POLE
VIDEO			BNC CONNECTOR
VIDEO			MINI DISPLAYPORT / THUNDERBOLT
VIDEO			F-TYPE COAXIAL
VIDEO			HDMI
MULTIMEDIA			CAT6A CONNECTOR
DATA \ MULTIMEDIA			USB - TYPE A
DATA \ MULTIMEDIA			USB - TYPE B
DATA \ MULTIMEDIA			USB - TYPE C
FIBEROPTIC			LC DUPLEX FIBEROPTIC CONNECTOR
FIBEROPTIC			SMPTE 304M HYBRID CONNECTOR

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL

MOUNTING HEIGHT — XXXX — DEVICE TYPE

MOUNTING HEIGHT — XXXX-###-# — DEVICE ID, ROOM NUMBER, DEVICE TYPE

ALL DEVICES AT OUTLET HEIGHT UNLESS NOTED OTHERWISE.

REFER TO TYPICAL BACKBOX MOUNTING HEIGHT DETAIL FOR MOUNTING CONDITIONS.

AUDIOVISUAL DEVICE TYPE KEY

ALSx	ASSISTIVE LISTENING	JBx	JUNCTION BOX
ATx	ANTENNA	LPx	LOUDSPEAKER PANEL
AVx	AUDIOVISUAL PANEL	MTx	MIC TERMINATION
AVRx	AV EQUIPMENT RACK	PTx	POKE THRU
BTx	BLUETOOTH PLATE	SCx	PROJECTION SCREEN
CMx	CAMERA	VTx	VIDEO TERMINATION
CPx	CONTROL PANEL		
CSx	CEILING SPEAKER		
CTx	CONTROL DEVICE		
FBx	FLOOR BOX		'x' REPRESENTS UNIQUE TYPE IDENTIFIERS
FFx	FURNITURE FEED		
ICx	INTERCOM		

AUDIOVISUAL SYMBOLS

- AV WALL BOX
- AV CEILING BOX
- AV FLOOR BOX
- AV CEILING LOUDSPEAKER

POWER SYMBOLS

- AV ISOLATED GROUND INDICATOR
- WALL MOUNTED
- INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR
- CEILING MOUNTED
- INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR
- FLOOR MOUNTED
- INTEGRATED POWER INDICATOR
- 20A, 120V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 DUPLEX RECEPTACLE
- QUADRUPLEX RECEPTACLE - 20A, 120V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 QUAD RECEPTACLES
- CUSTOM POWER WIRING TO DEVICE/EQUIPMENT
- SPECIALTY POWER - REFER TO ELECTRICAL DOCUMENTS FOR RECEPTACLE TYPE

DATA SYMBOLS

- WALL MOUNTED DATA RECEPTACLE FOR LAN CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE (+18" AFF UNO).
- WALL MOUNTED DATA RECEPTACLE FOR LAN, NOT CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE - FOR REFERENCE ONLY.
- FLOOR MOUNTED DATA RECEPTACLE FOR LAN CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE.
- FLOOR MOUNTED DATA RECEPTACLE FOR LAN, NOT CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE - FOR REFERENCE ONLY.
- CEILING MOUNTED DATA RECEPTACLE FOR LAN CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE.
- CEILING MOUNTED DATA RECEPTACLE FOR LAN, NOT CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE - FOR REFERENCE ONLY.

AV ELECTRICAL LEGEND

△ AVIG RECEPTACLES SHALL USE COLORED RECEPTACLES WITH TRIANGLE MARKING.

CONNECTOR	DESCRIPTION
	DUPLEX POWER RECEPTACLE 15A/20A (NEMA 5-20R) (FOR REFERENCE ONLY)
	NEMA 6-20R (FOR REFERENCE ONLY)
	NEMA L21-30 (FOR REFERENCE ONLY)
	NEMA L5-30 (FOR REFERENCE ONLY)
	NEMA L6-20R (FOR REFERENCE ONLY)
	NEMA L6-30R (FOR REFERENCE ONLY)

AUDIOVISUAL CONDUIT REQUIREMENTS

AUDIOVISUAL SYSTEM WIRING GROUPS ARE COMPRISED ACCORDING TO THEIR NOMINAL VOLTAGE LEVELS.

NEVER INTERMIX GROUPS WITHIN A GIVEN CONDUIT.

GROUP A	0mV-180mV (MIC OR LINE LEVEL)
GROUP B	10V-30V (COM LEVEL)
GROUP C	10V-100V (LOUDSPEAKER LEVEL AND CONTROL WIRING)
GROUP D	VIDEO, DATA, COAX, ANTENNA, SYNC, AND DIGITAL CIRCUITS
GROUP E	FIBER OPTIC CABLE
GROUP X	SPARE FOR FUTURE USE

MINIMUM SEPARATION BETWEEN CONDUITS CONTAINING WIRING OF DIFFERENT GROUPS IS AS FOLLOWS:

	GROUP A	GROUP B	GROUP C	GROUP D	GROUP E
GROUP A	ADJACENT	6"	12"	12"	ADJACENT
GROUP B	-	ADJACENT	12"	6"	ADJACENT
GROUP C	-	-	ADJACENT	6"	ADJACENT
GROUP D	-	-	-	ADJACENT	ADJACENT
GROUP E	-	-	-	-	ADJACENT
GROUP X	ADJACENT	ADJACENT	ADJACENT	ADJACENT	ADJACENT

ALL CONDUIT GROUPS CAN BE ADJACENT WITHIN 6' OF THE DESTINATION AV BACKBOX. 90-DEGREE CROSSINGS ARE EXEMPT FROM SEPARATION REQUIREMENTS.

AUDIOVISUAL CONDUITS AND CONDUITS FOR OTHER ELECTRICAL SERVICES SHALL BE SEPARATED AS DEFINED BELOW:

NOTE: HEAVY CURRENT DEMANDS OR LONG RUNS MAY REQUIRE GREATER SEPARATION TO AVOID INTERFERENCE WITH AUDIO SIGNALS.

	GROUP A	GROUP B	GROUP C	GROUP D	GROUP E	GROUP X
ELECTRONIC DIMMER-CONTROLLED LIGHTING, ELECTRONICALLY SWITCHED POWER SERVICES	36"	12"	6"	12"	ADJACENT	12"
SCR CONTROLLED SERVICES	36"	12"	6"	12"	ADJACENT	12"
208/480 CIRCUITS	36"	12"	6"	12"	ADJACENT	12"
ALL OTHER ELECTRICAL SERVICES	24"	6"	ADJACENT	ADJACENT	ADJACENT	ADJACENT
SERVICE AND TRANSFORMER FEEDERS, TRANSFORMERS, MOTORS	50'	25'	15'	15'	ADJACENT	15'
NON-AV LOW VOLTAGE SIGNAL AND DATA SYSTEMS	ADJACENT	ADJACENT	ADJACENT	ADJACENT	ADJACENT	ADJACENT

1. CONDUIT SIZING ON TA7 SERIES DRAWINGS ARE NOMINAL, AND MUST BE VERIFIED BASED ON FIELD CONDITIONS.
2. AV CONDUITS SHALL BE INSTALLED PER REQUIREMENTS IN DIVISION 26 SPECIFICATIONS.
3. ALL AUDIOVISUAL CONDUITS SHALL BE FERROUS METALLIC CONDUITS REGARDLESS OF INSTALLATION CONDITIONS, LOCATIONS, AND MATERIALS PERMITTED BY OTHER SECTIONS.
4. AUDIOVISUAL CONDUIT PATHS SHALL FOLLOW THE SHORTEST ROUTE FROM SOURCE TO DESTINATION WHEREVER POSSIBLE.
5. AVOID PENETRATIONS OF ACOUSTICALLY SENSITIVE WALLS, CEILINGS, AND FLOORS.
6. PROVIDE PLASTIC BUSHINGS AT UNTERMINATED CONDUIT ENDS TO PROTECT CABLES FROM DAMAGE AT SHARP EDGE.
7. FURNISH PULL STRINGS IN EVERY CONDUIT FOR FUTURE CABLING. FURNISH JUNCTION BOXES, STUB-UPS, MOUNTING HARDWARE, ETC. AS REQUIRED.
8. ALL AUDIOVISUAL EQUIPMENT RACKS SHALL BE ELECTRICALLY ISOLATED FROM THE CONDUIT/RACEWAY SYSTEM WITH INSULATING CONDUIT CONNECTORS OR DIELECTRIC COUPLINGS AS REQUIRED.
9. LABEL INSIDE OF AV WIRING DEVICE BACK BOXES WITH WIRING DEVICE TYPE AND NUMBER ACCORDING TO PLANS AND SCHEDULES. INCLUDE MARKING OF CONDUIT GROUP DESIGNATION INSIDE THE BOXES AT EACH CONDUIT ENTRY.
10. CLEAR CONDUITS/RACEWAYS OF ANY DEBRIS AND SEAL OPENINGS WITH PLASTIC WRAP, CAP, OR TAPE. PROVIDE BLANK BOX COVERS FOR ALL BACK BOXES. PROVIDE CARDBOARD FILLERS IN BOXES AT PLASTER RING ADAPTERS TO MINIMIZE COLLECTION OF DEBRIS DURING CONSTRUCTION AND FINISHING.
11. FOR CONDUIT FILL REFER TO THE MOST RECENT VERSION OF NEC AS APPLICABLE:
    - 40% FILL FOR 3+ CABLES
    - 31% FILL FOR 2 CABLES
    - 53% FILL FOR A SINGLE CABLE
    - JAM RATIO SHALL BE CALCULATED USING THE CONDUIT ID/CABLE OD METHOD AND SHALL NOT FALL BETWEEN 2.8-3.2.
12. ANY EXCEPTIONS OR VARIANCES FROM THESE REQUIREMENTS DUE TO PROJECT CONDITIONS MUST BE APPROVED BY THE ARCHITECT PRIOR TO INSTALLATION.

GENERAL AUDIOVISUAL NOTES

1. SEE AUDIOVISUAL SYSTEM SPECIFICATIONS (SECTION 27 41 16 AND OTHER APPLICABLE SECTIONS) FOR WORK SCOPE DETAILS.
2. LINE VOLTAGE RECEPTACLES SHOWN IN AV WIRING DEVICES ARE PROVIDED AND WIRED BY THE ELECTRICAL CONTRACTOR.
3. PHYSICALLY SEPARATE ELECTRICAL RECEPTACLES AND WIRING FROM ALL LOW VOLTAGE WIRING BY MEANS OF A 1/16" THICK METALLIC BARRIER. RESIZE BACK BOX ACCORDINGLY IF BARRIER CANNOT BE ACCOMMODATED.
4. FACEPLATES FOR FLUSH BACK BOXES TO CONTAIN A 1/2" LIP ON ALL SIDES TO CONCEAL INSTALLATION CUTS.
5. FINAL CONNECTOR NUMBERING CONVENTION TO BE REVIEWED AND APPROVED PRIOR TO PANEL FABRICATION.
6. CONTRACTOR TO VERIFY ALL CONNECTORS, CONTROLS, ETC. ARE POSITIONED TO ALLOW REQUIRED CLEARANCES WITHIN BACK BOX DIMENSIONS AND PANEL MOUNT POINTS. BACK BOXES SHALL NOT BE MODIFIED TO ACCOUNT FOR PANEL CONNECTOR LAYOUT CLEARANCES.
7. LINE VOLTAGE POWER RECEPTACLES SHOWN ON TA SHEETS ARE FOR LOCATION REFERENCE ONLY - ADJACENT TO AV WIRING DEVICES. SEE ELECTRICAL DRAWINGS FOR CIRCUITING AND WIRING.
8. ALL ELECTRICAL CIRCUITS SERVING AV DEVICES (EXCEPT MOTORS AND LIFTS) SHALL BE TERMINATED ON DEDICATED AV PANEL BOARDS.
9. AVIG RECEPTACLES SHALL USE COLORED RECEPTACLES WITH TRIANGLE MARKING.

AUDIOVISUAL SYSTEM SCHEDULE OF RESPONSIBILITY

ITEMS TO BE FURNISHED AND INSTALLED	ELECTRICAL CONTRACTOR		AUDIOVISUAL CONTRACTOR		GENERAL CONTRACTOR / CONSTRUCTION MANAGER		N/A
	FURNISH	INSTALL*	FURNISH	INSTALL	FURNISH	INSTALL	
MAIN POWER SERVICE PANEL BOARDS AND CIRCUIT BREAKERS	X	X					
MAIN POWER SERVICE CONDUIT AND CONDUCTORS	X	X					
MAIN POWER SERVICE TERMINATIONS	X	X					
ELECTRICAL RECEPTACLES	X	X					
AVIG STANDARD LOAD CENTERS AND CIRCUIT BREAKERS	X	X					
AVIG STANDARD LOAD CENTER CONDUIT AND CONDUCTORS	X	X					
AVIG STANDARD LOAD CENTER TERMINATIONS	X	X					
AVIG BRANCH CIRCUIT CONDUIT AND CONDUCTORS	X	X					
AVIG BRANCH CIRCUIT RECEPTACLES AND TERMINATION	X	X					
AVIG CUSTOM SEQUENCING PANEL BOARD	X	X					
AVIG RACK MOUNT POWER DISTRIBUTION DEVICES (EG POWER STRIP, UPS)			X	X			
AVIG HARD-WIRED RACK MOUNT TERMINATIONS	X	X					
AVIG EQUIPMENT RACK TROUGHS AND BACKBOXES	X	X					
AVIG TRANSFORMERS	X	X					
STRUCTURAL RIGGING FOR LOUDSPEAKERS					X	X	
AV AND AVIG OUTLET DEVICE STANDARD BACK BOXES AND ENCLOSURES	X	X					
AV AND AVIG OUTLET DEVICE CUSTOM BACK BOXES AND ENCLOSURES		X	X				
AV AND AVIG OUTLET DEVICE CUSTOM WALL PLATES			X	X			
STRUCTURAL BACKING AND SUPPORTS FOR DISPLAYS AND WALL MTD PROJECTION SCREENS					X	X	
STRUCTURAL SUPPORTS FOR CEILING MTD PROJECTION SCREENS AND PROJECTORS					X	X	
STRUCTURAL BACKING AND SUPPORTS FOR LOUDSPEAKERS MOUNTING					X	X	
AUDIOVISUAL PROJECTION SCREENS		X	X	X			
PROJECTOR LIFTS		X	X	X			
AUDIOVISUAL LV/HV CONTROL INTERFACES		X	X	X			
AUDIOVISUAL SYSTEM FLOORPOCKET BACKBOXES (FLOORBOX)	X	X					
AUDIOVISUAL SYSTEM FLOORBOX COVER/LID	X	X					
AUDIOVISUAL SYSTEM FLOORBOX PLATES			X	X			
AUDIOVISUAL SYSTEM WALLBOX	X	X					
AUDIOVISUAL SYSTEM WALLBOX CONSTRUCTION COVERS	X	X					
AUDIOVISUAL SYSTEM WALLBOX FACEPLATES / CUSTOM PLATES			X	X			
CONDUIT, JUNCTION BOXES, AND RACEWAY FOR LOW VOLTAGE AUDIOVISUAL CABLES	X	X					
AUDIOVISUAL SYSTEM CONDUIT RISER DIAGRAM (SHOP DRAWINGS)	X		X				
LOW VOLTAGE AUDIOVISUAL CABLES AND CONNECTORS			X	X			
LOW VOLTAGE AUDIOVISUAL TERMINATIONS			X	X			
AUDIOVISUAL CABLE ROUTING DIAGRAM (SHOP DRAWINGS)			X				

*ELECTRICAL CONTRACTOR TO OBTAIN INSTALLATION CRITERIA FROM ARCHITECT AND/OR AUDIOVISUAL CONTRACTOR PRIOR TO INSTALLATION

NOTES

1. THIS SCHEDULE PROVIDES GENERAL RECOMMENDATIONS WHERE APPLICABLE TO THE PROJECT. FINAL DELINEATION OF SCOPE IS DETERMINED BY THE GENERAL CONTRACTOR OR CONSTRUCTION MANAGER. IF MODIFIED, PROVIDE AN UPDATED VERSION TO THE ARCHITECT AND OWNER.
2. ELECTRICAL CONTRACTOR TO FURNISH CONDUIT TO LOCATION OF FUTURE AUDIOVISUAL EQUIPMENT OR JUNCTION BOX INDICATED ON DRAWINGS.
3. IT/VOICE/DATA FACEPLATES AND TERMINATIONS TO BE FURNISHED BY THE TELECOM CONTRACTOR.

AUDIOVISUAL CABLE

(DIMENSIONS IN INCHES)

NAME	TYPE	DESCRIPTION	MFR.	PART #	GROUP	O.D. [in]
ANTENNA	ANTENNA CABLE	10 AWG RG-8 50 OHM COAX	BELDEN	7810R	D	0.403
AUDIO	MICROPHONE / LINE LEVEL AUDIO	22 AWG SHIELDED TWISTED PAIR	BELDEN	1800B	A	0.185
COM	PRODUCTION INTERCOM	18 AWG SHIELDED TWISTED PAIR	BELDEN	9460	B	0.230
CONTROL	RS-232 SERIAL COMM/RELAY	20 AWG STRANDED 5 CONDUCTOR, SHIELDED	BELDEN	9445	C	0.239
DATA	CAT6 UTP	23 AWG CATEGORY 6	BELDEN	2412	D	0.224
DATA-S	CAT6A F/UTP	23 AWG CATEGORY 6A, FOIL SHIELDED	BELDEN	10GX62F	D	0.300
DC POWER	DC POWER CABLE	SIZE WIRE ACCORDING TO AMPS, VOLTAGE, DISTANCE & LOAD	CONTRACTOR NOMINATED		C	-
FIBER-6	6-STRAND SM FIBER	OS2 SINGLEMODE FIBER, INDOOR RISER	BELDEN	FISD006R9	E	0.220
FIBER-24	24-STRAND SM FIBER	OS2 SINGLEMODE FIBER, INDOOR RISER	BELDEN	FISD024R9	E	0.325
FIBER-96	96-STRAND SM FIBER	OS2 SINGLEMODE FIBER, INDOOR RISER	BELDEN	FISD096RK	E	0.953
FIBER-144	144-STRAND SM FIBER	OS2 SINGLEMODE FIBER, INDOOR RISER	BELDEN	FISD144RK	E	1.076
HDBT	HDBASET MEDIA	23 AWG, 4K UHD MEDIA CABLE, FOIL SHIELDED	BELDEN	2183R	D	0.290
HDMI	DVI/HDMI VIDEO	HDMI CABLE ASSEMBLY	CONTRACTOR NOMINATED		D	-
IR	IR CONTROL	22 AWG 2 CONDUCTOR SHIELDED	BELDEN	5500FE	D	0.126
MIC-S	STAR QUAD MICROPHONE CABLE	20 AWG SHIELDED TWISTED 4 CONDUCTOR	CANARE	L-4E6AT	A	0.244
SDI-3G	DIGITAL COAX	18 AWG RG6 COAX	BELDEN	1694A	D	0.274
SDI-12G	DIGITAL COAX, 4K UHD 12G-SDI	18 AWG RG6 COAX	BELDEN	4694R	D	0.274
SPKR18-2	LOUDSPEAKER CABLE 18 AWG, 2 CONDUCTORS	STRANDED UNSHIELDED TWISTED PAIR	BELDEN	6300UE	C	0.154
SPKR18-4	LOUDSPEAKER CABLE 18 AWG, 4 CONDUCTORS	STRANDED UNSHIELDED TWISTED PAIR	BELDEN	6302UE	C	0.180
SPKR16-2	LOUDSPEAKER CABLE 16 AWG, 2 CONDUCTORS	STRANDED UNSHIELDED TWISTED PAIR	BELDEN	6200UE	C	0.176
SPKR14-2	LOUDSPEAKER CABLE 14 AWG, 2 CONDUCTORS	STRANDED UNSHIELDED TWISTED PAIR	BELDEN	5100UP	C	0.266
SPKR12-2	LOUDSPEAKER CABLE 12 AWG, 2 CONDUCTORS	STRANDED UNSHIELDED TWISTED PAIR	BELDEN	5000UP	C	0.312
SPKR12-4	LOUDSPEAKER CABLE 12 AWG, 4 CONDUCTORS	STRANDED UNSHIELDED TWISTED PAIR	BELDEN	(2x) 5000UP	C	(2x) 0.312
SPKR10-2	LOUDSPEAKER CABLE 10 AWG, 2 CONDUCTORS	STRANDED UNSHIELDED TWISTED PAIR	BELDEN	5T00UP	C	0.356
SPKR-UB	LOUDSPEAKER + 48V DC CABLE	COMPOSITE #16 PR + #20 PR INDIVIDUALLY SHIELDED PAIRS	BELDEN	3086A	C	0.398
USB	USB	USB CABLE	CONTRACTOR NOMINATED		D	-

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HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
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AUDIOVISUAL GENERAL NOTES

TA.001.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_TA_24.rvt
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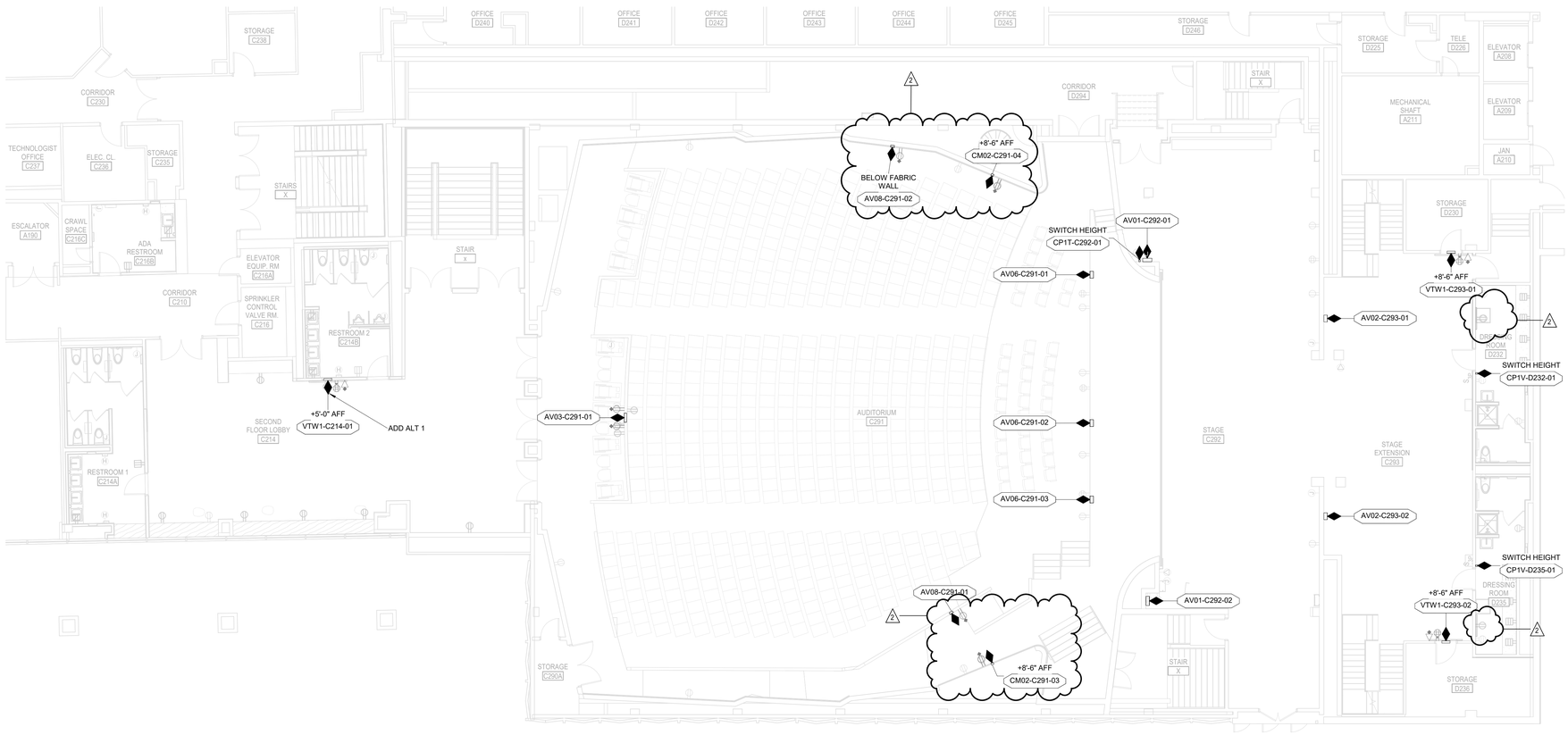

LEVEL 02 - WIRING DEVICE PLAN

SCALE: 1/8" = 1'-0"

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL

MOUNTING HEIGHT — XXXX — DEVICE TYPE

MOUNTING HEIGHT — XXXX-###-# — DEVICE ID, ROOM NUMBER, DEVICE TYPE

ALL DEVICES AT OUTLET HEIGHT UNLESS NOTED OTHERWISE.

REFER TO TYPICAL BACKBOX MOUNTING HEIGHT DETAIL FOR MOUNTING CONDITIONS.

AUDIOVISUAL DEVICE TYPE KEY

ALSx	ASSISTIVE LISTENING	JBx	JUNCTION BOX
ATx	ANTENNA	LPx	LOUDSPEAKER PANEL
AVx	AUDIOVISUAL PANEL	MTx	MIC TERMINATION
AVRx	AV EQUIPMENT RACK	PTx	POKE THRU
BTx	BLUETOOTH PLATE	SCx	PROJECTION SCREEN
CMx	CAMERA	VTx	VIDEO TERMINATION
CPx	CONTROL PANEL		
CSx	CEILING SPEAKER		
CTx	CONTROL DEVICE		
FBx	FLOOR BOX		
FFx	FURNITURE FEED		
ICx	INTERCOM		

'x' REPRESENTS UNIQUE TYPE IDENTIFIERS

AUDIOVISUAL SYMBOLS

- AV WALL BOX
- AV CEILING BOX
- AV FLOOR BOX
- AV CEILING LOUDSPEAKER

POWER SYMBOLS

- AV ISOLATED GROUND INDICATOR / WALL MOUNTED / INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR / CEILING MOUNTED / INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR / FLOOR MOUNTED / INTEGRATED POWER INDICATOR
- 20A, 120V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 DUPLEX RECEPTACLE
- QUADRUPLEX RECEPTACLE - 20A, 120V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 QUAD RECEPTACLES
- CUSTOM POWER WIRING TO DEVICE/EQUIPMENT
- SPECIALTY POWER - REFER TO ELECTRICAL DOCUMENTS FOR RECEPTACLE TYPE

DATA SYMBOLS

- WALL MOUNTED DATA RECEPTACLE FOR LAN CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE (+18" AFF UNO).
- WALL MOUNTED DATA RECEPTACLE FOR LAN, NOT CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE - FOR REFERENCE ONLY.
- FLOOR MOUNTED DATA RECEPTACLE FOR LAN CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE.
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AUDIOVISUAL WIRING DEVICE PLAN, SECOND LEVEL

TA.102.00

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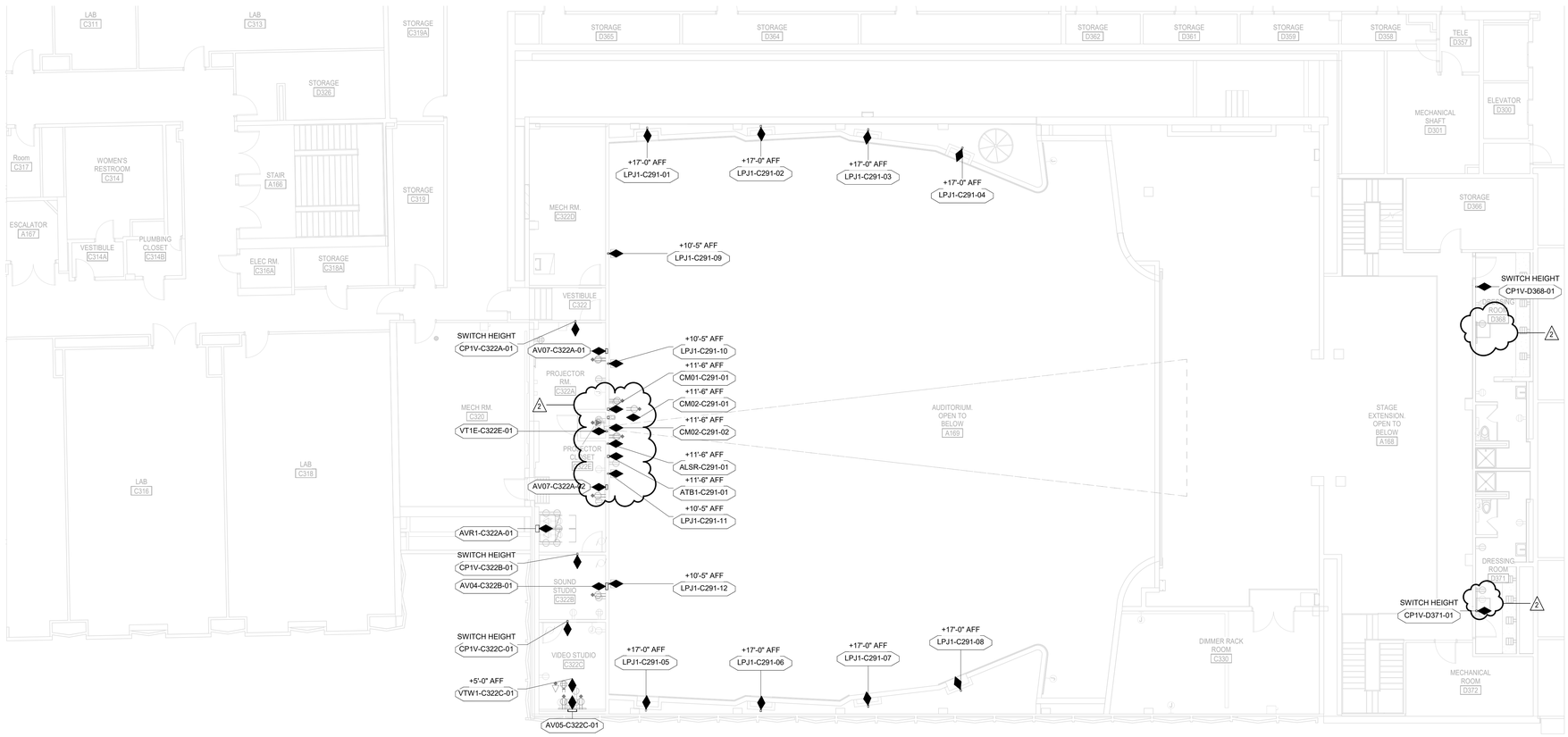
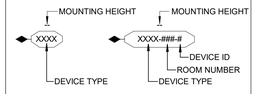


LEVEL 03 - WIRING DEVICE PLAN

SCALE: 1/8" = 1'-0"

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL



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REFER TO TYPICAL BACKBOX MOUNTING HEIGHT DETAIL FOR MOUNTING CONDITIONS.

AUDIOVISUAL DEVICE TYPE KEY

ALSx	ASSISTIVE LISTENING	JBx	JUNCTION BOX
ATx	ANTENNA	LPx	LOUDSPEAKER PANEL
AVx	AUDIOVISUAL PANEL	MTx	MIC TERMINATION
AVRx	AV EQUIPMENT RACK	PTx	POKE THRU
BTx	BLUETOOTH PLATE	SCx	PROJECTION SCREEN
CMx	CAMERA	VTx	VIDEO TERMINATION
CPx	CONTROL PANEL		
CSx	CEILING SPEAKER		
CTx	CONTROL DEVICE		
FBx	FLOOR BOX		
FFx	FURNITURE FEED		
ICx	INTERCOM		

'x' REPRESENTS UNIQUE TYPE IDENTIFIERS

AUDIOVISUAL SYMBOLS

- AV WALL BOX
- AV CEILING BOX
- AV FLOOR BOX
- AV CEILING LOUDSPEAKER

POWER SYMBOLS

- AV ISOLATED GROUND INDICATOR / WALL MOUNTED / INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR / CEILING MOUNTED / INTEGRATED POWER INDICATOR
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DATA SYMBOLS

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AUDIOVISUAL WIRING DEVICE PLAN, THIRD LEVEL

TA.103.00

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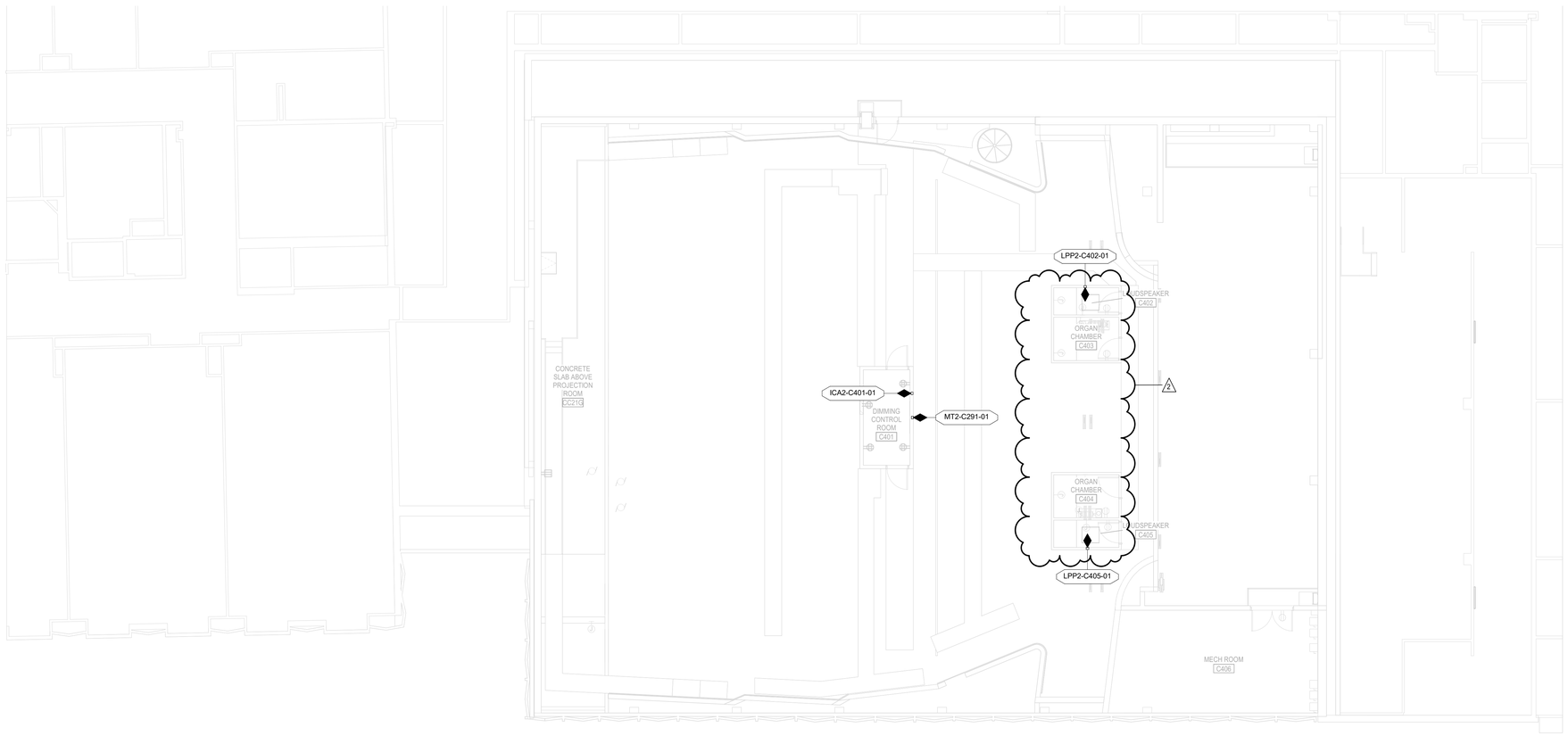
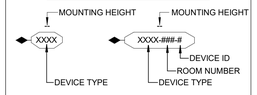


LEVEL 03M - WIRING DEVICE PLAN

SCALE: 1/8" = 1'-0"

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL



ALL DEVICES AT OUTLET HEIGHT UNLESS NOTED OTHERWISE.

REFER TO TYPICAL BACKBOX MOUNTING HEIGHT DETAIL FOR MOUNTING CONDITIONS.

AUDIOVISUAL DEVICE TYPE KEY

ALSx	ASSISTIVE LISTENING	JBx	JUNCTION BOX
ATx	ANTENNA	LPx	LOUDSPEAKER PANEL
AVx	AUDIOVISUAL PANEL	MTx	MIC TERMINATION
AVRx	AV EQUIPMENT RACK	PTx	POKE THRU
BTx	BLUETOOTH PLATE	SCx	PROJECTION SCREEN
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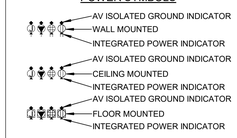
'x' REPRESENTS UNIQUE TYPE IDENTIFIERS

AUDIOVISUAL SYMBOLS

- AV WALL BOX
- AV CEILING BOX
- AV FLOOR BOX
- AV CEILING LOUDSPEAKER

POWER SYMBOLS



- 20A, 120V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 DUPLEX RECEPTACLE
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AUDIOVISUAL WIRING DEVICE PLAN, FOURTH LEVEL

TA.103M.00

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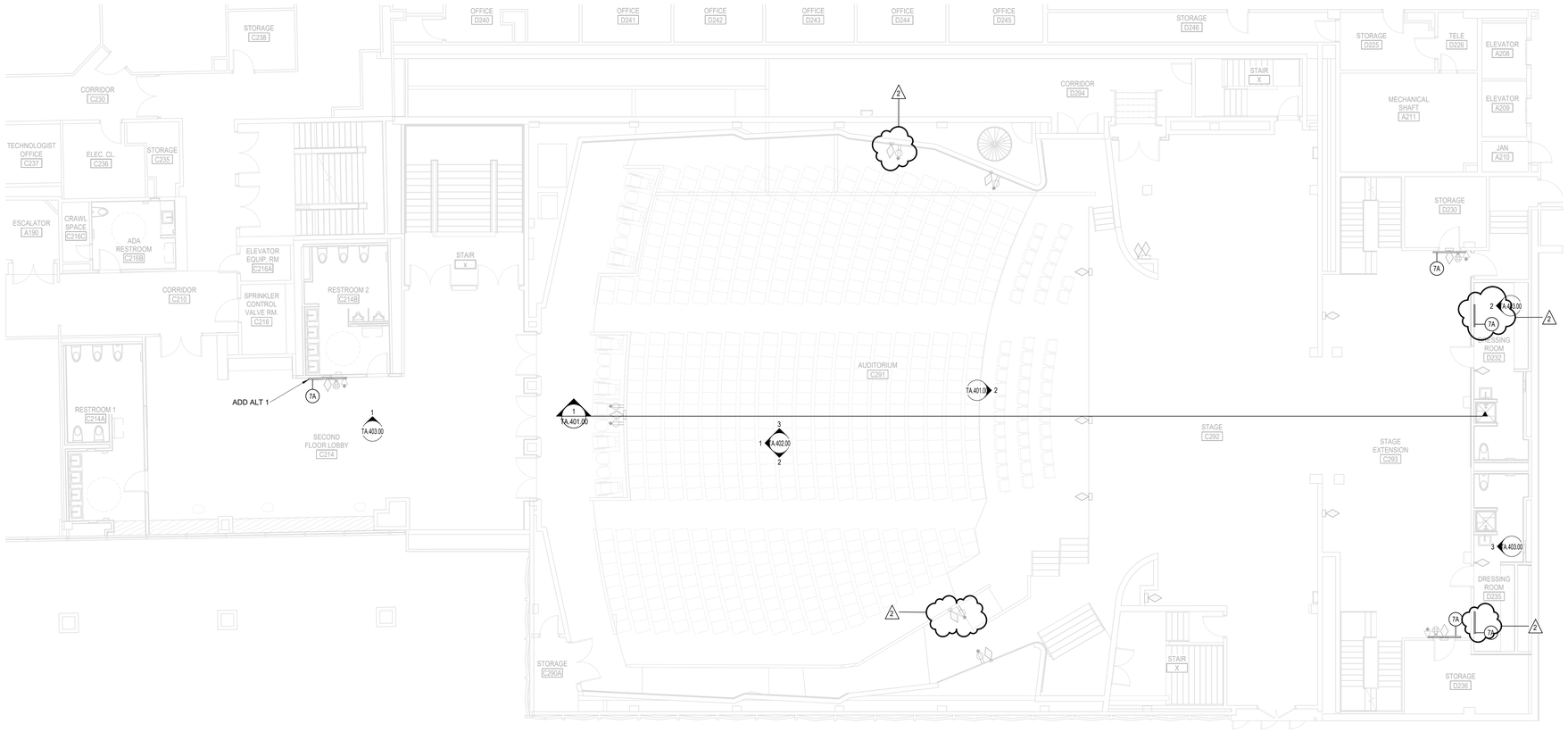

LEVEL 02 - EQUIPMENT PLAN

SCALE: 1/8" = 1'-0"

Keynote Legend

ALL ITEMS PER 274116 UNLESS NOTED OTHERWISE.

Key Value	Keynote Text
1D	PROJECTION SCREEN, LINE SET HUNG
2G	PROJECTOR IN ARCHITECTURAL ENCLOSURE
5A	CEILING LOUDSPEAKER
5C	PERFORMANCE POINT SOURCE LOUDSPEAKER
5D	PERFORMANCE LINE ARRAY ASSEMBLY
5G	SUBWOOFER
6A	AV EQUIPMENT RACK
7A	VIDEO DISPLAY, LANDSCAPE
9A	PTZ CAMERA
9C	INFRARED LOW-LIGHT CAMERA
11B	WIRELESS MICROPHONE ANTENNA

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AUDIOVISUAL EQUIPMENT PLAN, SECOND LEVEL

TA.112.00

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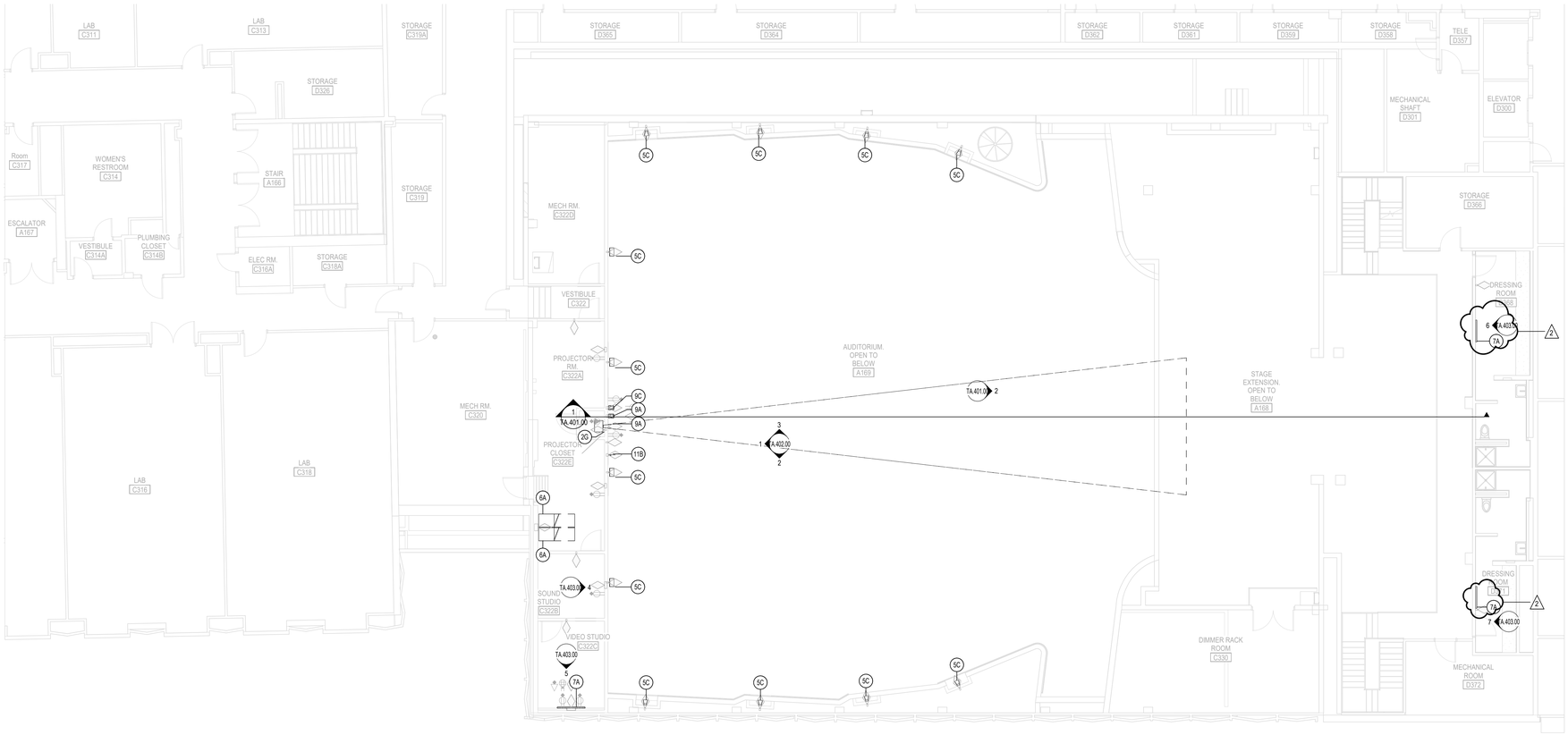

LEVEL 03 - EQUIPMENT PLAN

SCALE: 1/8" = 1'-0"

Keynote Legend

ALL ITEMS PER 274116 UNLESS NOTED OTHERWISE.

Key Value	Keynote Text
1D	PROJECTION SCREEN, LINE SET HUNG
2G	PROJECTOR IN ARCHITECTURAL ENCLOSURE
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AUDIOVISUAL EQUIPMENT PLAN, THIRD LEVEL

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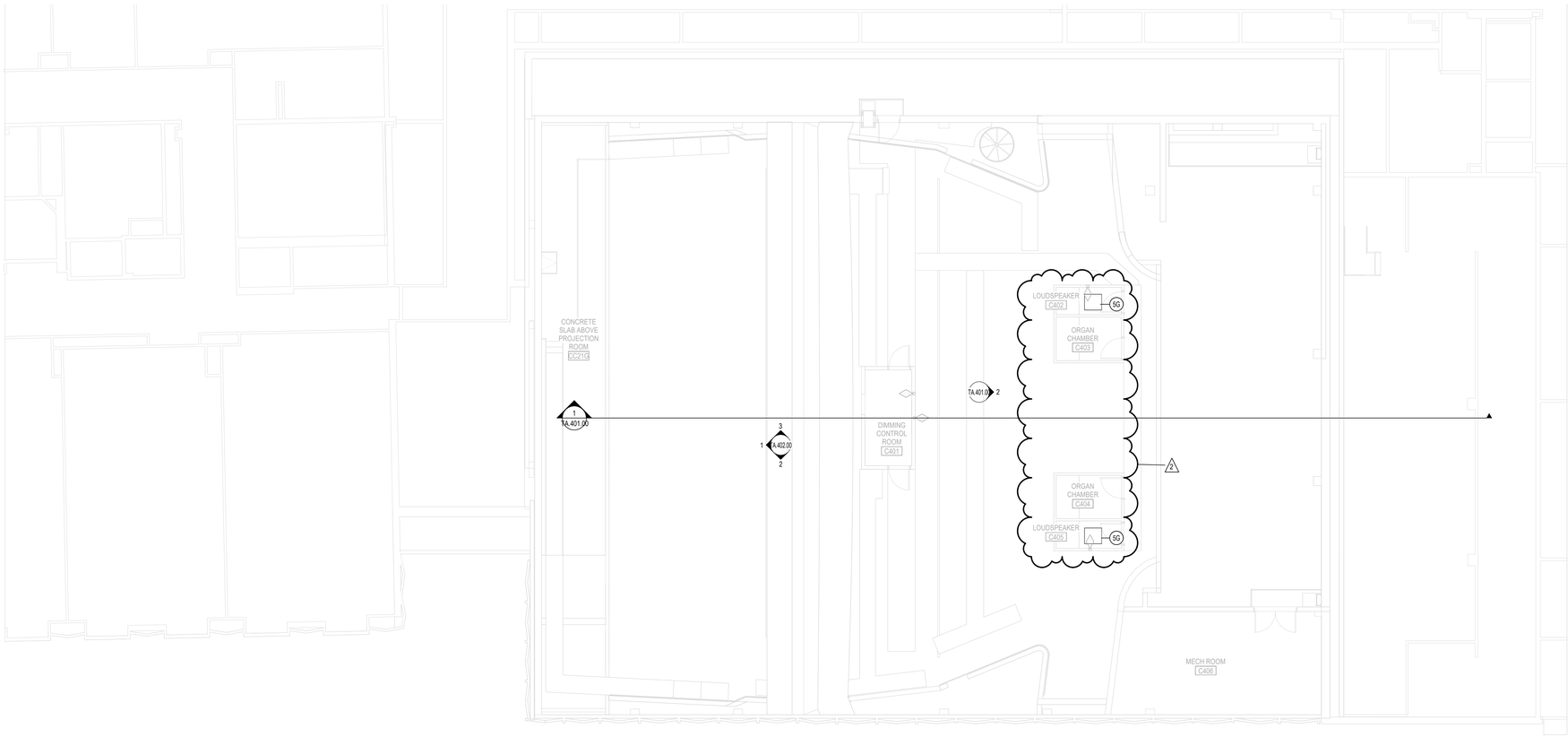

LEVEL 03M - EQUIPMENT PLAN

SCALE: 1/8" = 1'-0"

Keynote Legend

ALL ITEMS PER 274116 UNLESS NOTED OTHERWISE.

Key Value	Keynote Text
1D	PROJECTION SCREEN, LINE SET HUNG
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AUDIOVISUAL EQUIPMENT PLAN, FOURTH LEVEL

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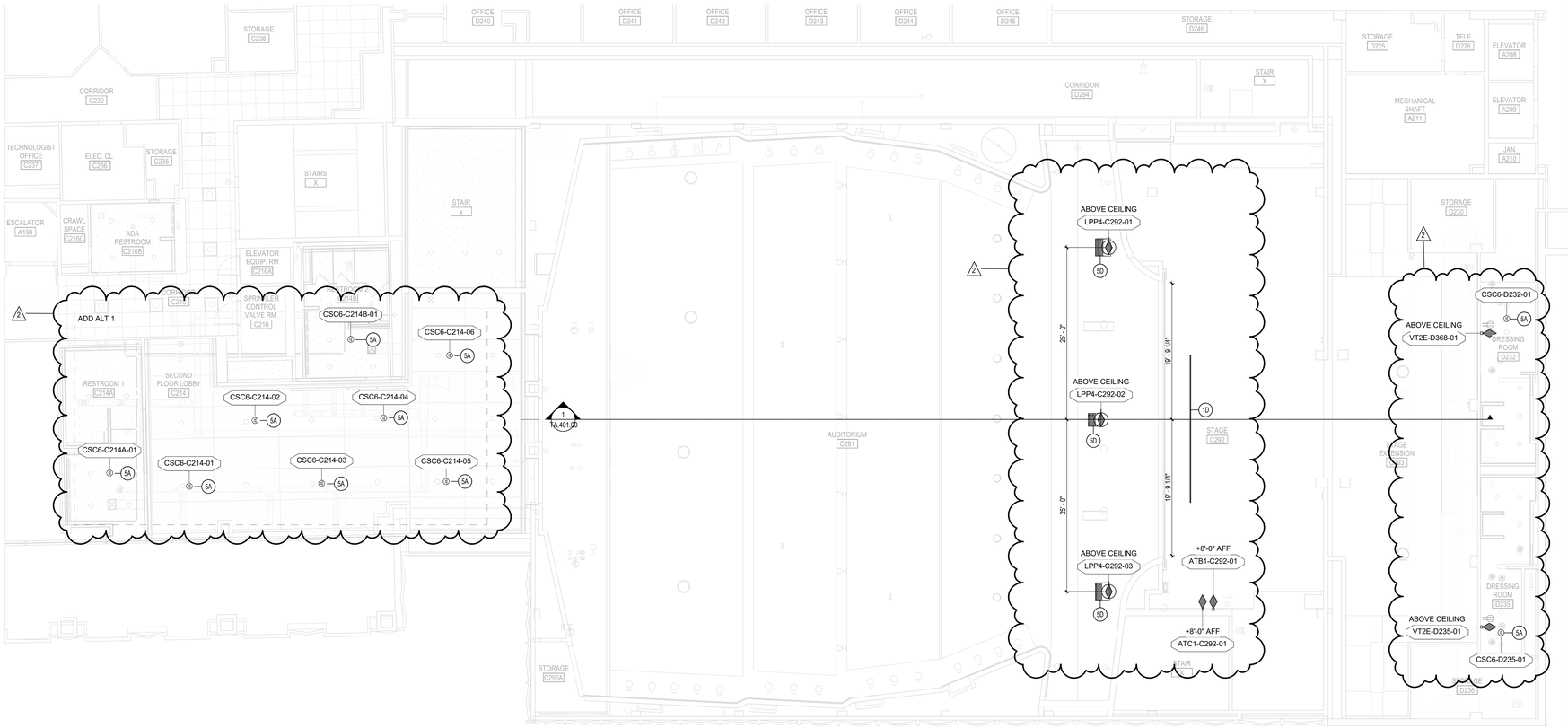
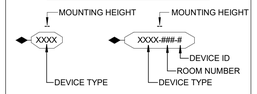


LEVEL 02 - REFLECTED CEILING PLAN

SCALE: 1/8" = 1'-0"

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL



ALL DEVICES AT OUTLET HEIGHT UNLESS NOTED OTHERWISE.

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AUDIOVISUAL DEVICE TYPE KEY

ALSx	ASSISTIVE LISTENING	JBx	JUNCTION BOX
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CTx	CONTROL DEVICE		
FBx	FLOOR BOX		
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'x' REPRESENTS UNIQUE TYPE IDENTIFIERS

AUDIOVISUAL SYMBOLS

- AV WALL BOX
- AV CEILING BOX
- AV FLOOR BOX
- AV CEILING LOUDSPEAKER

POWER SYMBOLS

- AV ISOLATED GROUND INDICATOR
- WALL MOUNTED
- INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR
- CEILING MOUNTED
- INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR
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- 20A, 120V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 DUPLEX RECEPTACLE
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Keynote Legend

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2G	PROJECTOR IN ARCHITECTURAL ENCLOSURE
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7A	VIDEO DISPLAY, LANDSCAPE
9A	PTZ CAMERA
9C	INFRARED LOW-LIGHT CAMERA
11B	WIRELESS MICROPHONE ANTENNA

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AUDIOVISUAL REFLECTED CEILING PLAN, SECOND LEVEL

TA.202.00

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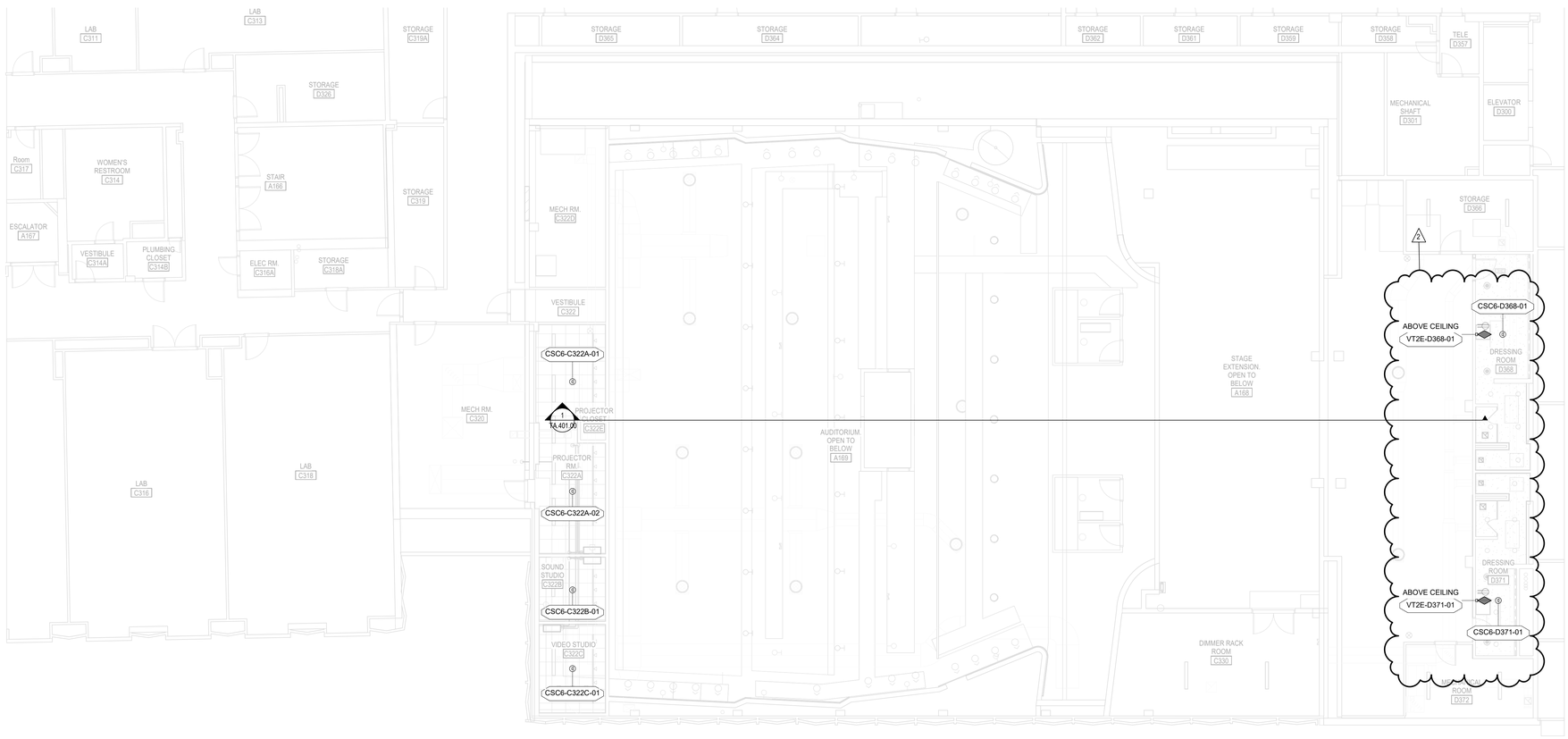

LEVEL 03 - REFLECTED CEILING PLAN

SCALE: 1/8" = 1'-0"

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL

MOUNTING HEIGHT — XXXX — DEVICE TYPE

MOUNTING HEIGHT — XXXX-###-# — DEVICE TYPE, ROOM NUMBER, DEVICE ID

ALL DEVICES AT OUTLET HEIGHT UNLESS NOTED OTHERWISE.

REFER TO TYPICAL BACKBOX MOUNTING HEIGHT DETAIL FOR MOUNTING CONDITIONS.

AUDIOVISUAL DEVICE TYPE KEY

ALSx	ASSISTIVE LISTENING	JBx	JUNCTION BOX
ATx	ANTENNA	LPx	LOUDSPEAKER PANEL
AVx	AUDIOVISUAL PANEL	MTx	MIC TERMINATION
AVRx	AV EQUIPMENT RACK	PTx	POKE THRU
BTx	BLUETOOTH PLATE	SCx	PROJECTION SCREEN
CMx	CAMERA	VTx	VIDEO TERMINATION
CPx	CONTROL PANEL		
CSx	CEILING SPEAKER		
CTx	CONTROL DEVICE		
FBx	FLOOR BOX		
FFx	FURNITURE FEED		
ICx	INTERCOM		

'x' REPRESENTS UNIQUE TYPE IDENTIFIERS

AUDIOVISUAL SYMBOLS

- AV WALL BOX
- AV CEILING BOX
- AV FLOOR BOX
- AV CEILING LOUDSPEAKER

POWER SYMBOLS

- AV ISOLATED GROUND INDICATOR / WALL MOUNTED / INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR / CEILING MOUNTED / INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR / FLOOR MOUNTED / INTEGRATED POWER INDICATOR
- 20A, 120V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 DUPLEX RECEPTACLE
- QUADRUPLEX RECEPTACLE - 20A, 120V, 2 POLE, 3 WIRE, GROUNDING TYPE, NEMA 5-20 QUAD RECEPTACLES
- CUSTOM POWER WIRING TO DEVICE/EQUIPMENT
- SPECIALTY POWER - REFER TO ELECTRICAL DOCUMENTS FOR RECEPTACLE TYPE

DATA SYMBOLS

- WALL MOUNTED DATA RECEPTACLE FOR LAN CONTAINED IN AUDIOVISUAL WIRING DEVICE PLATE (+18" AFF UNO).
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Keynote Legend

ALL ITEMS PER 274116 UNLESS NOTED OTHERWISE.

Key Value	Keynote Text
1D	PROJECTION SCREEN, LINE SET HUNG
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5A	CEILING LOUDSPEAKER
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9A	PTZ CAMERA
9C	INFRARED LOW-LIGHT CAMERA
11B	WIRELESS MICROPHONE ANTENNA

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AUDIOVISUAL REFLECTED CEILING PLAN, THIRD LEVEL

TA.203.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_TA_24.rvt
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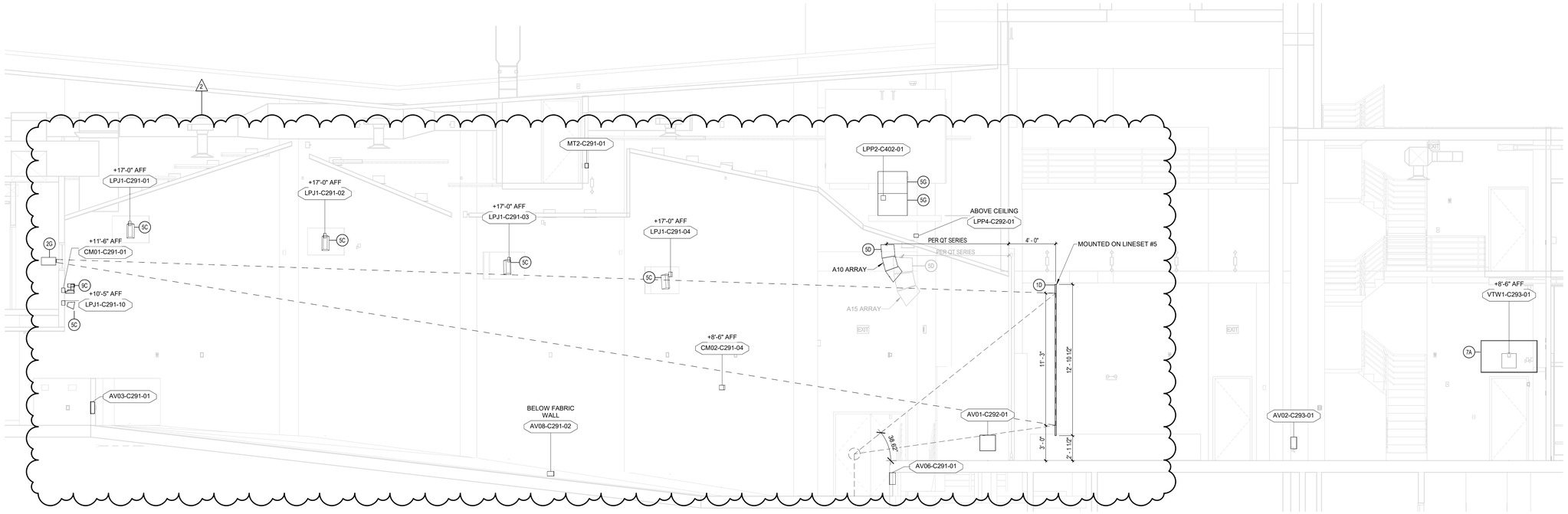
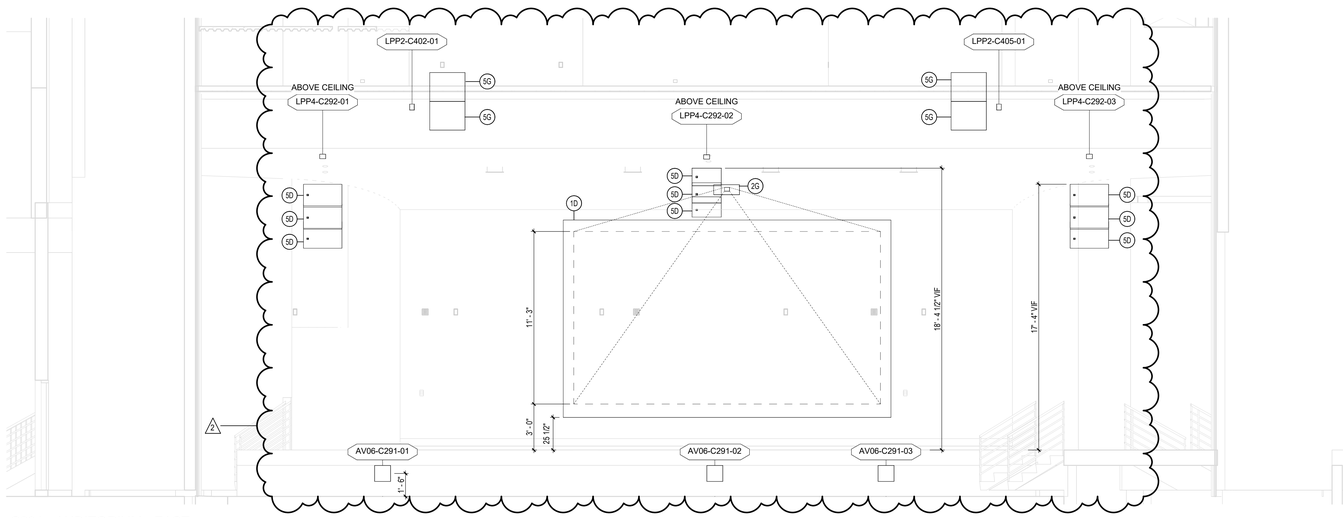


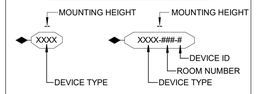
1 LONGITUDINAL CROSS SECTION
TA.401.00 SCALE: 1/4" = 1'-0"



2 C291 - AUDITORIUM - EAST
TA.401.00 SCALE: 1/4" = 1'-0"

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL



ALL DEVICES AT OUTLET HEIGHT UNLESS NOTED OTHERWISE.

REFER TO TYPICAL BACKBOX MOUNTING HEIGHT DETAIL FOR MOUNTING CONDITIONS.

AUDIOVISUAL DEVICE TYPE KEY

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AUDIOVISUAL SYMBOLS

- AV WALL BOX
- AV CEILING BOX
- AV FLOOR BOX
- AV CEILING LOUDSPEAKER

POWER SYMBOLS

- AV ISOLATED GROUND INDICATOR
- WALL MOUNTED
- INTEGRATED POWER INDICATOR
- AV ISOLATED GROUND INDICATOR
- CEILING MOUNTED
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Keynote Legend

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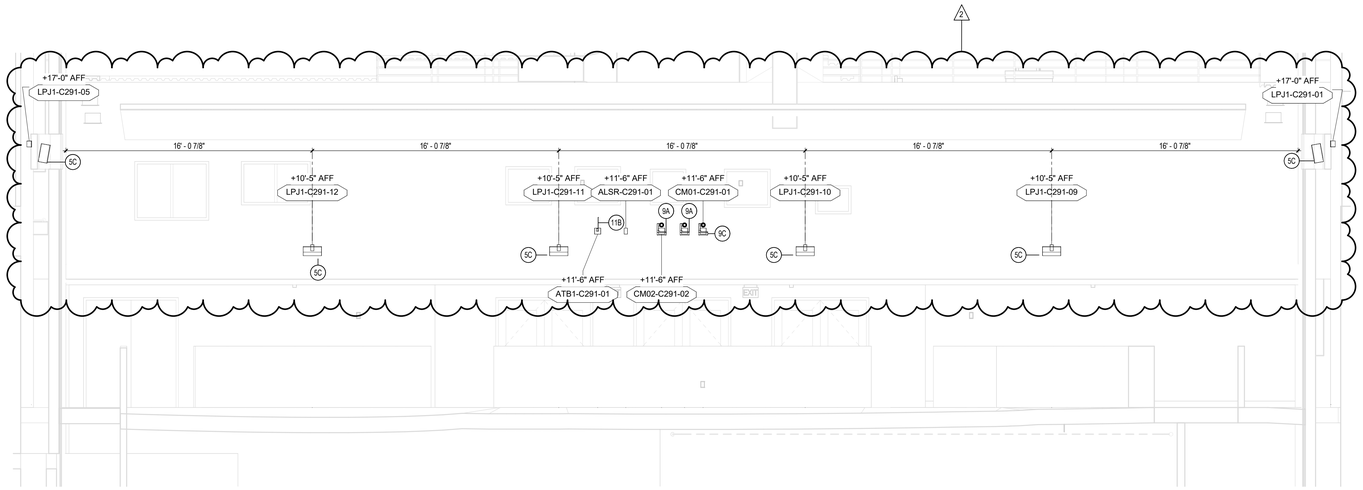

1 TA.402.00 C291 - AUDITORIUM - WEST
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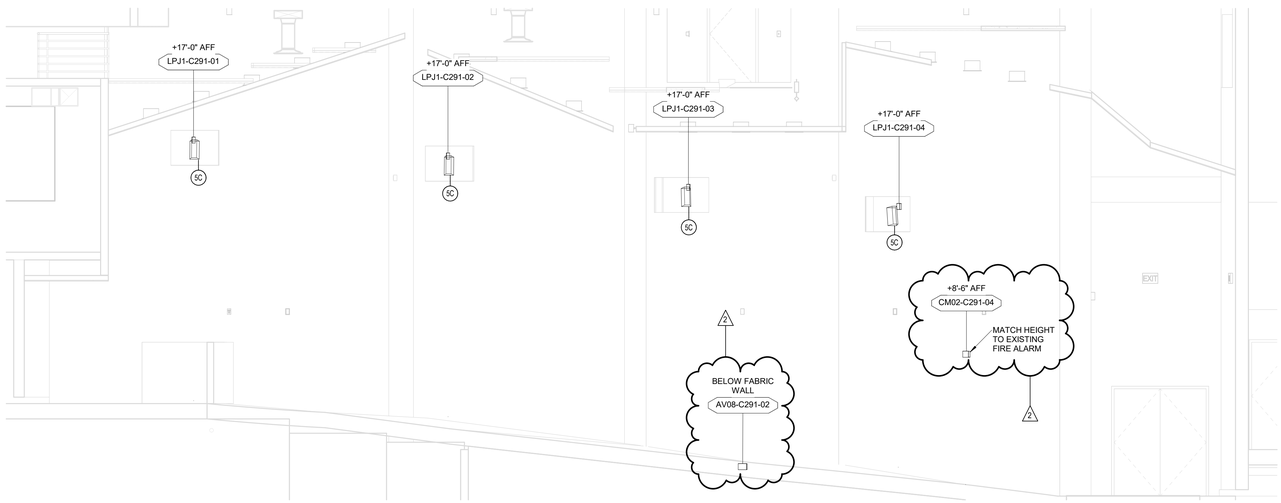

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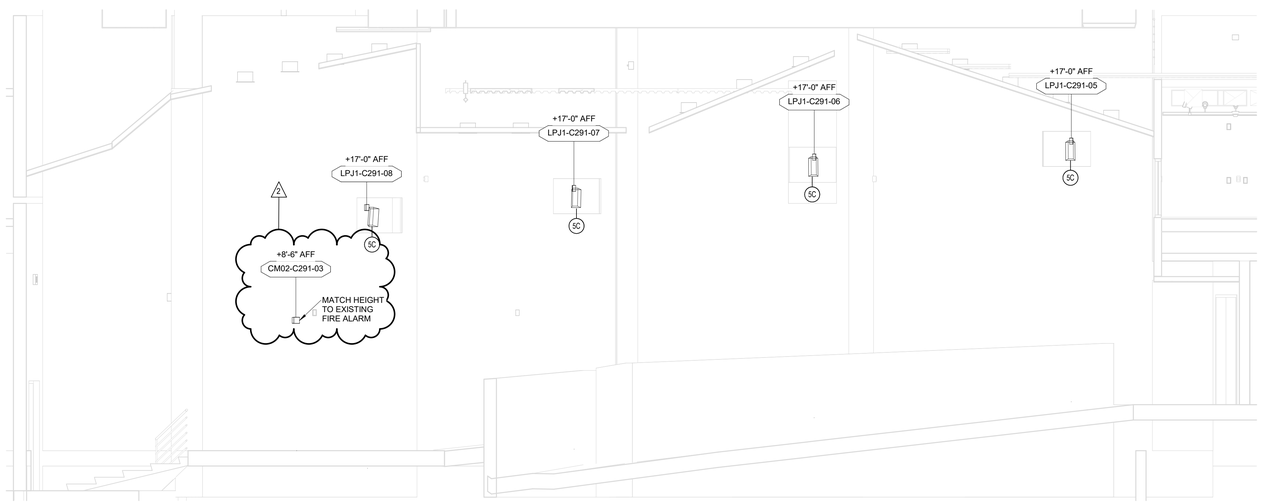
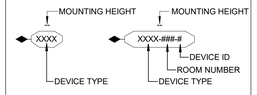


2 TA.402.00 C291 - AUDITORIUM - SOUTH
SCALE: 1/4" = 1'-0"

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL



ALL DEVICES AT OUTLET HEIGHT UNLESS NOTED OTHERWISE.

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AUDIOVISUAL DEVICE TYPE KEY

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AUDIOVISUAL SYMBOLS

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Keynote Legend

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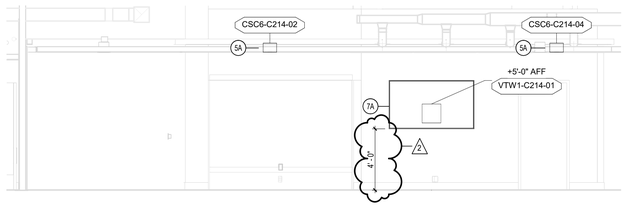

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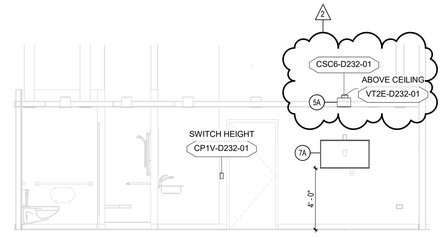

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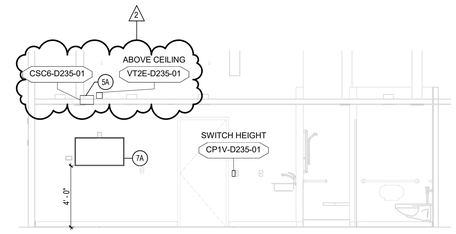
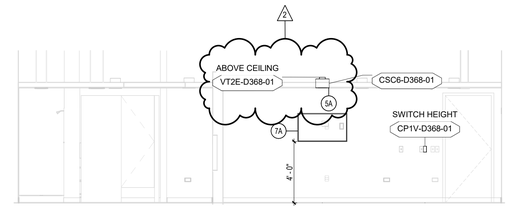


3 TA.403.00 D235 - DRESSING ROOM - WEST
SCALE: 1/4" = 1'-0"

4 TA.403.00 C322B - SOUND STUDIO - EAST
SCALE: 1/4" = 1'-0"

5 TA.403.00 C322C - VIDEO STUDIO - SOUTH
SCALE: 1/4" = 1'-0"



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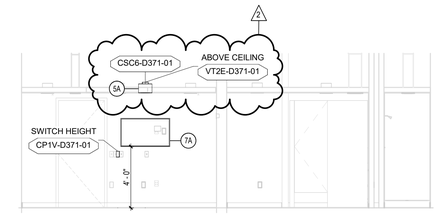
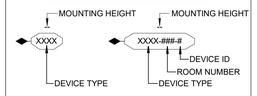


7 TA.403.00 D371 - DRESSING ROOM - WEST
SCALE: 1/4" = 1'-0"

AUDIOVISUAL SYMBOLS

AUDIOVISUAL DEVICE SYMBOL



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REFER TO TYPICAL BACKBOX MOUNTING HEIGHT DETAIL FOR MOUNTING CONDITIONS.

AUDIOVISUAL DEVICE TYPE KEY

ALSx	ASSISTIVE LISTENING	JBx	JUNCTION BOX
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AUDIOVISUAL SYMBOLS

- AV WALL BOX
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- AV FLOOR BOX
- AV CEILING LOUDSPEAKER

POWER SYMBOLS

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- WALL MOUNTED
- INTEGRATED POWER INDICATOR
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Keynote Legend

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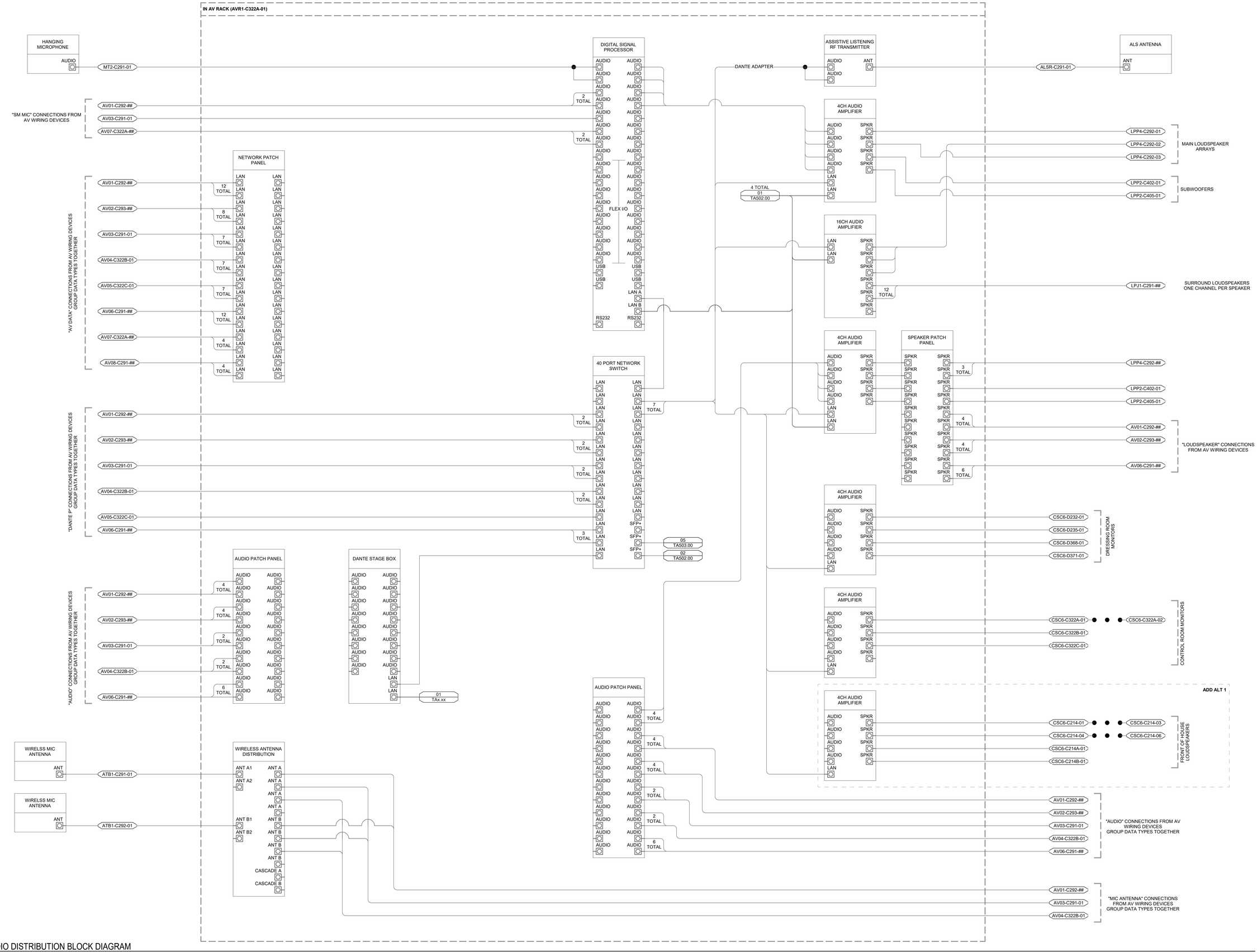

1 AUDIO DISTRIBUTION BLOCK DIAGRAM
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TA.501.00

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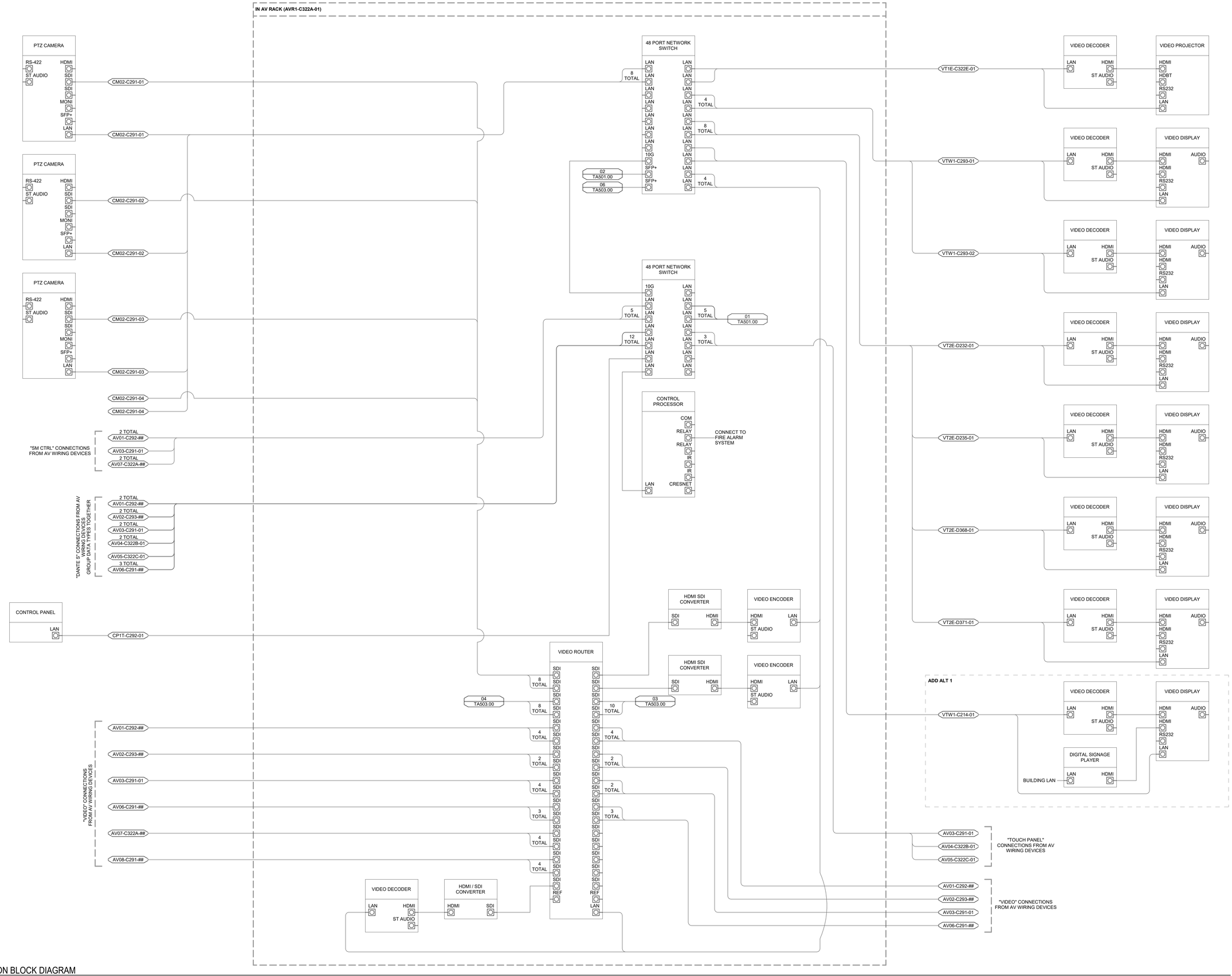

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TA.502.00

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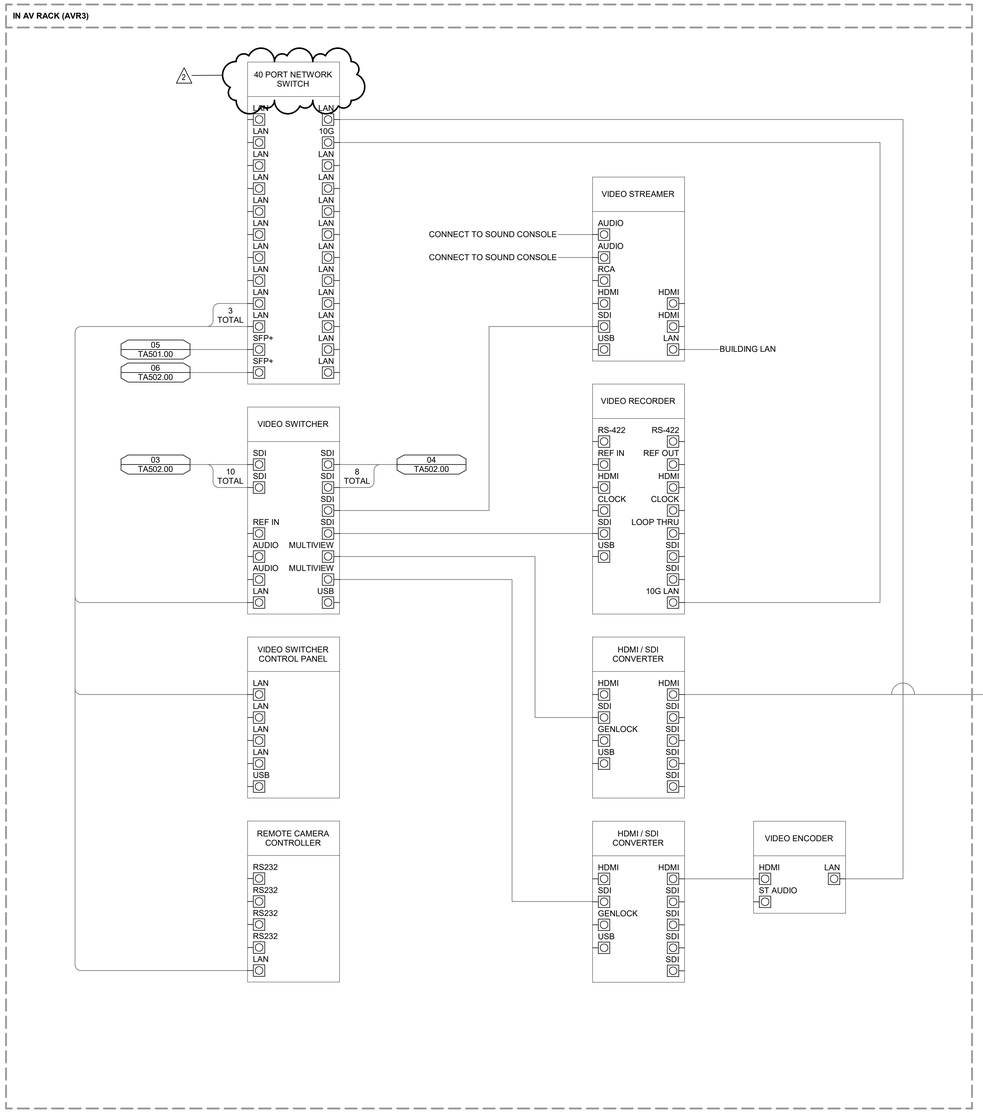

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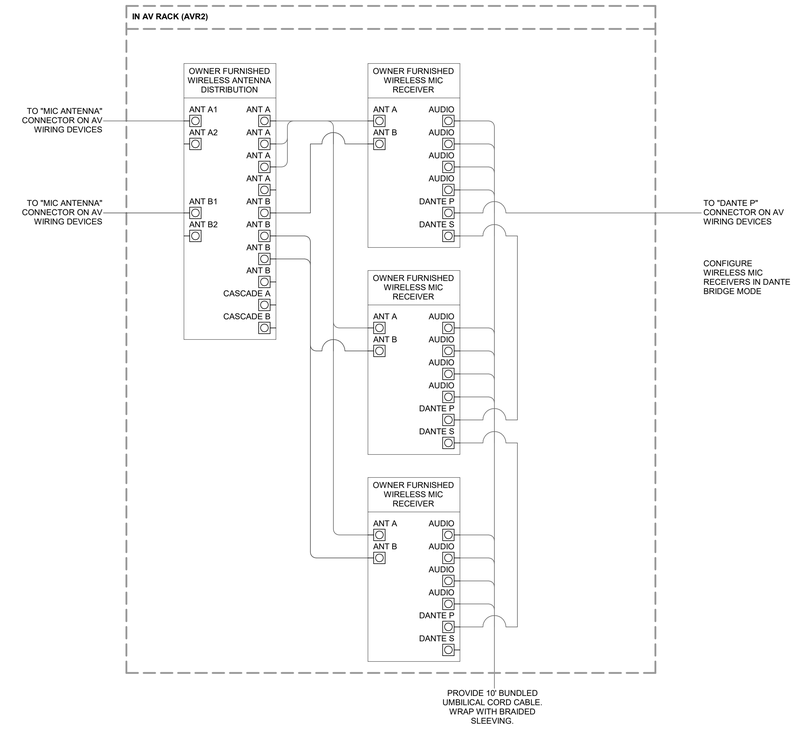

2 WIRELESS MICROPHONE BLOCK DIAGRAM
TA.503.00 NO SCALE

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TA.503.00

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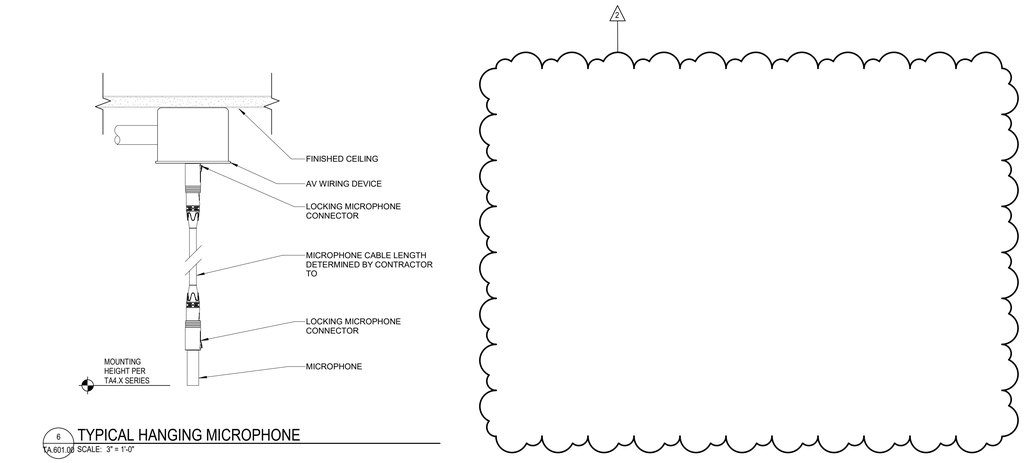
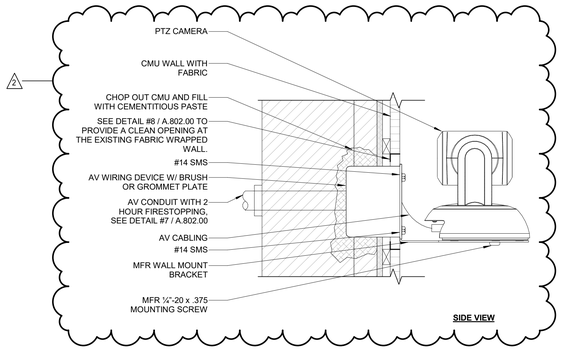
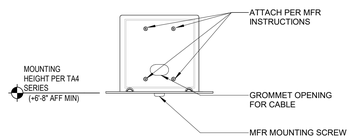
6 TA.601.00 TYPICAL HANGING MICROPHONE
SCALE: 3" = 1'-0"

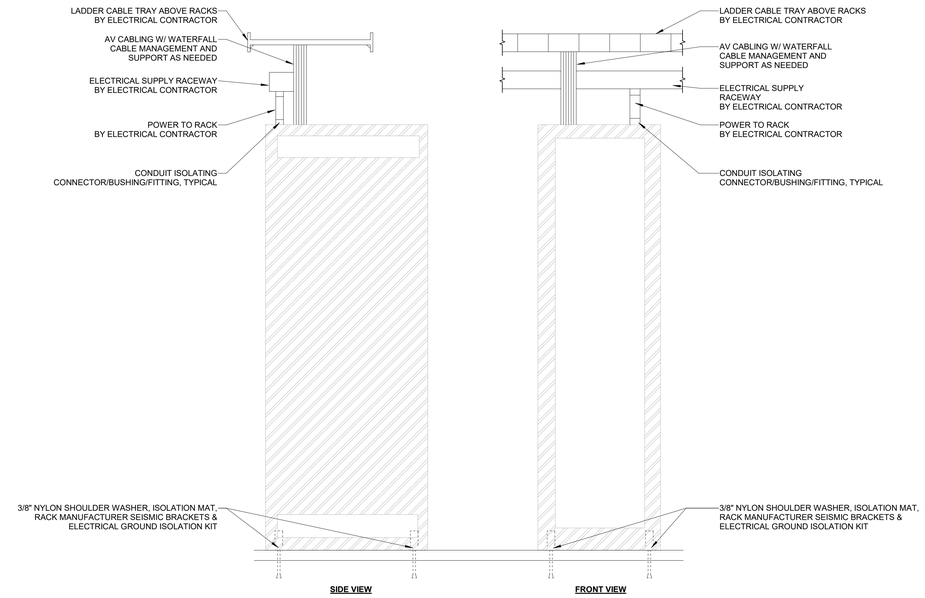






NOTE: INCLUDE MOUNTING HOLES ON ALL CAMERA WIRING DEVICES FOR CAMERA RELOCATION BY USER

5 TA.601.00 TYPICAL CAMERA - PTZ, WALL MOUNT
SCALE: 3" = 1'-0"



1 TA.601.00 TYPICAL AV EQUIPMENT RACK
SCALE: 1" = 1'-0"

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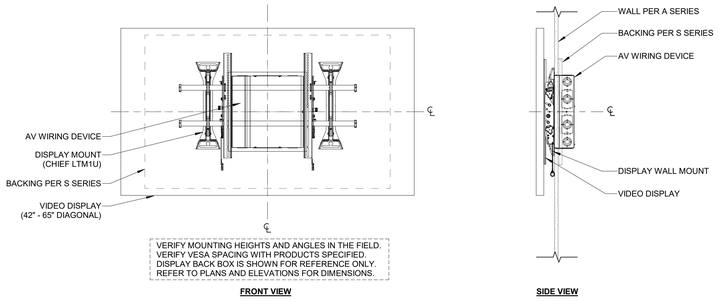
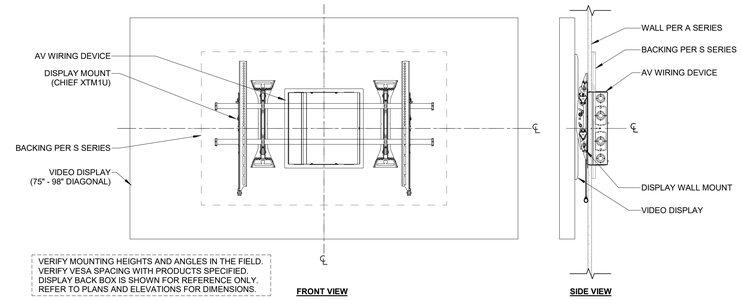
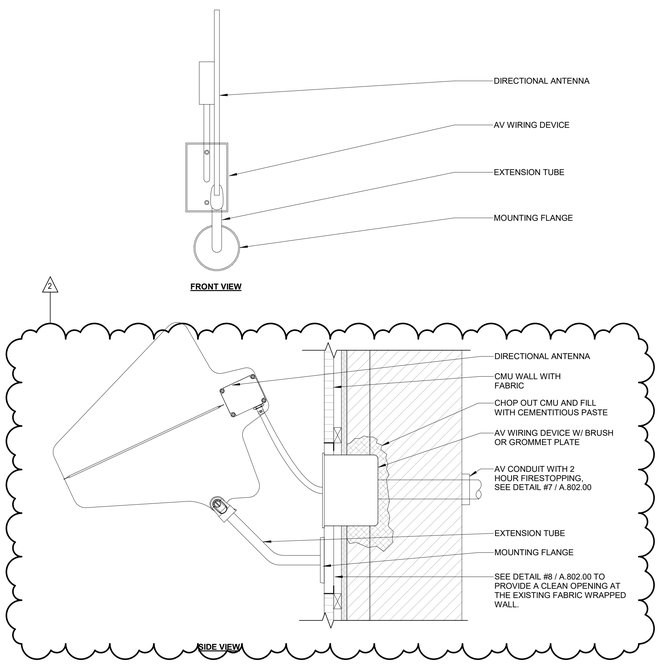


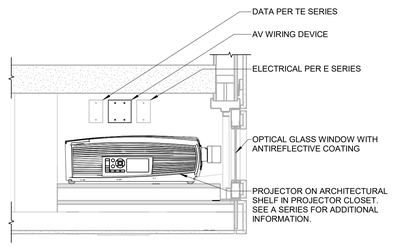
1 TYPICAL DISPLAY - TILT MOUNT (42" - 65")
TA.602.00 SCALE: 1" = 1'-0"



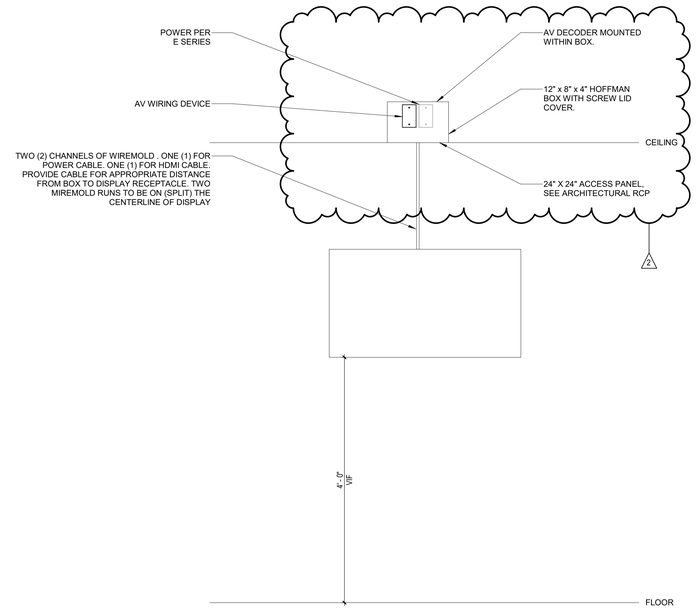
2 TYPICAL DISPLAY - TILT MOUNT (75" - 98")
TA.602.00 SCALE: 1" = 1'-0"



3 TYPICAL ANTENNA - MIC, DIRECTIONAL
TA.602.00 SCALE: 3" = 1'-0"



4 PROJECTOR - ENCLOSURE (SIDE)
TA.602.00 SCALE: 1" = 1'-0"



5 TYPICAL DRESSING ROOM DISPLAY
TA.602.00 SCALE: 1" = 1'-0"

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TA.602.00

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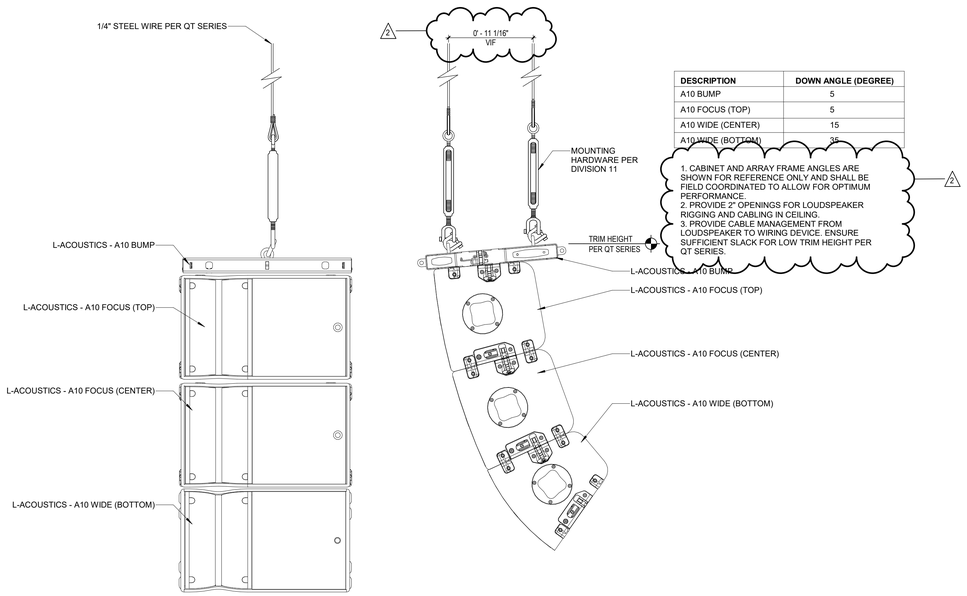
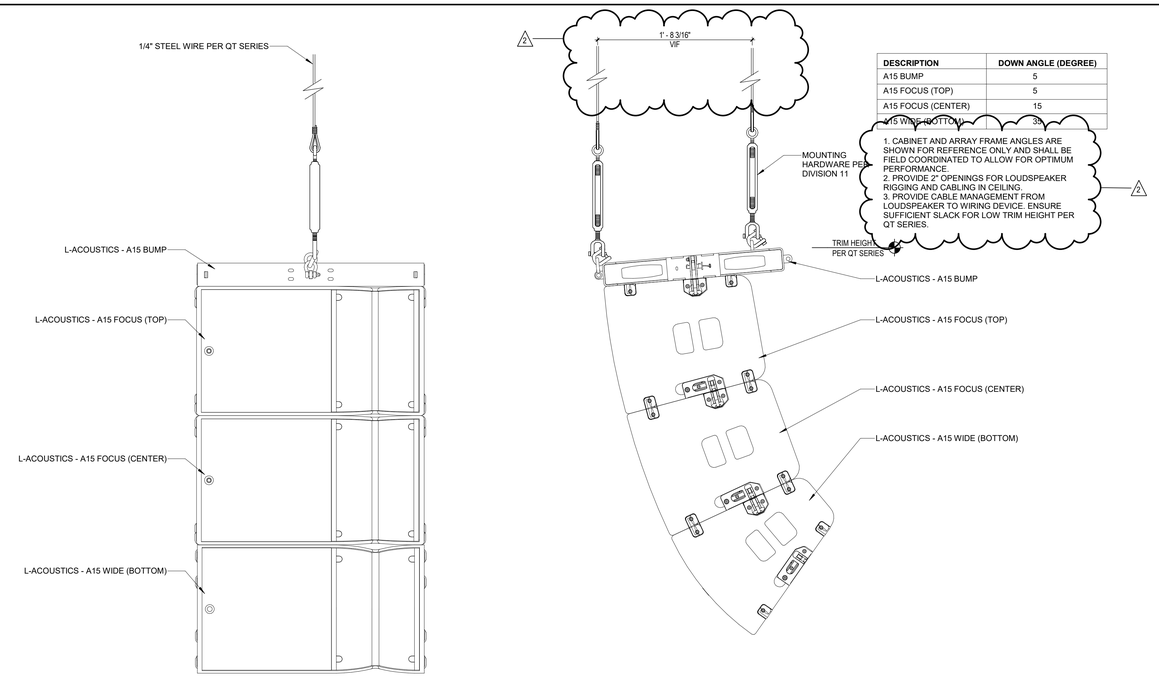


DESCRIPTION	DOWN ANGLE (DEGREE)
A10 BUMP	5
A10 FOCUS (TOP)	5
A10 WIDE (CENTER)	15
A10 WIDE (BOTTOM)	35

1. CABINET AND ARRAY FRAME ANGLES ARE SHOWN FOR REFERENCE ONLY AND SHALL BE FIELD COORDINATED TO ALLOW FOR OPTIMUM PERFORMANCE.
2. PROVIDE 2" OPENINGS FOR LOUDSPEAKER RIGGING AND CABLING IN CEILING.
3. PROVIDE CABLE MANAGEMENT FROM LOUDSPEAKER TO WIRING DEVICE. ENSURE SUFFICIENT SLACK FOR LOW TRIM HEIGHT PER QT SERIES.

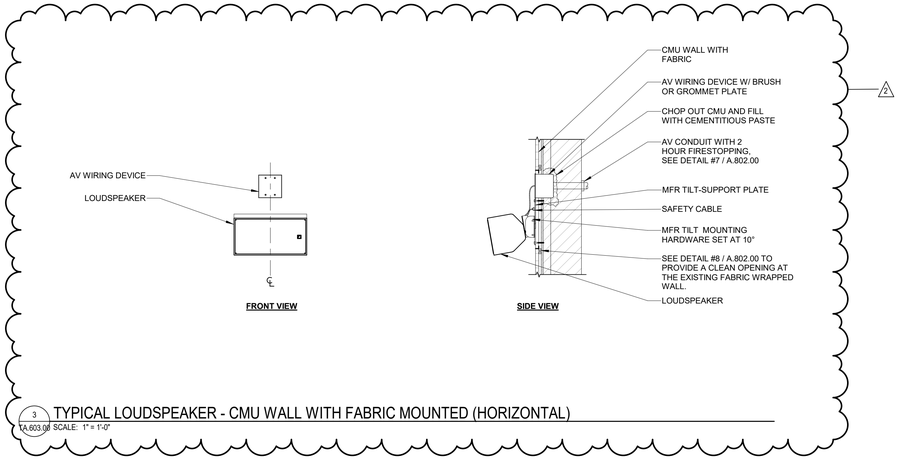
1 TA.603.00 PRODUCTION LOUDSPEAKER ARRAY MOUNTING DETAIL (CENTER)
SCALE: 1 1/2" = 1'-0"



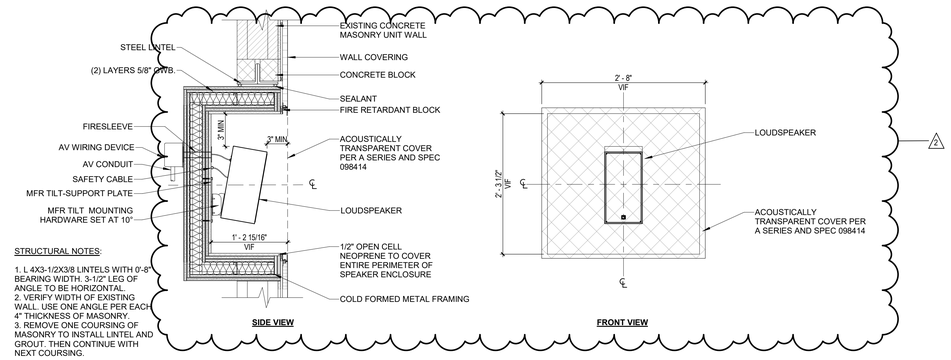
DESCRIPTION	DOWN ANGLE (DEGREE)
A15 BUMP	5
A15 FOCUS (TOP)	5
A15 FOCUS (CENTER)	15
A15 WIDE (BOTTOM)	35

1. CABINET AND ARRAY FRAME ANGLES ARE SHOWN FOR REFERENCE ONLY AND SHALL BE FIELD COORDINATED TO ALLOW FOR OPTIMUM PERFORMANCE.
2. PROVIDE 2" OPENINGS FOR LOUDSPEAKER RIGGING AND CABLING IN CEILING.
3. PROVIDE CABLE MANAGEMENT FROM LOUDSPEAKER TO WIRING DEVICE. ENSURE SUFFICIENT SLACK FOR LOW TRIM HEIGHT PER QT SERIES.

2 TA.603.00 PRODUCTION LOUDSPEAKER ARRAY MOUNTING DETAIL (LEFT/RIGHT)
SCALE: 1 1/2" = 1'-0"



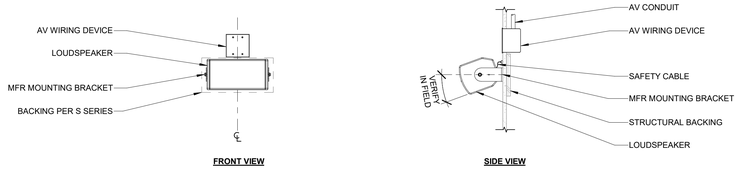
3 TA.603.00 TYPICAL LOUDSPEAKER - CMU WALL WITH FABRIC MOUNTED (HORIZONTAL)
SCALE: 1" = 1'-0"



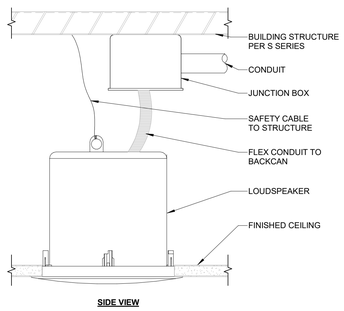
STRUCTURAL NOTES:

1. L 4X3-1/2X3/8 LINTELS WITH 0'-8" BEARING WIDTH. 3-1/2" LEG OF ANGLE TO BE HORIZONTAL.
2. VERIFY WIDTH OF EXISTING WALL. USE ONE ANGLE PER EACH 4" THICKNESS OF MASONRY.
3. REMOVE ONE COURSING OF MASONRY TO INSTALL LINTEL AND GROUT. THEN CONTINUE WITH NEXT COURSING.

4 TA.603.00 TYPICAL SURROUND LOUDSPEAKER - WALL RECESSED
SCALE: 1" = 1'-0"



5 TA.603.00 TYPICAL LOUDSPEAKER - WALL MOUNTED (HORIZONTAL)
SCALE: 1" = 1'-0"



6 TA.603.00 TYPICAL LOUDSPEAKER - CEILING RECESSED W/ FLEX CONDUIT
SCALE: 3" = 1'-0"

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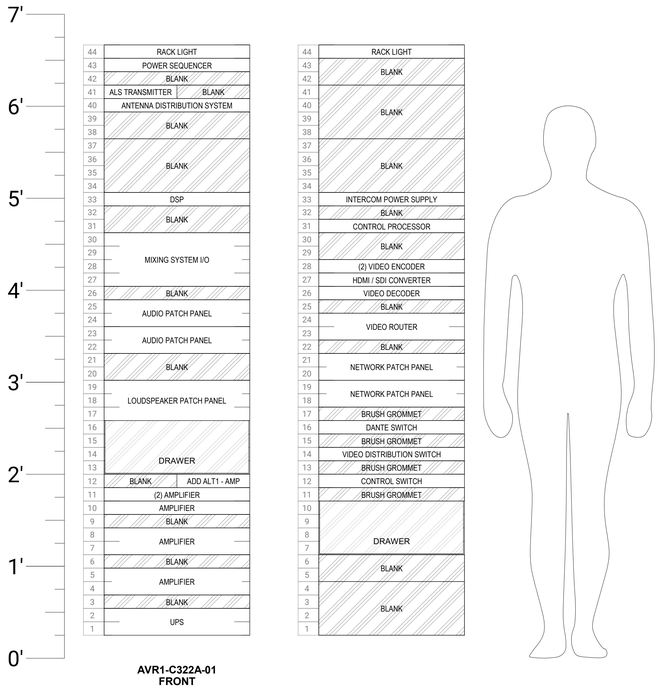

1 RACK ELEVATION
TA.611.00 SCALE: 1 1/2" = 1'-0"

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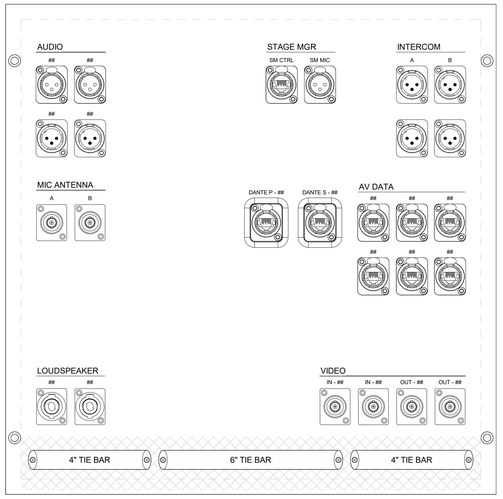
AUDIOVISUAL RACK ELEVATIONS

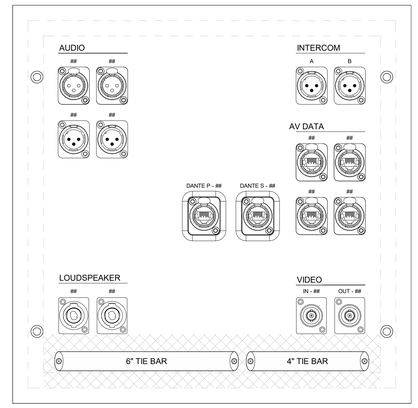
TA.611.00



WIRING DEVICE DETAILS

DEVICE TYPE:	AV01
DESCRIPTION:	STAGE AV PANEL
BACKBOX:	16" x16" x 6" BACK BOX
CONDUIT GROUP TYPE:	WIRE TYPE:
A	(5) AUDIO
B	(2) COM
C	(2) SPKR14-2
D	(9) DATA-S, (4) SDI-12G, (2) ANTENNA
E	-

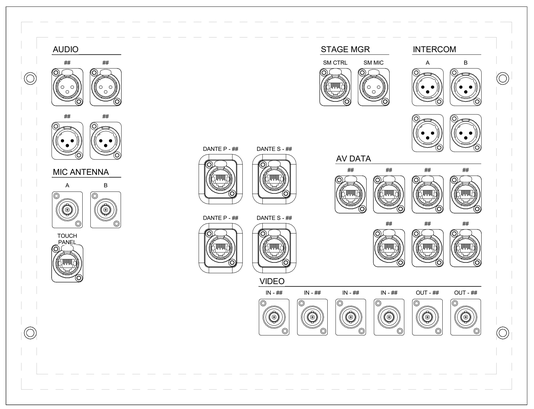
1 AV01 - STAGE AV PANEL
TA.651.00 SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	AV02
DESCRIPTION:	STAGE AV PANEL
BACKBOX:	12" x12" x 6" BACK BOX
CONDUIT GROUP TYPE:	WIRE TYPE:
A	(4) AUDIO
B	(2) COM
C	(2) SPKR14-2
D	(6) DATA-S, (2) SDI-12G
E	-

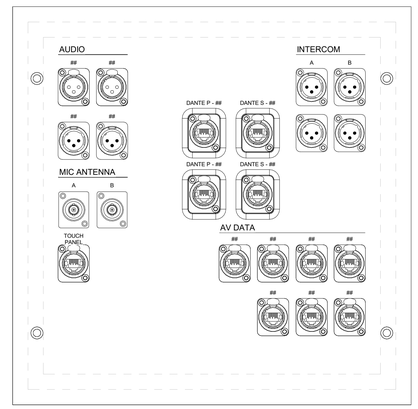
2 AV02 - STAGE AV PANEL
TA.651.00 SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	AV03
DESCRIPTION:	AUDITORIUM MIX PANEL
BACKBOX:	16" x12" x 4" BACK BOX
CONDUIT GROUP TYPE:	WIRE TYPE:
A	(5) AUDIO
B	(2) COM
C	-
D	(13) DATA-S, (6) SDI-12G, (2) ANTENNA
E	-

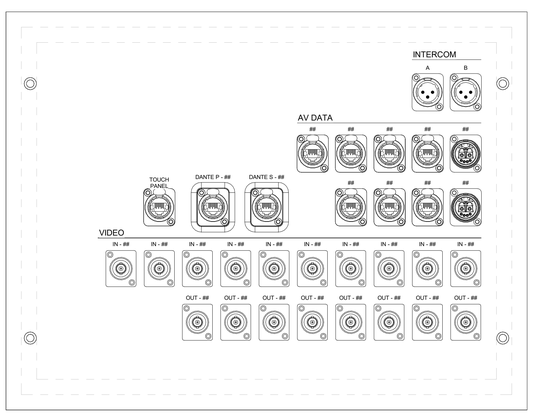
3 AV03 - AUDITORIUM MIX PANEL
TA.651.00 SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	AV04
DESCRIPTION:	SOUND STUDIO PANEL
BACKBOX:	12" x12" x 4" BACK BOX
CONDUIT GROUP TYPE:	WIRE TYPE:
A	(4) AUDIO
B	(2) COM
C	-
D	(12) DATA-S, (2) ANTENNA
E	-

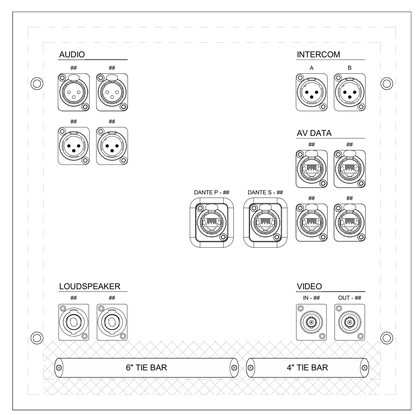
4 AV04 - SOUND STUDIO PANEL
TA.651.00 SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	AV05
DESCRIPTION:	VIDEO PRODUCTION PANEL
BACKBOX:	16" x12" x 4" BACK BOX
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	(2) COM
C	-
D	(10) DATA-S, (18) SDI-12G
E	(1) FIBER-6

5 AV05 - VIDEO PRODUCTION PANEL
TA.651.00 SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	AV06
DESCRIPTION:	STAGE APRON AV PANEL
BACKBOX:	12" x12" x 6" BACK BOX
CONDUIT GROUP TYPE:	WIRE TYPE:
A	(4) AUDIO
B	(2) COM
C	(2) SPKR14-2
D	(6) DATA-S, (2) SDI-12G
E	-

6 AV06 - STAGE APRON AV PANEL
TA.651.00 SCALE: 6" = 1'-0"

AUDIOVISUAL CONNECTORS

	KEYSTONE	PANEL MOUNT	DESCRIPTION
			BLANK PLATE
AUDIO			3.5mm STEREO UNBALANCED AUDIO
AUDIO			RCA CONNECTOR (RECESSED)
AUDIO			RCA CONNECTOR (STEREO)
AUDIO			XLR PIN
AUDIO			XLR SOCKET
AUDIO			XLR COMBO RECEPTACLE
LOUDSPEAKER			TWIST-LOCK LOUDSPEAKER CONNECTOR - 2 POLE
LOUDSPEAKER			TWIST-LOCK LOUDSPEAKER CONNECTOR - 4 POLE
VIDEO			BNC CONNECTOR
VIDEO			MINI DISPLAYPORT / THUNDERBOLT
VIDEO			F-TYPE COAXIAL
VIDEO			HDMI
DATA \ MULTIMEDIA			CAT6A CONNECTOR
DATA \ MULTIMEDIA			USB - TYPE A
DATA \ MULTIMEDIA			USB - TYPE B
DATA \ MULTIMEDIA			USB - TYPE C
FIBEROPTIC			LC DUPLEX FIBEROPTIC CONNECTOR
FIBEROPTIC			SMPTE 304M HYBRID CONNECTOR

NOTES:
1. REFER TO WIRING DEVICE PLANS AND REFLECTED CEILING PLANS FOR PLATE LOCATIONS.
2. REFER TO WIRING DEVICE SCHEDULE FOR PLATE MOUNTING HEIGHTS, TYPES, AND CONDITIONS.
3. REFER TO AUDIOVISUAL SYSTEMS SPECIFICATION FOR PLATE LABELING, FINISH, AND HARDWARE REQUIREMENTS.
4. FOR SURFACE MOUNT BOXES, PLATES SHALL BE THE SAME SIZE AS THE BACKBOX.
5. FOR FLUSH MOUNT BOXES, PLATES SHALL SHALL EXTEND 1/2" BEYOND THE BOX AT EACH SIDE.
6. PROVIDE BLANK COVERS FOR ALL JUNCTION BOXES (WITH GROMMETS IF REQUIRED). AV CONTRACTOR TO DETERMINE GROMMET SIZES.
7. AV CONTRACTOR SHALL VERIFY PLATE COLOR WITH ARCHITECT PRIOR TO FABRICATION OF THE PLATES.
8. COORDINATE WITH TELECOM CONTRACTOR TO TERMINATE ENTERPRISE LAN AND PoE CONNECTORS ON AV PLATES.
9. COORDINATE WITH ELECTRICAL CONTRACTOR TO TERMINATE POWER RECEPTACLES ON AV PLATES OR IN AV BACK BOXES.
10. SEE AV SYSTEM BLOCK DIAGRAMS FOR AV PLATE CONNECTOR NUMBERING. REPLACE "#" WITH NUMBER ACCORDINGLY. NUMBERING SHALL BE SEQUENTIAL, NON-REPEATING WITHIN EACH SPACE. SUBMIT SHOP DRAWINGS FOR APPROVAL.
11. PANEL LABELS SHALL BE UNIQUE AND INTUITIVE, REFERENCING THE LOCATION IN ROOM (EX. UPSTAGE LEFT). SUBMIT SHOP DRAWINGS FOR APPROVAL.
12. AV CONTRACTOR TO VERIFY BACK BOX SIZES AND ORIENTATION ONSITE PRIOR TO FABRICATION OF AV PLATES.
13. PROVIDE COLORED GASKET FOR RJ45 CONNECTORS DESINATED FOR DANTE, TOUCH PANEL/CONTROL, AND DIGITAL INTERCOM CONNECTIONS:
    A. YELLOW FOR DANTE PRIMARY
    B. GREEN FOR DANTE SECONDARY
    C. BLUE FOR TOUCH PANEL/CONTROL
    D. WHITE FOR DIGITAL INTERCOM

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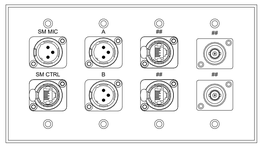
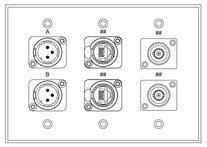


WIRING DEVICE DETAILS

DEVICE TYPE:	AV07
DESCRIPTION:	CAMERA POSITION PANEL WITH SM CONTROLS
BACKBOX:	4 GANG, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	(1) AUDIO
B	(2) COM
C	-
D	(3) DATA-S, (2) SDI-12G
E	-

1 TA.652.00 AV07 - CAMERA POSITION PANEL
SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	AV08
DESCRIPTION:	CAMERA POSITION PANEL
BACKBOX:	3 GANG, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	(2) COM
C	-
D	(2) DATA-S, (2) SDI-12G
E	-

2 TA.652.00 AV07 - CAMERA POSITION PANEL
SCALE: 6" = 1'-0"

WIRING DEVICE DETAILS

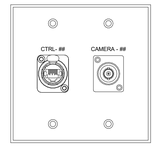
DEVICE TYPE:	ALSR
DESCRIPTION:	ALS ANTENNA
BACKBOX:	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(1) ANTENNA
E	-

3 TA.652.00 ALSR - ALS ANTENNA
SCALE: 6" = 1'-0"

WIRING DEVICE DETAILS

DEVICE TYPE:	ATB1
DESCRIPTION:	ANTENNA - SINGLE BNC
BACKBOX:	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(1) ANTENNA
E	-

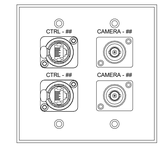
4 TA.652.00 ATB1 - ANTENNA - SINGLE BNC
SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	CM01
DESCRIPTION:	VIDEO CAMERA
BACKBOX:	2 GANG, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(1) DATA-S, (1) SDI-12G
E	-

5 TA.652.00 CM01 - SDI + DATA
SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	CM02
DESCRIPTION:	VIDEO CAMERA
BACKBOX:	2 GANG, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(2) DATA-S, (2) SDI-12G
E	-

6 TA.652.00 CM02 - (2) SDI + (2) DATA
SCALE: 6" = 1'-0"

WIRING DEVICE DETAILS

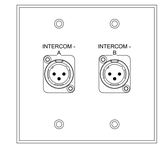
DEVICE TYPE:	CP1T
DESCRIPTION:	TOUCH PANEL DEVICE
BACKBOX:	1 GANG, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(1) DATA-S
E	-

7 TA.652.00 CP1T - TOUCH PANEL DEVICE
SCALE: 6" = 1'-0"

WIRING DEVICE DETAILS

DEVICE TYPE:	CP1V
DESCRIPTION:	VOLUME CONTROL ENCODER
BACKBOX:	1 GANG, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(1) DATA-S
E	-

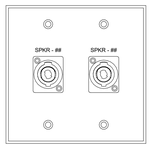
8 TA.652.00 CP1V - VOLUME CONTROL ENCODER
SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	ICA2
DESCRIPTION:	2CH ANALOG INTERCOM PLATE
BACKBOX:	2 GANG, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	(2) COM
C	-
D	-
E	-

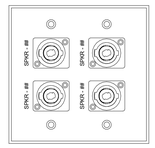
9 TA.652.00 ICA2 - (2) ANALOG COM
SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	LPP2
DESCRIPTION:	DUAL NL4 CONNECTION
BACKBOX:	2 GANG BOX, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(2) SPKR12-4
E	-

10 TA.652.00 LPP2 - DUAL NL4 CONNECTION
SCALE: 6" = 1'-0"



WIRING DEVICE DETAILS

DEVICE TYPE:	LPP4
DESCRIPTION:	LOUDSPEAKER PANEL
BACKBOX:	2 GANG BOX, 3-1/2" DEEP
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	(4) SPKR14-2
D	-
E	-

11 TA.652.00 LPP4 - QUAD NL4 CONNECTION
SCALE: 6" = 1'-0"

WIRING DEVICE DETAILS

DEVICE TYPE:	MT1
DESCRIPTION:	MICROPHONE TERMINATION
BACKBOX:	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING
CONDUIT GROUP TYPE:	WIRE TYPE:
A	(1) AUDIO
B	-
C	-
D	-
E	-

12 TA.652.00 MT1 - MICROPHONE TERMINATION
SCALE: 6" = 1'-0"

AUDIOVISUAL CONNECTORS

	KEYSTONE	PANEL MOUNT	DESCRIPTION
			BLANK PLATE
AUDIO			3.5mm STEREO UNBALANCED AUDIO
			RCA CONNECTOR (RECESSED)
			RCA CONNECTOR (STEREO)
			XLR PIN
			XLR SOCKET
			XLR COMBO RECEPTACLE
LOUDSPEAKER			TWIST-LOCK LOUDSPEAKER CONNECTOR - 2 POLE
			TWIST-LOCK LOUDSPEAKER CONNECTOR - 4 POLE
VIDEO			BNC CONNECTOR
			MINI DISPLAYPORT / THUNDERBOLT
			F-TYPE COAXIAL
			HDMI
DATA \ MULTIMEDIA			CAT6A CONNECTOR
			USB - TYPE A
			USB - TYPE B
			USB - TYPE C
FIBEROPTIC			LC DUPLEX FIBEROPTIC CONNECTOR
			SMPTE 304M HYBRID CONNECTOR

NOTES:
1. REFER TO WIRING DEVICE PLANS AND REFLECTED CEILING PLANS FOR PLATE LOCATIONS.
2. REFER TO WIRING DEVICE SCHEDULE FOR PLATE MOUNTING HEIGHTS, TYPES, AND CONDITIONS.
3. REFER TO AUDIOVISUAL SYSTEMS SPECIFICATION FOR PLATE LABELING, FINISH, AND HARDWARE REQUIREMENTS.
4. FOR SURFACE MOUNT BOXES, PLATES SHALL BE THE SAME SIZE AS THE BACKBOX.
5. FOR FLUSH MOUNT BOXES, PLATES SHALL SHALL EXTEND 1/2" BEYOND THE BOX AT EACH SIDE.
6. PROVIDE BLANK COVERS FOR ALL JUNCTION BOXES (WITH GROMMETS IF REQUIRED). AV CONTRACTOR TO DETERMINE GROMMET SIZES.
7. AV CONTRACTOR SHALL VERIFY PLATE COLOR WITH ARCHITECT PRIOR TO FABRICATION OF THE PLATES.
8. COORDINATE WITH TELECOM CONTRACTOR TO TERMINATE ENTERPRISE LAN AND PoE CONNECTORS ON AV PLATES.
9. COORDINATE WITH ELECTRICAL CONTRACTOR TO TERMINATE POWER RECEPTACLES ON AV PLATES OR IN AV BACK BOXES.
10. SEE AV SYSTEM BLOCK DIAGRAMS FOR AV PLATE CONNECTOR NUMBERING. REPLACE "#" WITH NUMBER ACCORDINGLY. NUMBERING SHALL BE SEQUENTIAL, NON-REPEATING WITHIN EACH SPACE. SUBMIT SHOP DRAWINGS FOR APPROVAL.
11. PANEL LABELS SHALL BE UNIQUE AND INTUITIVE, REFERENCING THE LOCATION IN ROOM (EX. UPSTAGE LEFT). SUBMIT SHOP DRAWINGS FOR APPROVAL.
12. AV CONTRACTOR TO VERIFY BACK BOX SIZES AND ORIENTATION ONSITE PRIOR TO FABRICATION OF AV PLATES.
13. PROVIDE COLORED GASKET FOR RJ45 CONNECTORS DESINATED FOR DANTE, TOUCH PANEL/CONTROL, AND DIGITAL INTERCOM CONNECTIONS:
    A. YELLOW FOR DANTE PRIMARY
    B. GREEN FOR DANTE SECONDARY
    C. BLUE FOR TOUCH PANEL/CONTROL
    D. WHITE FOR DIGITAL INTERCOM

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HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
343 WEST 27TH STREET
NEW YORK, NY 10001

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AUDIOVISUAL WIRING DEVICE DETAILS

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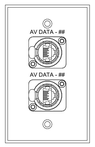
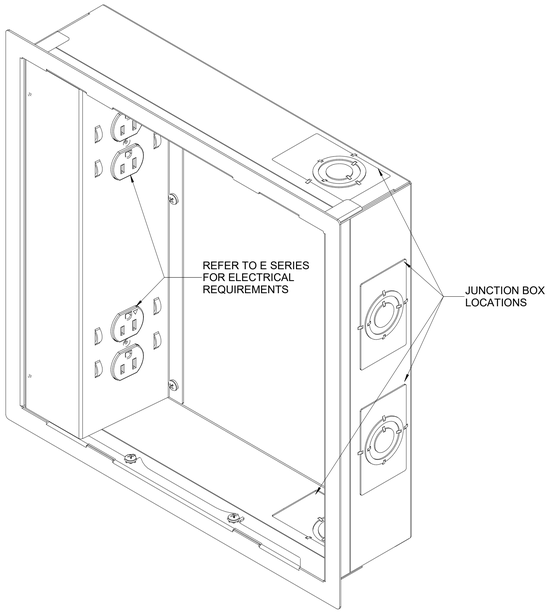
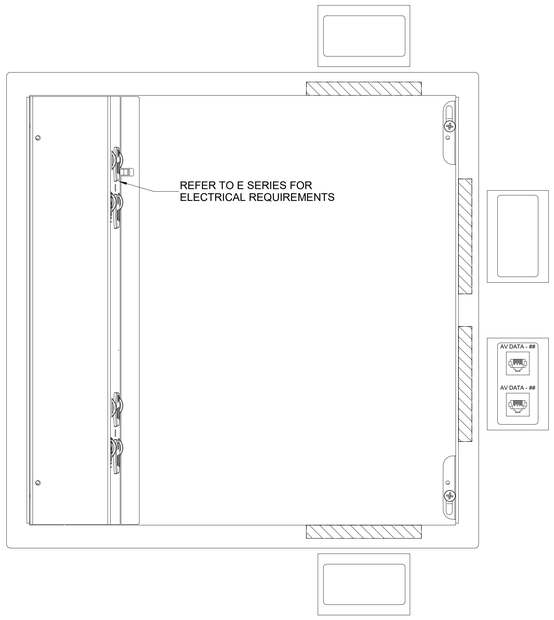


WIRING DEVICE DETAILS

DEVICE TYPE:	VT2E
DESCRIPTION:	RJ45 RECEPTACLE - DUAL
BACKBOX:	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(2) DATA-S
E	-

1 TA.653.00 VT2E - RJ45 RECEPTACLE - DUAL
SCALE: 6" = 1'-0"





WIRING DEVICE DETAILS

DEVICE TYPE:	VTW1
DESCRIPTION:	DISPLAY BACK BOX
BACKBOX:	CHIEF PAC526
CONDUIT GROUP TYPE:	WIRE TYPE:
A	-
B	-
C	-
D	(2) DATA-S
E	-

2 TA.653.00 VTW1 - DISPLAY BACK BOX
SCALE: 6" = 1'-0"

AUDIOVISUAL CONNECTORS

	KEYSTONE	PANEL MOUNT	DESCRIPTION
			BLANK PLATE
AUDIO			3.5mm STEREO UNBALANCED AUDIO
AUDIO			RCA CONNECTOR (RECESSED)
AUDIO			RCA CONNECTOR (STEREO)
AUDIO			XLR PIN
AUDIO			XLR SOCKET
AUDIO			XLR COMBO RECEPTACLE
LOUDSPEAKER			TWIST-LOCK LOUDSPEAKER CONNECTOR - 2 POLE
LOUDSPEAKER			TWIST-LOCK LOUDSPEAKER CONNECTOR - 4 POLE
VIDEO			BNC CONNECTOR
VIDEO			MINI DISPLAYPORT / THUNDERBOLT
VIDEO			F-TYPE COAXIAL
VIDEO			HDMI
DATA \ MULTIMEDIA			CAT6A CONNECTOR
DATA \ MULTIMEDIA			USB - TYPE A
DATA \ MULTIMEDIA			USB - TYPE B
DATA \ MULTIMEDIA			USB - TYPE C
FIBEROPTIC			LC DUPLEX FIBEROPTIC CONNECTOR
FIBEROPTIC			SMPTE 304M HYBRID CONNECTOR

NOTES:
1. REFER TO WIRING DEVICE PLANS AND REFLECTED CEILING PLANS FOR PLATE LOCATIONS.
2. REFER TO WIRING DEVICE SCHEDULE FOR PLATE MOUNTING HEIGHTS, TYPES, AND CONDITIONS.
3. REFER TO AUDIOVISUAL SYSTEMS SPECIFICATION FOR PLATE LABELING, FINISH, AND HARDWARE REQUIREMENTS.
4. FOR SURFACE MOUNT BOXES, PLATES SHALL BE THE SAME SIZE AS THE BACKBOX.
5. FOR FLUSH MOUNT BOXES, PLATES SHALL SHALL EXTEND 1/2" BEYOND THE BOX AT EACH SIDE.
6. PROVIDE BLANK COVERS FOR ALL JUNCTION BOXES (WITH GROMMETS IF REQUIRED). AV CONTRACTOR TO DETERMINE GROMMET SIZES.
7. AV CONTRACTOR SHALL VERIFY PLATE COLOR WITH ARCHITECT PRIOR TO FABRICATION OF THE PLATES.
8. COORDINATE WITH TELECOM CONTRACTOR TO TERMINATE ENTERPRISE LAN AND PoE CONNECTORS ON AV PLATES.
9. COORDINATE WITH ELECTRICAL CONTRACTOR TO TERMINATE POWER RECEPTACLES ON AV PLATES OR IN AV BACK BOXES.
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    B. GREEN FOR DANTE SECONDARY
    C. BLUE FOR TOUCH PANEL/CONTROL
    D. WHITE FOR DIGITAL INTERCOM

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AUDIOVISUAL WIRING DEVICE DETAILS

TA.653.00

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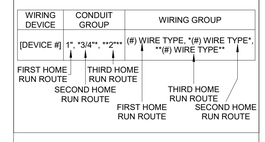
AV BACK BOX AND CONDUIT SCHEDULE

AV WIRING DEVICE NUMBER	BACK BOX DESCRIPTION	BACK BOX MOUNTING	ITEM DESCRIPTION	HOME RUN ROUTE	CONDUIT GROUPS					
					A	B	C	D	E	X
C214 - SECOND FLOOR LOBBY										
CSC6-C214-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
CSC6-C214-02	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
CSC6-C214-03	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
CSC6-C214-04	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
CSC6-C214-05	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
CSC6-C214-06	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
VTW1-C214-01	CHIEF PAC526	FLUSH MOUNT	DISPLAY BACK BOX	AVR1-C322A-01	-	-	-	1-1/4"	-	-
C214A - RESTROOM 1										
CSC6-C214A-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
C214B - RESTROOM 2										
CSC6-C214B-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
C291 - AUDITORIUM										
ALSR-C291-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	FLUSH MOUNT	ALS ANTENNA	AVR1-C322A-01	-	-	-	1"	-	-
ATB1-C291-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	FLUSH MOUNT	ANTENNA - SINGLE BNC	AVR1-C322A-01	-	-	-	1"	-	-
AV03-C291-01	16" x12" x 4" BACK BOX	FLUSH MOUNT	AUDITORIUM MIX PANEL	AVR1-C322A-01	3/4"	3/4"	-	2-1/2"	-	-
AV06-C291-01	12" x12" x 6" BACK BOX	FLUSH MOUNT	STAGE APRON AV PANEL	AVR1-C322A-01	3/4"	3/4"	3/4"	1-1/4"	-	-
AV06-C291-02	12" x12" x 6" BACK BOX	FLUSH MOUNT	STAGE APRON AV PANEL	AVR1-C322A-01	3/4"	3/4"	3/4"	1-1/4"	-	-
AV06-C291-03	12" x12" x 6" BACK BOX	FLUSH MOUNT	STAGE APRON AV PANEL	AVR1-C322A-01	3/4"	3/4"	3/4"	1-1/4"	-	-
AV08-C291-01	3 GANG, 3-1/2" DEEP	FLUSH MOUNT	CAMERA POSITION PANEL	AVR1-C322A-01	-	3/4"	-	1"	-	-
AV08-C291-02	3 GANG, 3-1/2" DEEP	FLUSH MOUNT	CAMERA POSITION PANEL	AVR1-C322A-01	-	3/4"	-	1"	-	-
CM01-C291-01	2 GANG, 3-1/2" DEEP	FLUSH MOUNT	VIDEO CAMERA	AVR1-C322A-01	-	-	-	1"	-	-
CM02-C291-01	2 GANG, 3-1/2" DEEP	FLUSH MOUNT	VIDEO CAMERA	AVR1-C322A-01	-	-	-	1"	-	-
CM02-C291-02	2 GANG, 3-1/2" DEEP	FLUSH MOUNT	VIDEO CAMERA	AVR1-C322A-01	-	-	-	1"	-	-
CM02-C291-03	2 GANG, 3-1/2" DEEP	FLUSH MOUNT	VIDEO CAMERA	AVR1-C322A-01	-	-	-	1"	-	-
CM02-C291-04	2 GANG, 3-1/2" DEEP	FLUSH MOUNT	VIDEO CAMERA	AVR1-C322A-01	-	-	-	1"	-	-
LPJ1-C291-01	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-02	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-03	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-04	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-05	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-06	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-07	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-08	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-09	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-10	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-11	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
LPJ1-C291-12	1 GANG, 3-1/2" DEEP W/ GROMMET PLATE	FLUSH MOUNT	LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	-
MT2-C291-01	2 GANG, 3-1/2" DEEP	FLUSH MOUNT	MICROPHONE TERMINATION	AVR1-C322A-01	3/4"	-	-	-	-	-
C292 - STAGE										
ATB1-C292-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	FLUSH MOUNT	ANTENNA - SINGLE BNC	AVR1-C322A-01	-	-	-	1"	-	-
ATC1-C292-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	FLUSH MOUNT	WIRELESS INTERCOM TRANSCEIVER	AVR1-C322A-01	-	-	-	1"	-	-
AV01-C292-01	16" x16" x 6" BACK BOX	SURFACE MOUNT	STAGE AV PANEL	AVR1-C322A-01	3/4"	3/4"	3/4"	2-1/2"	-	-
AV01-C292-02	16" x16" x 6" BACK BOX	SURFACE MOUNT	STAGE AV PANEL	AVR1-C322A-01	3/4"	3/4"	3/4"	2-1/2"	-	-
CP1T-C292-01	1 GANG, 3-1/2" DEEP	SURFACE MOUNT	TOUCH PANEL DEVICE	AVR1-C322A-01	-	-	-	1"	-	-
LPP4-C292-01	2 GANG BOX, 3-1/2" DEEP	FLUSH MOUNT	LOUDSPEAKER PANEL	AVR1-C322A-01	-	-	3/4"	-	-	-
LPP4-C292-02	2 GANG BOX, 3-1/2" DEEP	FLUSH MOUNT	LOUDSPEAKER PANEL	AVR1-C322A-01	-	-	3/4"	-	-	-
LPP4-C292-03	2 GANG BOX, 3-1/2" DEEP	FLUSH MOUNT	LOUDSPEAKER PANEL	AVR1-C322A-01	-	-	3/4"	-	-	-
C293 - STAGE EXTENSION										
AV02-C293-01	12" x12" x 6" BACK BOX	SURFACE MOUNT	STAGE AV PANEL	AVR1-C322A-01	3/4"	3/4"	3/4"	1-1/2"	-	-
AV02-C293-02	12" x12" x 6" BACK BOX	SURFACE MOUNT	STAGE AV PANEL	AVR1-C322A-01	3/4"	3/4"	3/4"	1-1/2"	-	-
VTW1-C293-01	CHIEF PAC526	FLUSH MOUNT	DISPLAY BACK BOX	AVR1-C322A-01	-	-	-	1-1/4"	-	-
VTW1-C293-02	CHIEF PAC526	FLUSH MOUNT	DISPLAY BACK BOX	AVR1-C322A-01	-	-	-	1-1/4"	-	-
C322A - PROJECTOR ROOM										
AV07-C322A-01	4 GANG, 3-1/2" DEEP	FLUSH MOUNT	CAMERA POSITION PANEL WITH SM CONTROLS	AVR1-C322A-01	3/4"	3/4"	-	1-1/4"	-	-
AV07-C322A-02	4 GANG, 3-1/2" DEEP	FLUSH MOUNT	CAMERA POSITION PANEL WITH SM CONTROLS	AVR1-C322A-01	3/4"	3/4"	-	1-1/4"	-	-
AVR1-C322A-01	12" x12" x 6" BACK BOX	FLUSH MOUNT	-	-	-	-	-	-	-	-
CP1V-C322A-01	1 GANG, 3-1/2" DEEP	FLUSH MOUNT	VOLUME CONTROL ENCODER	AVR1-C322A-01	-	-	-	1"	-	-
CSC6-C322A-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
CSC6-C322A-02	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
C322B - SOUND STUDIO										
AV04-C322B-01	12" x12" x 4" BACK BOX	FLUSH MOUNT	SOUND STUDIO PANEL	AVR1-C322A-01	3/4"	3/4"	-	2"	-	-
CP1V-C322B-01	1 GANG, 3-1/2" DEEP	FLUSH MOUNT	VOLUME CONTROL ENCODER	AVR1-C322A-01	-	-	-	1"	-	-
CSC6-C322B-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
C322C - VIDEO STUDIO										
AV05-C322C-01	16" x12" x 4" BACK BOX	FLUSH MOUNT	VIDEO PRODUCTION PANEL	AVR1-C322A-01	-	3/4"	-	3"	3/4"	-
CP1V-C322C-01	1 GANG, 3-1/2" DEEP	FLUSH MOUNT	VOLUME CONTROL ENCODER	AVR1-C322A-01	-	-	-	1"	-	-
CSC6-C322C-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
VTW1-C322C-01	CHIEF PAC526	FLUSH MOUNT	DISPLAY BACK BOX	AVR1-C322A-01	-	-	-	1-1/4"	-	-
C322E - PROJECTOR CLOSET										
VT1E-C322E-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	FLUSH MOUNT	RJ45 RECEPTACLE - DUAL	AVR1-C322A-01	-	-	-	1-1/4"	-	-
C401 - DIMMING CONTROL ROOM										
ICA2-C401-01	2 GANG, 3-1/2" DEEP	FLUSH MOUNT	2CH ANALOG INTERCOM PLATE	AVR1-C322A-01	-	3/4"	-	-	-	-
C402 - LOUDSPEAKER										
LPP2-C402-01	2 GANG BOX, 3-1/2" DEEP	FLUSH MOUNT	DUAL NL4 CONNECTION	AVR1-C322A-01	-	-	1-1/4"	-	-	-
C405 - LOUDSPEAKER										
LPP2-C405-01	2 GANG BOX, 3-1/2" DEEP	FLUSH MOUNT	DUAL NL4 CONNECTION	AVR1-C322A-01	-	-	1-1/4"	-	-	-
D232 - DRESSING ROOM										
CP1V-D232-01	1 GANG, 3-1/2" DEEP	SURFACE MOUNT	VOLUME CONTROL ENCODER	AVR1-C322A-01	-	-	-	1"	-	-
CSC6-D232-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
VT2E-D232-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	SURFACE MOUNT	RJ45 RECEPTACLE - DUAL	AVR1-C322A-01	-	-	-	1-1/4"	-	-
D235 - DRESSING ROOM										
CP1V-D235-01	1 GANG, 3-1/2" DEEP	SURFACE MOUNT	VOLUME CONTROL ENCODER	AVR1-C322A-01	-	-	-	1"	-	-
CSC6-D235-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
VT2E-D235-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	SURFACE MOUNT	RJ45 RECEPTACLE - DUAL	AVR1-C322A-01	-	-	-	1-1/4"	-	-
D368 - DRESSING ROOM										
CP1V-D368-01	1 GANG, 3-1/2" DEEP	SURFACE MOUNT	VOLUME CONTROL ENCODER	AVR1-C322A-01	-	-	-	1"	-	-
CSC6-D368-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
VT2E-D368-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	SURFACE MOUNT	RJ45 RECEPTACLE - DUAL	AVR1-C322A-01	-	-	-	1-1/4"	-	-
D371 - DRESSING ROOM										
CP1V-D371-01	1 GANG, 3-1/2" DEEP	SURFACE MOUNT	VOLUME CONTROL ENCODER	AVR1-C322A-01	-	-	-	1"	-	-
CSC6-D371-01	2 GANG, 3-1/2" DEEP	SURFACE MOUNT	6" CEILING RECESSED LOUDSPEAKER	AVR1-C322A-01	-	-	3/4"	-	-	
VT2E-D371-01	2 GANG, 3-1/2" DEEP W/ 1 GANG TRIM RING	SURFACE MOUNT	RJ45 RECEPTACLE - DUAL	AVR1-C322A-01	-	-	-	1-1/4"	-	-

AV WIRING SCHEDULE

AV WIRING DEVICE NUMBER	HOME RUN ROUTE	WIRE TYPE PER SIGNAL GROUP					
		A	B	C	D	E	X
C214 - SECOND FLOOR LOBBY							
CSC6-C214-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
CSC6-C214-02	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
CSC6-C214-03	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
CSC6-C214-04	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
CSC6-C214-05	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
CSC6-C214-06	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
VTW1-C214-01	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-
C214A - RESTROOM 1							
CSC6-C214A-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
C214B - RESTROOM 2							
CSC6-C214B-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
C291 - AUDITORIUM							
ALSR-C291-01	AVR1-C322A-01	-	-	-	(1) ANTENNA	-	-
ATB1-C291-01	AVR1-C322A-01	-	-	-	(1) ANTENNA	-	-
AV03-C291-01	AVR1-C322A-01	(5) AUDIO	(2) COM	-	(13) DATA-S, (6) SDI-12G, (2) ANTENNA	-	-
AV06-C291-01	AVR1-C322A-01	(4) AUDIO	(2) COM	(2) SPKR14-2	(6) DATA-S, (2) SDI-12G	-	-
AV06-C291-02	AVR1-C322A-01	(4) AUDIO	(2) COM	(2) SPKR14-2	(6) DATA-S, (2) SDI-12G	-	-
AV06-C291-03	AVR1-C322A-01	(4) AUDIO	(2) COM	(2) SPKR14-2	(6) DATA-S, (2) SDI-12G	-	-
AV08-C291-01	AVR1-C322A-01	-	(2) COM	-	(2) DATA-S, (2) SDI-12G	-	-
AV08-C291-02	AVR1-C322A-01	-	(2) COM	-	(2) DATA-S, (2) SDI-12G	-	-
CM01-C291-01	AVR1-C322A-01	-	-	-	(1) DATA-S, (1) SDI-12G	-	-
CM02-C291-01	AVR1-C322A-01	-	-	-	(2) DATA-S, (2) SDI-12G	-	-
CM02-C291-02	AVR1-C322A-01	-	-	-	(2) DATA-S, (2) SDI-12G	-	-
CM02-C291-03	AVR1-C322A-01	-	-	-	(2) DATA-S, (2) SDI-12G	-	-
CM02-C291-04	AVR1-C322A-01	-	-	-	(2) DATA-S, (2) SDI-12G	-	-
LPJ1-C291-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-02	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-03	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-04	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-05	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-06	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-07	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-08	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-09	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-10	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-11	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
LPJ1-C291-12	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	-
MT2-C291-01	AVR1-C322A-01	(2) AUDIO	-	-	-	-	-
C292 - STAGE							
ATB1-C292-01	AVR1-C322A-01	-	-	-	(1) ANTENNA	-	-
ATC1-C292-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
AV01-C292-01	AVR1-C322A-01	(5) AUDIO	(2) COM	(2) SPKR14-2	(9) DATA-S, (4) SDI-12G, (2) ANTENNA	-	-
AV01-C292-02	AVR1-C322A-01	(5) AUDIO	(2) COM	(2) SPKR14-2	(9) DATA-S, (4) SDI-12G, (2) ANTENNA	-	-
CP1T-C292-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
LPP4-C292-01	AVR1-C322A-01	-	-	(4) SPKR14-2	-	-	-
LPP4-C292-02	AVR1-C322A-01	-	-	(4) SPKR14-2	-	-	-
LPP4-C292-03	AVR1-C322A-01	-	-	(4) SPKR14-2	-	-	-
C293 - STAGE EXTENSION							
AV02-C293-01	AVR1-C322A-01	(4) AUDIO	(2) COM	(2) SPKR14-2	(6) DATA-S, (2) SDI-12G	-	-
AV02-C293-02	AVR1-C322A-01	(4) AUDIO	(2) COM	(2) SPKR14-2	(6) DATA-S, (2) SDI-12G	-	-
VTW1-C293-01	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-
VTW1-C293-02	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-
C322A - PROJECTOR ROOM							
AV07-C322A-01	AVR1-C322A-01	(1) AUDIO	(2) COM	-	(3) DATA-S, (2) SDI-12G	-	-
AV07-C322A-02	AVR1-C322A-01	(1) AUDIO	(2) COM	-	(3) DATA-S, (2) SDI-12G	-	-
AVR1-C322A-01	-	-	-	-	-	-	-
CP1V-C322A-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
CSC6-C322A-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
CSC6-C322A-02	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
C322B - SOUND STUDIO							
AV04-C322B-01	AVR1-C322A-01	(4) AUDIO	(2) COM	-	(12) DATA-S, (2) ANTENNA	-	-
CP1V-C322B-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
CSC6-C322B-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
C322C - VIDEO STUDIO							
AV05-C322C-01	AVR1-C322A-01	-	(2) COM	-	(10) DATA-S, (18) SDI-12G	(1) FIBER-6	-
CP1V-C322C-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
CSC6-C322C-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
VTW1-C322C-01	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-
C322E - PROJECTOR CLOSET							
VT1E-C322E-01	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-
C401 - DIMMING CONTROL ROOM							
ICA2-C401-01	AVR1-C322A-01	-	(2) COM	-	-	-	-
C402 - LOUDSPEAKER							
LPP2-C402-01	AVR1-C322A-01	-	-	-	(2) SPKR12-4	-	-
C405 - LOUDSPEAKER							
LPP2-C405-01	AVR1-C322A-01	-	-	-	(2) SPKR12-4	-	-
D232 - DRESSING ROOM							
CP1V-D232-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
CSC6-D232-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
VT2E-D232-01	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-
D235 - DRESSING ROOM							
CP1V-D235-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
CSC6-D235-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
VT2E-D235-01	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-
D368 - DRESSING ROOM							
CP1V-D368-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
CSC6-D368-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
VT2E-D368-01	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-
D371 - DRESSING ROOM							
CP1V-D371-01	AVR1-C322A-01	-	-	-	(1) DATA-S	-	-
CSC6-D371-01	AVR1-C322A-01	-	-	(1) SPKR14-2	-	-	
VT2E-D371-01	AVR1-C322A-01	-	-	-	(2) DATA-S	-	-

NOTES:
1. SEE TA0.01 FOR AUDIOVISUAL SYSTEMS CONDUIT REQUIREMENTS.
2. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL PULL BOXES AS REQUIRED PER NEC.
3. PROVIDE CABLE DROP OUT KIT / WATERFALL CABLE MANAGEMENT FOR CABLE TRAYS TO PROTECT CABLES EXITING THE TRAY. COORDINATE WITH AV CONTRACTOR FOR TRAY AND CABLE DROP OUT KIT MOUNTING LOCATIONS.
4. AV CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR TO VERIFY CONDUIT ROUTES, SIZES, AND CABLING ACCORDING TO AUDIOVISUAL SYSTEM DIAGRAMS.
5. CONDUIT RUNS FROM WIRING DEVICES TO THEIR DESINATION MAY BE COMBINED PROVIDED SIGNAL SEPARATION AND GROUPING FOR ALL AV CABLING ARE MAINTAINED PER REQUIREMENTS ON SHEET TA0.01. ANY CONDUIT RUNS COMBINED IN THIS WAY SHALL BE DONE SO WITH A PULL BOX SIZED PER NEC. FOR ANY COMBINED CONDUIT RUNS, THE CONDUITS MUST UPSIZE PER CONDUIT FILL REQUIREMENTS ON SHEET TA0.01.
6. FOR DEVICES WITH MULTIPLE HOME RUN ROUTES, DIFFERENT HOME RUNS ARE INDICATED BY A (*) SYMBOL. FOR EXAMPLE:



DLRGROUP
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HAFT THEATER - INTERIOR RENOVATIONS
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343 WEST 27TH STREET
NEW YORK, NY 10001

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REVISIONS

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AUDIOVISUAL SCHEDULES

TA.701.00

Autodesk Docs://57-23140-00 FIT Haft Auditorium Phase 2 Renovations/57-23140-00 FIT Haft Aud_PH 2 Reno_TA_24.rvt
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GENERAL NOTES

1. REMOVE ALL UNUSED PIPING, DUCTWORK AND ACCESSORIES.
2. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING, PRIOR TO FINAL BID, ALL EXISTING CONDITIONS FOR PLUMBING AND MECHANICAL SYSTEMS WITHIN TENANT SPACE AND WITHIN CLOSE PROXIMITY OF TENANT SPACE.
3. THE MECHANICAL CONTRACTOR SHALL PERFORM SERVICE AND REPAIR ON THE EXISTING EQUIPMENT AND ITS ACCESSORIES AS FOLLOWS: CLEAN ALL COILS, REPLACE THE FILTERS AND BELTS, INSPECT, REPAIR, OR REPLACE THE ECONOMIZERS, DRIVES AND FAN BEARINGS, MOTORS, CONTROL COMPONENTS, VALVES AND ANY OTHER ITEM NECESSARY FOR A COMPLETE AND PROPER OPERATING SYSTEM. THIS CONTRACTOR SHALL ALSO VISIT THE SITE, PRIOR TO FINAL BIDDING, AND VERIFY ALL EXISTING SITE CONDITIONS. PROVIDE ALL MATERIAL AND COMPONENTS AS NEEDED TO BRING THE UNITS TO FULL COMPLIANCE OF THE LANDLORD'S CRITERIA AND LOCAL AUTHORITY HAVING JURISDICTION.
4. WHERE FLOOR DRAINS OCCUR WITHIN THE LIMITS OF CONSTRUCTION, PREVENT CONSTRUCTION DEBRIS FROM ENTERING DRAIN BODY BY SEALING DRAIN OPENING PRIOR TO START OF WORK. UNSEAL DRAINS AT COMPLETION OF CONSTRUCTION.
5. COORDINATE INSTALLATION OF PIPING, DUCTWORK, CONDUIT, LIGHTS, CABLE TRAY, STRUCTURE, AND EQUIPMENT TO PREVENT CONFLICTS.
6. THE CONTRACTOR SHALL BE FAMILIAR WITH ALL THE CONDITIONS BOTH EXISTING AND THOSE ILLUSTRATED BY THESE DOCUMENTS AS WELL AS THOSE WHICH CAN BE REASONABLY ANTICIPATED INCLUDING, BUT NOT LIMITED TO ARCHITECTURAL, ELECTRICAL, VENTILATION, PLUMBING, AND OTHER SYSTEMS INVOLVED ON THIS PROJECT.
7. FINAL PRODUCT SHALL BE A COMPLETE AND FUNCTIONING SYSTEM, AND SHALL CONFORM TO ALL REQUIREMENTS OF APPLICABLE FEDERAL, STATE, AND LOCAL CODES, INCLUDING BUT NOT LIMITED TO THE INTERNATIONAL BUILDING CODE AND INTERNATIONAL MECHANICAL CODE.
8. LOCATE EQUIPMENT REQUIRING ACCESS 2'-0" MAXIMUM ABOVE CEILING.
9. ALL ROOF MOUNTED EQUIPMENT SHALL BE A MINIMUM 10'-0" FROM EDGE OF ROOF.
10. LOCATE DUCTWORK, PIPING AND MECHANICAL EQUIPMENT AWAY FROM THE SPACE ABOVE ELECTRICAL PANELS. TRANSFORMERS AND OTHER ELECTRICAL EQUIPMENT.
11. FIRE SEAL AROUND DUCT AND PIPING PENETRATIONS OF FIRE RATED WALLS. REFER TO SPECIFICATION.
12. PROVIDE SLEEVES AND/OR OPENINGS TO RUN PIPES AND DUCTS THROUGH FOUNDATIONS, FLOORS, WALLS, AND ROOF.
13. ADJUST PIPING AND DUCTWORK SIZES TO PROPERLY CONNECT TO MECHANICAL EQUIPMENT.
14. REFER TO PLUMBING SERIES DRAWINGS FOR GAS AND A.C. CONDENSATE DRAIN PIPING.
15. PIPE SIZES SHOWN SHALL BE CONTINUED IN THE DIRECTION OF FLOW UNTIL ANOTHER SIZE IS SHOWN.
16. FOR DETAILS, EQUIPMENT CONNECTIONS, AND PIPE SIZES NOT SHOWN ON THE SEGMENTS, REFER TO DETAILS, SCHEDULES, AND SPECIFICATIONS.
17. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH THE RESPECTIVE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS, AT A LEVEL OF QUALITY AND WORKMANSHIP CONSISTENT WITH THE SPECIFICATIONS.
18. LOCATIONS OF PIPING, DUCTWORK AND EQUIPMENT AS INDICATED ON THE DRAWING, ARE APPROXIMATE AND SUBJECT TO MINOR ADJUSTMENTS IN THE FIELD. WORK SHALL BE COORDINATED WITH ALL OTHER TRADES TO AVOID INTERFERENCE IN THE FIELD.
19. INSTALL EXPOSED PIPING AND DUCTWORK AS HIGH AS PRACTICAL IN ROOMS WITHOUT CEILINGS.

GENERAL HVAC NOTES

1. SUPPLY AND RETURN PIPING TO COILS ARE THE SAME SIZE.
2. CONTRACTOR SHALL LOCATE THERMOSTATS AND TEMPERATURE SENSORS AT 48" AFF MAX, A MINIMUM OF 8" FROM LIGHT SWITCH.
3. REFER TO PIPING DRAWINGS FOR THERMOSTAT AND TEMPERATURE SENSOR LOCATIONS.
4. CONDENSATE DRAINS SHALL BE SUPPLIED FOR ALL COOLING EQUIPMENT. CONTRACTOR SHALL ENSURE PROPER INSTALLATION AND DRAINAGE AS REQUIRED BY FEDERAL, STATE, AND LOCAL CODES. CONDENSATE PIPING SHALL BE TYPE "L" COPPER.
5. PROVIDE A 4" HOUSEKEEPING PAD FOR EACH PIECE OF MECHANICAL EQUIPMENT. COORDINATE SIZES WITH MECHANICAL EQUIPMENT SELECTED.
6. ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK SHALL BE RATED FOR PRESSURE CLASS OF 2" W.G. UNLESS NOTED OTHERWISE.
7. THIS CONTRACTOR SHALL BE REQUIRED TO REPLACE FILTERS ON HVAC EQUIPMENT AFTER ALL DUST PRODUCING CONSTRUCTION HAS BEEN COMPLETED AND PRIOR TO THE FINAL PUNCH.

SHEET INDEX

M.001.00 MECHANICAL GENERAL NOTES, SYMBOLS AND ABBREVIATIONS
M.002.00 MECHANICAL ABBREVIATIONS

MD.102.00 LEVEL 02 AND 03 - MECHANICAL DEMOLITION PLAN

M.102.00 LEVEL 02 - MECHANICAL PLAN
M.103.00 LEVEL 03 - MEZZANINE MECHANICAL PLAN
M.104.00 ROOF - MECHANICAL PLAN

M.301.00 ENLARGED MECHANICAL PLANS - 2ND FLOOR LOBBY
M.302.00 ENLARGED MECHANICAL PLANS - 2ND AND 3RD FLOOR DRESSING ROOMS
M.303.00 ENLARGED MECHANICAL PLANS - 3RD FLOOR AV ROOMS

2 M.500.00 MECHANICAL CONTROLS

M.800.00 MECHANICAL SCHEDULES AND DETAILS

GENERAL SYMBOLS

	POINT OF DISCONNECT - DEMOLITION REMOVED FROM EXISTING
	POINT OF CONNECTION - NEW CONNECTS TO EXISTING
	AREA NOT IN CONTRACT

PIPING ANNOTATIONS

SCHEMATIC	3D	DESCRIPTION
		EXISTING TO REMAIN - (E) or EXIST
		ITEM TO BE DEMOLISHED - (D) or DEMO
18" CHWS	18" CHWS	PIPE SIZE TAG (DIAMETER WITH SYSTEM NAME)
		ABOVE GROUND PIPING
		BELOW GROUND PIPING
1/8" / 12" SLOPE	1/8" / 12" SLOPE	PIPE SLOPE
IE: -93' - 1"	IE: -93' - 8"	PIPE INVERT ELEVATION
DDC-xx		MECHANICAL EQUIPMENT TAG
		MECHANICAL EQUIPMENT CLEARANCE

PIPING VALVES AND FITTINGS

SCHEMATIC	3D	DESCRIPTION
		PIPE DROP
		PIPE RISE
		PIPE TEE DOWN
		PIPE TEE UP
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER
		PIPE CAP
		PIPE ALIGNMENT GUIDE
		PIPE ANCHOR
		FLOW DIRECTION
		EXPANSION JOINT
		FLEXIBLE CONNECTION
		UNION
		DIRECTION OF PIPE PITCH
		AQUASTAT
		EXPANSION LOOP
		BALANCING VALVE
		BALANCING VALVE W/ METERING POINTS
		BALL VALVE
		BUTTERFLY VALVE
		CHECK VALVE
		STEAM TRAP
		GATE VALVE
		CIRCUIT SETTER
		MANUAL AIR VENT
		AUTOMATIC AIR VENT
		PLUG VALVE
		PRESSURE GAUGE
		SOLENOID VALVE
		ANGLE VALVE
		AUTOMATIC CONTROL VALVE 2-WAY
		AUTOMATIC CONTROL VALVE 3-WAY
		AUTOMATIC FLOW CONTROL VALVE
		STRAINER
PT		PRESSURE AND TEMPERATURE TEST PORT
		THERMOMETER
		PRESSURE REDUCING VALVE (WATER SYSTEMS) PRESSURE REGULATING VALVE (GAS SYSTEMS)
		RELIEF VALVE
		FLOW MEASURING DEVICE
		BACKFLOW PREVENTER
		UNION

*** 3D VALVE REPRESENTATION IS AN EXAMPLE. VALVE IN MODEL MAY VARY DEPENDING ON APPLICATIONS. SEE SPECIFICATIONS.

HVAC SYMBOLS

SCHEMATIC	3D	DESCRIPTION
		DIFFUSER (SUPPLY)
		GRILLE (RETURN)
		GRILLE (EXHAUST)
		WALL REGISTER
		LINEAR DIFFUSER (SLOT)
AFMS	AFMS	AIR FLOW MEASURING STATION
D	D	DUCT DETECTOR
H	H	DUCT MOUNTED HUMIDISTAT
BDD	BDD	BACKDRAFT DAMPER
SB	SB	SECURITY BARS
VD	VD	VOLUME DAMPER
FS	FS	COMBINATION FIRE / SMOKE DAMPER
F	F	FIRE DAMPER
S	S	SMOKE DAMPER
MBD	MBD	MOTORIZED BACKDRAFT DAMPER
M	M	MOTORIZED DAMPER
		ROUND DUCT UP
		RECTANGULAR DUCT UP
		OVAL DUCT UP
		ROUND DUCT DOWN
		RECTANGULAR DUCT DOWN
		OVAL DUCT DOWN
		MITERED ELBOW WITH VANES
		MITERED ELBOW WITHOUT VANES
		RADIUSED ELBOW
		TEE WITH VANES
		RADIUSED TEE
		DUCT WITH INSULATION
		DUCT WITH LINING
		DUCT IS FABRIC
		FLEXIBLE DUCT
		TRANSFER DUCT
		DUCT SMOKE DETECTOR
		SUPPLY ARROW RETURN ARROW EXHAUST ARROW
UC 100		DOOR UNDERCUT ARROW WITH CFM
D-1 12"x12" 200 CFM		DIFFUSER, REGISTER OR GRILLE TAG NECK SIZE (00"x00" - SQ / RECT) (0"ø ROUND) AIR FLOW (CUBIC FEET PER MINUTE)
24"x12"		TYPICAL DUCT - SIZE AS INDICATED (WIDTH x DEPTH) SIZE INDICATED FREE AREA
	DDC-xx	MECHANICAL EQUIPMENT TAG MECHANICAL EQUIPMENT CLEARANCE
		CARBON DIOXIDE SENSOR - WALL MOUNTED
		CARBON MONOXIDE SENSOR - WALL MOUNTED
		STATIC PRESSURE SENSOR - WALL MOUNTED
		STATIC PRESSURE SENSOR - CEILING MOUNTED
		HUMIDISTAT - WALL MOUNTED
		HUMIDISTAT - CEILING MOUNTED
		NITROGEN DIOXIDE SENSOR - WALL MOUNTED
		PRESSURE SENSOR - WALL MOUNTED
		PRESSURE SENSOR - CEILING MOUNTED
		TEMPERATURE SENSOR - WALL MOUNTED
		TEMPERATURE SENSOR - CEILING MOUNTED
		THERMOSTAT - WALL MOUNTED

MECHANICAL PIPING SYSTEMS

SCHEMATIC	3D	DESCRIPTION
DFR	DFR	DIESEL FUEL RETURN
DFS	DFS	DIESEL FUEL SUPPLY
DFV	DFV	DIESEL FUEL VENT
FOR	FOR	FUEL OIL RETURN
FOS	FOS	FUEL OIL SUPPLY
FOV	FOV	FUEL OIL VENT
HPR	HPR	HIGH PRESSURE STEAM RETURN
HPS	HPS	HIGH PRESSURE STEAM SUPPLY
LPR	LPR	LOW PRESSURE STEAM RETURN
LPS	LPS	LOW PRESSURE STEAM SUPPLY
MPR	MPR	MEDIUM PRESSURE STEAM RETURN
MPS	MPS	MEDIUM PRESSURE STEAM SUPPLY
SV	SV	STEAM VENT
GWR	GWR	GEOTHERMAL WATER RETURN
GWS	GWS	GEOTHERMAL WATER SUPPLY
HRWR	HRWR	HEAT RECOVERY WATER RETURN
HRWS	HRWS	HEAT RECOVERY WATER SUPPLY
HTWR	HTWR	HIGH TEMPERATURE HOT WATER RETURN
HTWS	HTWS	HIGH TEMPERATURE HOT WATER SUPPLY
HWR	HWR	HOT WATER RETURN
HWS	HWS	HOT WATER SUPPLY
HCR	HCR	HOT / CHILLED WATER RETURN
HCS	HCS	HOT / CHILLED WATER SUPPLY
WLR	WLR	WATER LOOP RETURN
WLS	WLS	WATER LOOP SUPPLY
RD	RD	REFRIGERANT DISCHARGE
RHG	RHG	REFRIGERANT HOT GAS
RL	RL	REFRIGERANT LIQUID
RS	RS	REFRIGERANT SUCTION
RV	RV	REFRIGERANT VENT
CHWR	CHWR	CHILLED WATER RETURN
CHWS	CHWS	CHILLED WATER SUPPLY
CWR	CWR	CONDENSER WATER RETURN
CWS	CWS	CONDENSER WATER SUPPLY
CD	CD	CONDENSATE DRAIN
SCD	SCD	SECONDARY CONDENSATE DRAIN

PROJECT NARRATIVE

THE SCOPE OF THIS PROJECT FOCUSED AROUND 3 AREAS OF THE BUILDING.

1. THE ADDITION OF MINI-SPLIT SYSTEMS TO COOL THE ADDITION OF HEAT ADDED TO THE PROJECTION ROOM SPACES ON LEVEL 3.
2. THE ARCHITECTURAL CHANGES ASSOCIATED WITH THE 2ND FLOOR RESTROOMS AT THE LOBBY SPACES. THIS INCLUDES REARRANGING DUCTWORK. THE ADDITION OF AN EXHAUST FAN UP THROUGH THE BUILDING, AND PLUMBING UPGRADES TO SERVE THE NEW/UPGRADED RESTROOMS.
3. NEW CEILINGS AND PLUMBING FIXTURES ON 2ND FLOOR AND 3RD FLOOR DRESSING ROOMS TO INCLUDE REPLACEMENT OF PLUMBING FIXTURES AND GRILLES AND DIFFUSERS SERVING THOSE SPACES.

DLRGROUP
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MECHANICAL GENERAL NOTES, SYMBOLS AND ABBREVIATIONS

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ABBREVIATIONS

#	NUMBER
&	AND
(D)	DEMOLISHED
(E)	EXISTING
(R)	RELOCATED
@	AT
°C	DEGREES CELSIUS
°F	DEGREES FAHRENHEIT
Ø	PHASE
Ø	DIAMETER
A	COMPRESSED AIR
A	AMPERE
A	AMP
A/C	AIR CONDITIONING(ER)
A/E	ARCHITECT/ENGINEER
AABC	ASSOCIATED AIR BALANCE COUNCIL
AAP	ALARM ANNUNCIATOR PANEL
AAP	AREA ALARM PANEL
AAV	AUTOMATIC AIR VENT
AAV	AIR ADMITTANCE VALVE
AB	ANCHOR BOLT
ABS	ACRYLONITRILE-BUTADIENE-STYRENE
AC	ALTERNATING CURRENT
AC	ACOUSTIC CEILING
ACC	AIR COOLED CONDENSER
ACC	ACCESSIBLE
ACCU	AIR COOLED CONDENSING UNIT
ACM	ALUMINUM COMPOSITE MATERIAL
ACST	ACOUSTIC
AD	AREA DRAIN
AD	ACCESS DOOR
ADDN	ADDITION OR ADDITIONAL
ADJ	ADJUSTABLE
ADJT	ADJACENT, ADJOINING
ADMIN	ADMINISTRATION
ADO	AUTOMATIC DOOR OPENER
AF	AIR FILTER
AFC	ABOVE FINISHED COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AGF	AIR GAP FITTING
AHJ	AUTHORITY HAVING JURISDICTION
AHRI	AIR-CONDITIONING HEATING AND REFRIGERATION INSTITUTE
AHU	AIR HANDLING UNIT
AI	AREA INLET
AI	ANALOG INPUT
ALT	ALTERNATE
ALUM	ALUMINUM
AMB	AMBIENT
AMBA	AMERICAN BOILER MANUFACTURERS ASSOCIATION
AMP	AMPERE
ANCH	ANCHOR
AP	ACCESS PANEL
APC	ACOUSTIC PANEL CEILING
APPROX	APPROXIMATE
AR	ACID RESISTING
AR	ARGON
ARCH	ARCHITECTURAL
AS	AIR SEPARATOR
ASB	ASBESTOS
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASHRAE	AMERICAN SOCIETY OF HEATING REFRIGERATION AND AIR CONDITIONING ENGINEERS
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASPH	ASPHALT
AUTO	AUTOMATIC
AV	AUDIO-VIDEO, AUDIO-VISUAL
AV	ACID VENT
AV	AIR VENT
AVG	AVERAGE
AW	ACID WASTE
AWG	AMERICAN WIRE GAUGE
AWP	ACOUSTIC WALL PANEL
B	BOILER
B to B	BACK TO BACK
BAS	BUILDING AUTOMATION SYSTEM
BAT	BATTERY
BBO	BOILER BLOW OFF
BC	BALANCING COCK
BC	BARE COPPER
BCMU	BURNISHED CONCRETE MASONRY UNIT
BD	BOARD
BDD	BACK DRAFT DAMPER
BET	BETWEEN
BF	BOILER FEED
BFF	BELOW FINISH FLOOR
BFP	BACKFLOW PREVENTER
BFR	BELOW FLOOR
BFV	BUTTERFLY VALVE
BHP	BREAK HORSEPOWER
BI	BACKWARD INCLINED (FAN IMPELLER/WHEEL)
BKR	BREAKER
BL	BUILDING LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BLKHD	BULKHEAD
BM	BENCH MARK
BM(S)	BEAM(S)
BMS	BUILDING MANAGEMENT SYSTEM
BOD	BOTTOM OF DUCT
BOF	BOTTOM OF FOOTING
BOP	BOTTOM OF PIPE
BOT	BOTTOM
BPIP	BOILER PLANT INSTRUMENTATION PANEL
BRDG	BRIDGING
BRG	BEARING
BRKT	BRACKET
BSMT	BASEMENT
BT	BATHTUB
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BUR	BUILT UP ROOFING
BV	BALL VALVE
C	CONDUIT
C	CONDENSER WATER
CA	COMBUSTION AIR
CANT	CANTILEVER
CAP	CAPACITY
CAS	CASING
CBD	COUNTER-BALANCED DAMPER
CBD	CHALKBOARD
CC	COOLING COIL
CCR	CONTROL CONTRACTOR
CCTV	CLOSED CIRCUIT TELEVISION
CD	CONDENSATE DRAIN
CD	CEILING DIFFUSER
CD	CONSTRUCTION DOCUMENTS
CDA	CLEAN DRY AIR (COMPRESSED AIR)
CDF	COMBINATION DRINKING FOUNTAIN & BOTTLE FILLING STATION
CE	COVER ELEVATION
CEM	CEMENT
CENT	CENTRIFUGAL
CER	CERAMIC
CF	CUBIC FEET
CFCI	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CG	CORNER GUARD
CH	CHILLER
CH	CHANNEL
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CI	CAST IRON
CI	CURB INLET
CIP	CAST IN PLACE
CIP	CAST IRON PIPE
CIRC	CIRCULATING
CJ	CONTROL JOINT
CJ	CONSTRUCTION JOINT
CJA	CONTROL JOINT ABOVE
CKT	CIRCUIT
CKT BK	CIRCUIT BREAKER
CL	CENTER LINE
CL	CIRCUIT LINE
CLG	CEILING
CLOS	CLOSET
CLR	CLEAR
CM	CEILING MOUNTED
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
CO	CARBON MONOXIDE
CO	CONDUIT ONLY
CO2	CARBON DIOXIDE
COL	COLUMN
COMB	COMBINATION
COMM	COMMUNICATIONS
COMP	COMPRESSOR UNIT
COMP	COMPOSITE
COMPR	COMPRESSIBLE
CONC	CONCRETE
COND	CONDENSATE
CONF	CONFERENCE
CONFIG	CONFIGURATION
CONN(S)	CONNECTION(S)
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACT(OR)
CONV	CONVECTOR
COOR	COORDINATE
COORD	COORDINATE
CP	CONDENSATE PUMP
CP	COVER PLATE
CPS	CYCLES PER SECOND
CPT	CARPET
CPVC	CHLORINATED POLYVINYL CHLORIDE
CR	CORROSION RESISTANT
CRAC	COMPUTER ROOM AIR CONDITIONING UNIT
CS	COUNTERSINK
CS	COMBINATION SEWER
CS	CARBON STEEL
CSK	COUNTERSUNK
CSMU	CALCIUM SILICATE MASONRY UNIT
CSP	COMBINATION STANDPIPE
CSWK	CASEWORK
CT	COOLING TOWER
CT	CERAMIC TILE
CT	CURRENT TRANSFORMER
CTL	CONTROL
CTR	CENTER
CU	COPPER
CU	CONDENSING UNIT
CU	CUBIC
CU	COMBINATION UNIT
CUH	CABINET UNIT HEATER
CW	COLD WATER
CWP	CONDENSER WATER PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CWV	COMBINATION WASTE AND VENT
CY	CUBIC YARD
CYL	CYLINDER
D	DRAIN
D	DIFFUSER
D	DEPTH
D	DATA
d	PENNY (NAIL 10D)
DB	DECIBEL
DB	DRY BULB
DBA	DECIBELS A
DBL	DOUBLE
DC	DIRECT CURRENT
DC	DUST COLLECTOR
DCJ	DUMMY CONTROL JOINT
DDC	DIRECT DIGITAL CONTROL
DEG	DEGREE
DEMO	DEMOLISH OR DEMOLITION
DEPR	DEPRESS(ION)(ED)
DEPT	DEPARTMENT
DET	DETAIL
DET	DETENTION
DF	DRINKING FOUNTAIN
DFR	DIESEL FUEL RETURN
DFS	DIESEL FUEL SUPPLY
DFU	DRAINAGE FIXTURE UNIT
DFV	DIESEL FUEL VENT
DG	DOOR GRILLE
DH	DUCT HEATER
DHU	DEHUMIDIFICATION UNIT
DI	DEIONIZED WATER
DI	DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGONAL
DIC	DISCHARGE
DIFF	DIFFUSER
DIM	DIMENSION
DISC	DISCONNECT
DISC SW	DISCONNECT SWITCH
DISCH	DISCHARGE
DISTR	DISTRIBUTION
DIV	SPECIFICATION DIVISION
DL	DRUM LOUVER
DL	DEAD LOAD
DM	DAMPER MOTOR
DMPR	DAMPER
DN	DOWN
DO or "	DITTO
DOAS	DEDICATED OUTDOOR AIR SYSTEM UNIT
DOE	DEPARTMENT OF ENERGY
DP	DIFFERENTIAL PRESSURE
DPFG	DAMPROFFING
DPI	DIFFERENTIAL PRESSURE INDICATOR
DPS	DIFFERENTIAL PRESSURE SWITCH
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
DR	DOOR
DR	DRAIN
DS	DISTILLED WATER
DS	DOWNSPOUT
DSN	DOWNSPOUT NOZZLE
DSP	DRY STANDPIPE
DSPR	DRY SPRINKLER PIPING
DSPR	DRY SPRINKLER PIPE
DSTB	DISTRIBUTED
DTL	DETAIL
DTR	DUCT THRU ROOF
DW	DISHWASHER
DWBP	DOMESTIC WATER BOOSTER PUMP
DWDI	DOUBLE WIDTH DOUBLE INLET
DWG(S)	DRAWING(S)
DWL(S)	DOWEL(S)
DWR	DRAWER
DWRP	DOMESTIC WATER RECIRCULATING PUMP
DX	DIRECT EXPANSION
DXS	DOUBLE EXTRA STRONG
E	EAST
EA	EACH
EA	EXHAUST AIR
EA	EACH FACE
EAT	ENTERING AIR TEMPERATURE
EB	ELECTRIC BASEBOARD RADIATION
EB	EXPANSION BOLT
EBH	ELECTRIC BASIN HEATER
EC	ELECTRICAL CONTRACTOR
ECON	ECONOMIZER
ECS	EMERGENCY COMMUNICATION SYSTEM
EDH	ELECTRIC DUCT HEATER
EE	EACH END
EER	ENERGY EFFICIENCY RATIO
EEW	EMERGENCY EYE WASH
EEWS	EMERGENCY EYE WASH SHOWER
EF	EXHAUST FAN
EF	EACH FACE
EFF	EFFICIENCY
EG	EXHAUST AIR GRILLE
EH	ELECTRICAL HEATER
EIFS	EXTEROR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELAS	ELASTOMERIC
ELEC	ELECTRICAL(AL)
ELEV	ELEVATOR
EMCS	ENERGY MANAGEMENT CONTROL SYSTEM
EMD	ESTIMATED MAXIMUM DEMAND
EMER	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EMV	EMERGENCY MIXING VALVE
ENCL	ENCLOSURE
ENT	ENTERING
ENTR	ENTRANCE
EOMD	END OF MAIN DRIP
EP	ELECTRO-PNEUMATIC
EP	EXPLOSION PROOF
EPO	EMERGENCY POWER OFF
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ER	EXISTING (TO BE) RELOCATED
ER	EXHAUST REGISTER
ERA	ENERGY RECOVERY AIR
ERF	EPOXY RESIN FLOORING
ES	EMERGENCY SHOWER
ES	EXTRA STRONG
ESP	EXTERNAL STATIC PRESSURE
EST	ESTIMATE
ET	EXPANSION TANK
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EWT	ENTERING WATER TEMPERATURE
EXC	EXCAVATE
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION
EXP	EXPOSED
EXPL	EXPLOSION
EXT	EXTERIOR
F	FAHRENHEIT
F	FIRELINE
F	FURNACE
F	FACE
F	FIRE SERVICE
FA	FIRE ALARM
FA	FACE
FA	FRESH AIR
FAA	FIRE ALARM ANNUNCIATOR
FAB	FABRICATE(D)
FACP	FIRE ALARM CONTROL PANEL
FB	FACE BRICK
FC	FLUID COOLER
FCMU	FLUTED CONCRETE MASONRY UNIT
FCO	FLOOR CLEAN OUT
FCU	FAN COIL UNIT
FCV	FLOW CONTROL VALVE
FCW	FILTERED COLD WATER
FD	FLOOR DRAIN
FD	FIRE DAMPER
FDC	FIRE DEPARTMENT CONNECTION
FDN	FOUNDATION
FDNDR	FOUNDATION DRAIN
FDR	FEEDER
FDV	FIRE DEPARTMENT VALVE
FDVC	FIRE DEPARTMENT VALVE CABINET
FE	FIRE EXTINGUISHER
FEA	FUME HOOD EXHAUST AIR
FEC	FIRE EXTINGUISHER CABINET
FF	FINISH FLOOR
FH	FIRE HYDRANT
FH	FILTER HOUSING
FHC	FIRE HOSE CABINET
FIG	FIGURE
FIN	FINISHED
FIX	FIXTURE
FL	FLOOR
FLA	FULL LOAD AMPS
FLASH	FLASHING
FLEX	FLEXIBLE
FLG	FLANGE
FLG	FLOORING
FLM	FULL LENGTH MIRROR
FLUOR	FLUORESCENT
FM	FIRE MAIN
FM	FORCE MAIN
FM	FACTORY MUTUAL
FMCS	FACILITIES MANAGMENT CONTROL SYSTEM
FME	FLOW MEASURING EQUIPMENT
FNPT	FEMALE NPT
FO	FINISH OPENING
FO	FACE OF
FOC	FACE OF CONCRETE
FOF	FUEL OIL FILL
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOS	FACE OF STUD
FOV	FUEL OIL VENT
FOW	FACE OF WALL
FP	FIRE PUMP
FP	FIREPROOFING
FPB	FAN POWERED VAV TERMINAL
FPD	FIRE PUMP DISCHARGE
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FR	FIRE RESISTANT
FR	FIRE RESISTIVE
FR	FRAME
FRP	FIBERGLASS REINFORCED PANEL
FS	FLOW SWITCH
FS	FLOOR SINK
FSD	FIRE SMOKE DAMPER
FSEC	FOOD SERVICE EQUIPMENT CONTRACTOR
FT	FEET
FT	FIN TUBE
FT	FLOW TRANSMITTER
FTG	FOOTING
FURN	FURNISH(ED)
FUT	FUTURE
FV	FIELD VERIFY
FV	FACE VELOCITY
FVC	FIRE VALVE CABINET
FWC	FABRIC WALL COVERING
G	GRILLE
G	NATURAL GAS
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRAD BAR
GC	GENERAL CONTRACTOR
GCMU	GLAZED CONCRETE MASONRY UNIT
GCO	GRADE CLEAN OUT
GD	GARBAGE DISPOSAL
GEA	GREASE EXHAUST AIR
GEN	GENERATOR
GEN	GENERAL
GFA	GROSS FLOOR AREA
GFCMU	GROUND-FACE CONCRETE MASONRY UNIT
GFI, GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFRC	GLASS FIBER REINFORCED CONCRETE
GHR	GLYCOL-WATER HEATING RETURN
GHS	GLYCOL-WATER HEATING SUPPLY
GI	GALVANIZED IRON
GL	GLUE LAMINATED
GL	GLASS
GMU	GLASS MASONRY UNIT
GND	GROUND
GOVT	GOVERNMENT
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GUARD RAIL
GR	GRADE
GR	GRILLE
GRC	GLASS REINFORCED CONCRETE
GRC	GALVANIZED RIGID CONDUIT
GRC	GLASS REINFORCED CONCRETE
GRD	GRILLES, REGISTERS AND DIFFUSERS
GRGP	GLASS REINFORCED GYPSUM PLASTER
GRS	GALVANIZED RIGID STEEL
GRV	GRAVITY VENTILATOR
GS	GASOLINE
GV	GATE VALVE
GV	GREASE VENT
GVBF	GREASE VENT BELOW FLOOR
GW	GREASE WASTE
GWB	GYPSUM WALL BOARD
GWR	GEOTHERMAL WATER RETURN
GWS	GEOTHERMAL WATER SUPPLY
GYP	GYPSUM
H	HEIGHT
H1E	HOOK ONE END
H2	HYDROGEN
HB	HOSE BIB
HC	HEATING COIL
HC	HOLLOW CORE
HC	HANDICAP
HCB	HANDICAP BENCH
HCR	HOT/CHILLED WATER RETURN
HCS	HOT/CHILLED WATER SUPPLY
HCW	HARD COLD WATER
HD	HAND DRYER
HDBD	HARDBOARD
HDCP	HANDICAP
HDR	HEADER
HDWD	HARDWOOD
HDWR	HARDWARE
HE	HELIUM
HEV	HOSE END VALVE
HGR	HANGER
HID	HIGH INTENSITY DISCHARGE
HM	HOLLOW METAL
HOA	HAND-OFF-AUTOMATIC
HORIZ	HORIZONTAL
HP	HORSE POWER
HP	HEAT PUMP
HP	HIGH PRESSURE
HPC	HIGH PRESSURE STEAM CONDENSATE
HPNG	HIGH PRESSURE NATURAL GAS
HPR	HIGH PRESSURE STEAM RETURN
HPS	HIGH PRESSURE STEAM SUPPLY
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HRO	HOT REVERSE OSMOSIS
HROC	HOT REVERSE OSMOSIS RECIRCULATION
HRWR	HEAT RECOVERY WATER RETURN
HRWS	HEAT RECOVERY WATER SUPPLY
HS	HEADSTUD
HSPF	HEAT SEASONAL PERFORMANCE FACTOR
HSTR	HIGH STRENGTH
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HTWR	HIGH TEMPERATURE HOT WATER RETURN
HTWS	HIGH TEMPERATURE HOT WATER SUPPLY
HUM	HUMIDIFIER
HV	HEATING VENTILATING UNIT
HVAC	HEATING VENTILATING AND AIR CONDITIONING
HW	DOMESTIC HOT WATER
HWC	DOMESTIC HOT WATER RECIRCULATING
HWR	HEATING WATER RETURN
HWS	HEATING WATER SUPPLY
HX	HEAT EXCHANGER
HZ	HERTZ (FREQUENCY)
i.e.	THAT IS
IAQ	INDOOR AIR QUALITY
IAW	IN ACCORDANCE WITH
IB	INFRARED BURNER
IBC	INTERNATIONAL BUILDING CODE
IC	INTERCOM
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IECC	INTERNATIONAL ENERGY CONSERVATION CODE
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
IES	ILLUMINATING ENGINEERING SOCIETY
IF	INSIDE FACE
IG	ISOLATED GROUND
IH	INTAKE HOOD
IJ	ISOLATION JOINT
IJS	IN JOIST SPACE
IMC	INTERNATIONAL MECHANICAL CODE
IMC	INTERMEDIATE METAL CONDUIT
IN	INCH
IN HG	INCHES OF MERCURY (PRESSURE)
IN WC	INCHES OF WATER COLUMN (PRESSURE)
INC	INCLUDE(ING)
INSUL	INSULATION
INT	INTERIOR
IP	IRON PIPE
IPC	INTERNATIONAL PLUMBING CODE
IPS	IRON PIPE SIZE
IW	INDIRECT WASTE
JAN	JANITOR
JB	JUNCTION BOX
JCT	JUNCTION
JFB	JOINT FILLER BOARD
JST	JOIST
JT	JOINT
KCJ	KEYED CONSTRUCTION JOINT
KCP	KEENE'S CEMENT PLASTER
KD	KNOCKDOWN
KH	KITCHEN HOOD
KHE	KITCHEN HOOD EXHAUST FAN
KHS	KITCHEN HOOD SUPPLY FAN
KIT	KITCHEN
KO	KNOCKOUT
KS	KITCHEN SINK
KV	KILOVOLT
KVA	KILOVOLT AMPERES
KVAR	KILOVOLT AMPERES REACTIVE
KW	KILOWATT
KWH	KILOWATT HOUR
L	ANGLE
LA	LABRATORY COMPRESSED AIR
LAB	LABORATORY
LAM	LAMINATED
LAT	LEAVING AIR TEMPERATURE
LAV	LAVATORY
LB(S)	POUND(S)
LBR	LUMBER
LDG	LOADING
LF	LINEAR FOOT
LG	LENGTH (LONG)
LIN	LINEAR
LINO	LINOLEUM
LKR	LOCKER
LL	LIVE LOAD
LLH	LONG LENGTH HORIZONTAL
LLV	LONG LENGTH VERTICAL
LN2	LIQUID NITROGEN
LO2	LIQUID OXYGEN
LOC	LOCATION
LONG	LONGITUDINAL
LPG	LIQUIFIED PETROLEUM GAS (PROPANE)
LPR	LOW PRESSURE STEAM RETURN
LPS	LOW PRESSURE STEAM SUPPLY
LR	LIVING ROOM
LS	LAWN SPRINKLER
LSC	LIFE SAFETY CODE
LT	LIGHT
LTD	LINED TRANSFER DUCT
LTG	LIGHTING
LV	LOUVER
LV	LABORATORY VACUUM
LVG	LEAVING
LW	LONG WAY
LWT	LEAVING WATER TEMPERATURE
M	THOUSAND
MA	MIXED AIR
MA	MAKE-UP AIR
MA	MEDICAL COMPRESSED AIR
MAC	MACHINE
MAG	MAGNETIC
MAINT	MAINTENANCE
MAN	MANUAL
MAS	MASONRY
MATL	MATERIAL
MAU	MAKEUP AIR UNIT
MAV	MANUAL AIR VENT
MAX	MAXIMUM
MB	MACHINE BOLT
MBD	MARKER BOARD
MBH	THOUSAND BTU PER HOUR
MC	MECHANICAL CONTRACTOR
MC	MEDICINE CABINET
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MCM	METAL COMPOSITE MATERIAL
MD	MOTORIZED DAMPER
MDF	MEDIUM DENSITY FIBERBOARD
MDO	MEDIUM DENSITY OVERLAY
MECH	MECHANICAL
MEMB	MEMBRANE
MET	METAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MFRG	MANUFACTURING
MG	MOTOR GENERATOR
MH	MANHOLE
MH	METAL HALIDE
MH	MOP HOLDER
MIN	MINIMUM
MISC	MISCELLANEOUS
MISC	MISCELLANEOUS
ML	MOTORIZED LOUVER
MLDG	MOLDING
MLO	MAIN LUGS ONLY
MLWK	MILLWORK
MO	MASONRY OPENING
MOCP	MAXIMUM OVERCURRENT PROTECTION
MPG	MEDIUM PRESSURE GAS
MPR	MEDIUM PRESSURE STEAM RETURN
MPS	MEDIUM PRESSURE STEAM SUPPLY
MR	MIRROR
MR/S	MIRROR WITH SHELF
MS	MAGNETIC STARTER
MS	MOP SINK
MTD	MOUNTED
MTG	MOUNTING
MTL	METAL
MTWR	MEDIUM TEMP HOT WATER RETURN
MTWS	MEDIUM TEMP HOT WATER SUPPLY
MUL	MULLION
MV	MEDICAL VACUUM
MV	MERCURY VAPOR
MW	MARKER WALL
N	NITROGEN
N	NORTH
N2	LABORATORY NITROGEN
N2O	NITROUS OXIDE
N20	NITROUS OXIDE
N/A	NOT APPLICABLE
NA	NOT APPLICABLE
NAT	NATURAL
NC	NORMALLY CLOSED
NC	NOISE CRITERIA
NC	NURSE CALL
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSN.
NEUT	NEUTRAL
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO	NUMBER
NO2	NITROGEN DIOXIDE
NOM	NOMINAL
NRS	NON RISING STEM
NS	NEUTRAL SENSOR
NTS	NOT TO SCALE
NV	NITROGEN VENT
O2	OXYGEN
O to O	OUT TO OUT
O&M	OPERATION AND MAINTENANCE
OA	OUTSIDE AIR
OBSC	OBSCURE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OD	OVERFLOW DRAIN
OF	OUTSIDE FACE
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFF	OWNER FURNISHED OWNER INSTALLED
OFOI	OWNER FURNISHED OWNER INSTALLED
OHP	OVERHEAD POWER
OHT	OVERHEAD TELEPHONE
OPNG	OPENING
OPP	OPPOSITE
ORD	OVERFLOW ROOF DRAIN
OS&Y	OUTSIDE SCREW AND YOKE
OSD	OVERFLOW STORM DRAIN
OTCS	OPEN TO CEILING SPACE
OV	OIL VENT
OVFL	OVERFLOW
OVHD	OVERHEAD
OW	OIL WASTE
P	POLE(S)
P	PUMP
P/T	PRESSURE/TEMPERATURE TEST PORT
PA	PUBLIC ADDRESS
PAN B	PANIC BOLT
PAR	PARALLEL
PB	PULL BOX
PB	PUSH BUTTON
PB	PARTICLE BOARD
PBS	PUSH BUTTON STATION
PC	PRECAST CONCRETE
PC	PUMPED CONDENSATE
PCD	PAPER CUP DISPENSER
PCF	POUNDS PER CUBIC FOOT
PCT	PORCELAIN CERAMIC TILE
PCV	PRESSURE CONTROL VALVE
PCWP	PROCESS COOLING WATER PUMP
PCWR	PROCESS COOLING WATER RETURN
PCWS	PROCESS COOLING WATER SUPPLY
PD	PRESSURE DROP
PD	PUMP DISCHARGE
PDI	PLUMBING & DRAINAGE INSTITUTE
PENT	PENTHOUSE
PERF	PERFORATED
PERP	PERPENDICULAR
PF	POWER FACTOR
PG	PRESSURE GAUGE
PG	PROPANE GAS
PH	PHASE
PHC	PRE-HEAT COIL
PI	POINT OF INTERSECTION
PI	PRESSURE INDICATOR
PIC	PORTABLE INSTRUMENT CONNECTION
PIV	POST INDICATOR VALVE
PL	PLATE
PL	PLACE(S)
PLAM	PLASTIC LAMINATE
PLAS	PLASTER
PLBG	PLUMBING
PLYWD	PLYWOOD
PNEU	PNEUMATIC
PNL	PANEL
POC	POINT OF CONNECTION
PORC	PORCELAIN
PPM	PARTS PER MILLION
PR	PAIR
PREFAB	PREFABRICATED
PROJ	PROJECT(OR) (ION)
PRV	PRESSURE REGULATING VALVE
PS	PIPE SUPPORT
PS	PROJECTION SCREEN
PSF	POUNDS PER SQUARE FOOT
PSFA	POUNDS PER SQUARE FOOT, ABSOLUTE
PSFG	POUNDS PER SQUARE FOOT, GAUGE
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH, ABSOLUTE
PSID	POUNDS PER SQUARE INCH, DIFFERENTIAL
PSIG	POUNDS PER SQUARE INCH, GAUGE
PSV	PRESSURE SAFETY (RELIEF) VALVE
PT	PLASTER TRAP
PT	POINT
PT	POTENTIAL TRANSFORMER
PTD	PAPER TOWEL DISPENSER
PTD/R	COMBINATION TOWEL DISPENSER/RECEPTACLE
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PWL	SOUND POWER LEVEL
PWR	POWER
QT	QUARRY TILE
QTR RND	QUARTER ROUND
QTY	QUANTITY
R	RISER
R	RADIUS
R	REGISTER
RA	RETURN AIR
RAD	RADIUS
RAD	RADIATOR
RAD	RADIATED
RAT	RETURN AIR TEMPERATURE
RB	RUBBER BASE
RC	REMOTE CHILLER
RC	REMOTE CONTROL
RCP	REFLECTED CEILING PLAN
RCP	REINFORCED CONCRETE PIPE
RCP	RADIANT CEILING PANEL
RCU	RECIPROCATING CHILLER UNIT
RCW	RECLAIMED WATER
RD	ROOF DRAIN
RD	REFRIGERANT DISCHARGE
RE	REFER TO
RE	REFERENCE
RECIRC	RECIRCULATING
RECP	RECEPTACLE
RECPT	RECEPTACLE
RECT	RECTANGLE(AR)
REF	REFERENCE
REFL	REFLECTED
REFR	REFRIGERANT
REG	REGISTER
REINF	REINFORCEMENT
RELA	RELIEF AIR
REM	REMOVABLE
REQ(D)	REQUIRE(D)
RESIL	RESILIENT
RESP	RESPONSIVE
RET	RETAINING
REV	REVISION(S)
RF	RETURN FAN
RF	RUBBER FLOOR
RFM	RECESSED FLOOR MAT
RH	RELATIVE HUMIDITY
RH	REFLIEF HOOD
RH	ROBE HOOK
RHC	REHEAT COIL
RHG	REFRIGERANT HOT GAS
RI&C	ROUGH IN AND CONNECT
RIJS	RISE IN JOIST SPACE
RL	REFRIGERANT LIQUID
RM	ROOM
RND	ROUND
RO	REVERSE OSMOSIS WATER
RO	ROUGH OPENING
ROC	REVERSE OSMOSIS RECIRCULATING
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
RTU	ROOF TOP UNIT
RV	REFRIGERANT VENT
RWL	RAIN WATER LEADER
S	SMOKE DAMPER
S	SOUTH
S	SANITARY SEWER
S	SPRINKLER LINE
S	SINK
S	SOAP DISH
SA	SUPPLY AIR
SA	SHOCK ABSORBER
SAN	SANITARY WASTE
SC	SECURITY
SC	SOLID CORE
SC	SHOWER CURTAIN
SC	SPECIAL COATING
SCCR	SHORT CIRCUIT CURRENT RATING
SCD	SEAT COVER DISPENSER
SCD	SECONDARY CONDENSATE DRAIN
SCH	SHOWER CURTAIN HOOK
SCHED	SCHEDULE
SCR	SILICON CONTROLED RECTIFIER
SCT	STRUCTURAL CLAY TILE
SCUT	SCUTTLE
SCW	SOFT COLD WATER
SD	SMOKE DAMPER
SD	STORM DRAIN
SD	SMOKE DETECTOR
SD	SOAP DISPENSER
SE	STEAM EXHAUST VENT
SEA	SMOKE EXHAUST AIR
SEC	SECONDARY
SEC	SECOND
SECT	SECTION
SECY	SECRETARY
SENS	SENSIBLE
SF	SUPPLY FAN
SF	SQUARE FOOT
SFA	SPRINKLER FLOW ALARM
SFCMU	SPLIT-FACE CONCRETE MASONRY UNIT
SFU	STRUCTURE FACING UNIT
SGL	SINGLE
SH	SHOWER
SHM	SECURITY HOLLOW METAL
SHT	SHEET
SHW	SOFT HOT WATER
SHWC	SOFT HOT WATER RECIRCULATING
SHWR	SOLAR HOT WATER RETURN
SHWS	SOLAR HOT WATER SUPPLY
SIM	SIMILAR
SK	SINK
SL	SHORT LEG
SLNT	SEALANT
SM	SPRINKLER MAIN
SM	SHEET METAL
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SND	SANITARY NAPKIN DISPOSAL
SNV	SANITARY NAPKIN VENDOR
SP	STATIC PRESSURE (H2O)
SP	STAND PIPE
SPD	SURGE PROTECTION DEVICE
SPEC	SPECIFICATION(S)
SPK	SPRINKLER
SPL	SOUND PRESSURE LEVEL
SPL	SPECIAL
SPL BLK	SPLASH BLOCK
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN	SQUARE INCHES
SS	STAINLESS STEEL
SS	SERVICE SINK
SS	SOLID SURFACE
SS	SOLID SEPARATOR
SSA	STORM SHELTER AREA
SST	SECONDARY STORM DRAINAGE
ST	STAIR
ST	STORM DRAINAGE
STAG'D	STAGGERED
STC	SOUND TRANSMISSION CLASS
STD	STANDARD
STE	SINGLE TAPERED END
STGR	STRINGER
STL	STEEL
STOR	STORAGE
STR	STRUCTURE(AL)
STRUCT	STRUCTURAL
SUB	SUBSTATION
SURF	SURFACE
SUSP	SUSPENDED
SV	SOLENOID VALVE
SV	STEAM VENT
SW	SHORT WAY
SW	SWITCH
SWBD	SWITCHBOARD
SWP	STEAM WORKING PRESSURE
SYM	SYMETRICAL
T	TEMPERED
T	THERMOSTAT
T	TREAD
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
TA	TRANSFER AIR
TAB	TEST(ING) ADJUST(ING) BALANCE(ING)
TAN	TANGENT
TB	TERMINAL BOX
TB	TOWEL BAR
TBD	TACK BOARD
TC	TIME CLOCK
TC	TEMPERATURE CONTROL
TCC	TEMPERATURE CONTOLS CONTRACTOR
TD	TRANSFER DUCT
TD	TRENCH DRAIN
TDH	TOTAL DYNAMIC HEAD
TDS	TOTAL DISOLVED SOLIDS
TEL	TELEPHONE
TEMP	TERMPORARY
TEMP	TEMPERATURE
TEMP	TEMPERED
TEMP	TEMPORARY
TERR	TERRAZZO
TEXT	TEXTURED
TGL	TOGGLE
TH	THRESHOLD
TH	TOWEL HOOK
THK	THICK(NESS)
TMR	TILT MIRROR UNIT
TMV	THERMOSTATIC MIXING VALVE
TOB	TOP OF BEAM
TOC	TOP OF CONCRETE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOIL	TOILET
TOM	TOP OF MASONRY
TOP	TOP OF PAVING
TOP	TOP OF PIPE
TOS	TOP OF STEEL
TOW	TOP OF WALL
TPV	TRAP PRIMER
TPV	TRAP PRIMER VALVE
TR	TRIP
TRANS	TRANSVERSE
TRD	TREAD
TS	TEMPERATURE SENSOR
TSP	TOTAL STATIC PRESSURE
TT	TEMPERATURE TRANSMITTER
TT	TERRAZZO TILE
TTD	TOILET TISSUE DISPENSER
TV	TELEVISION
TW	TACK WALL
TYP	TYPICAL
UC	UNIT COOLER
UC	UNDERCUT DOOR
UG	UNDERGROUND
UGE	UNDERGROUND ELECTRICAL
UGT	UNDERGROUND TELEPHONE
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORIES
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
URD	UNDERGROUND RESIDENTIAL DISTRIBUTION
US	UTILITY SHELF
UTIL	UTILITY
UV	UNIT VENTILATOR
V	VOLT
V	SANITARY VENT
V	VACUUM
VA	VOLT-AMPERE
VA	VALVE
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VB	VAPOR BARRIER
VB	VINYL BASE
VBF	VENT BELOW FLOOR
VCB	VENTED COVE BASE
VCP	VITRIFIED CLAY PIPE
VCT	VINYL COMPOSITION TILE
VD	VOLUME DAMPER
VEL	VELOCITY
VENT	VENTALATOR(TION)
VERT	VERTICAL
VEST	VESTIBULE
VF	VINYL FLOOR
VFD	VARIABLE FREQUENCY DRIVE
VIF	VERIFY IN FIELD
VM	VOLTMETER
VOL	VOLUME
VP	VACUUM PUMP
VP	VENEER PLASTER
VSMP	VARIABLE SPEED MOTOR CONTROLLER
VT	VINYL TILE
VTR	VENT THROUGH ROOF
VWC	VINYL WALL COVERING
W	WIRE
W	WIDE FLANGE
W	WEST
W	WATER SERVICE
W	WIDE(TH)
W	WASTE (PLUG)
W	WATT
W/	WITH
W/O	WITHOUT
WAGD	WASTE ANESTHETIC GAS DISPOSAL
WB	WET BULB
WC	WATER COLUMN
WC	WATER CLOSET
WC	WALL COVERING
WCC	WATER COOLED CONDENSER
WCL	WATER CLOSET/LAVATORY COMBINATION
WCO	WALL CLEAN OUT
WD	WOOD
WDW	WINDOW
WF	WASH FOUNTAIN
WFMD	WATER FLOW MEASURING DEVICE
WFU	WASTE FIXTURE UNIT
WG	WIRE GUARD
WG	WATER GAUGE
WH	WALL HYDRANT
WH	WATER HEATER
WHA	WATER HAMMER ARRESTOR
WHM	WATT HOUR METER
WI	WROUGHT IRON
WLR	WATER LOOP RETURN
WLS	WATER LOOP SUPPLY
WMG	WATER MOTOR GOING
WNSCT	WAINSCOT
WP	WEATHER-PROOF (NEMA 3R)
WP	WEATHERPROOF
WPB	WHIRLPOOL BATH
WPF	WATERPROOF
WPFG	WATERPROOFING
WR	WASTE RECEPTACLE
WR	WATER RESISTANT
WSHP	WATER SOURCE HEAT PUMP
WSP	WET STAND PIPE
WT	WEIGHT
WW	WARM WHITE
WWF	WELDED WIRE FABRIC
XFMR	TRANSFORMER
XMTR	TRANSMITTER
YD	YARD
YH	YARD HYDRANT
Z	IMPEDANCE
ZCB	ZONE CONTROL BOX
ZCV	ZONE CONTROL VALVE
ZVB	ZONE VALVE BOX

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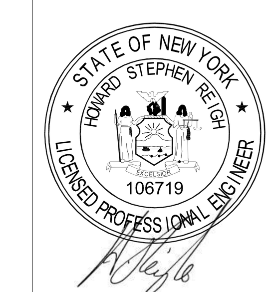

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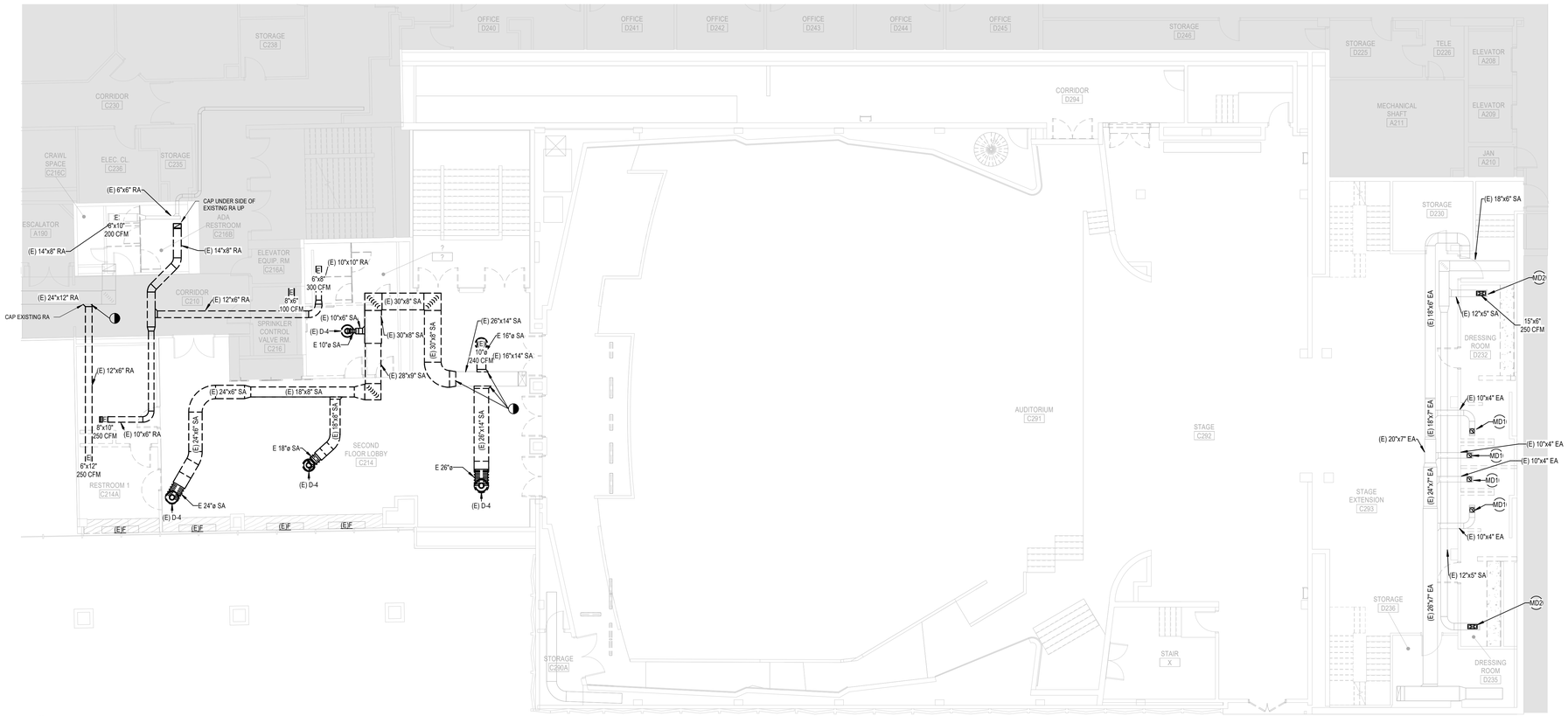
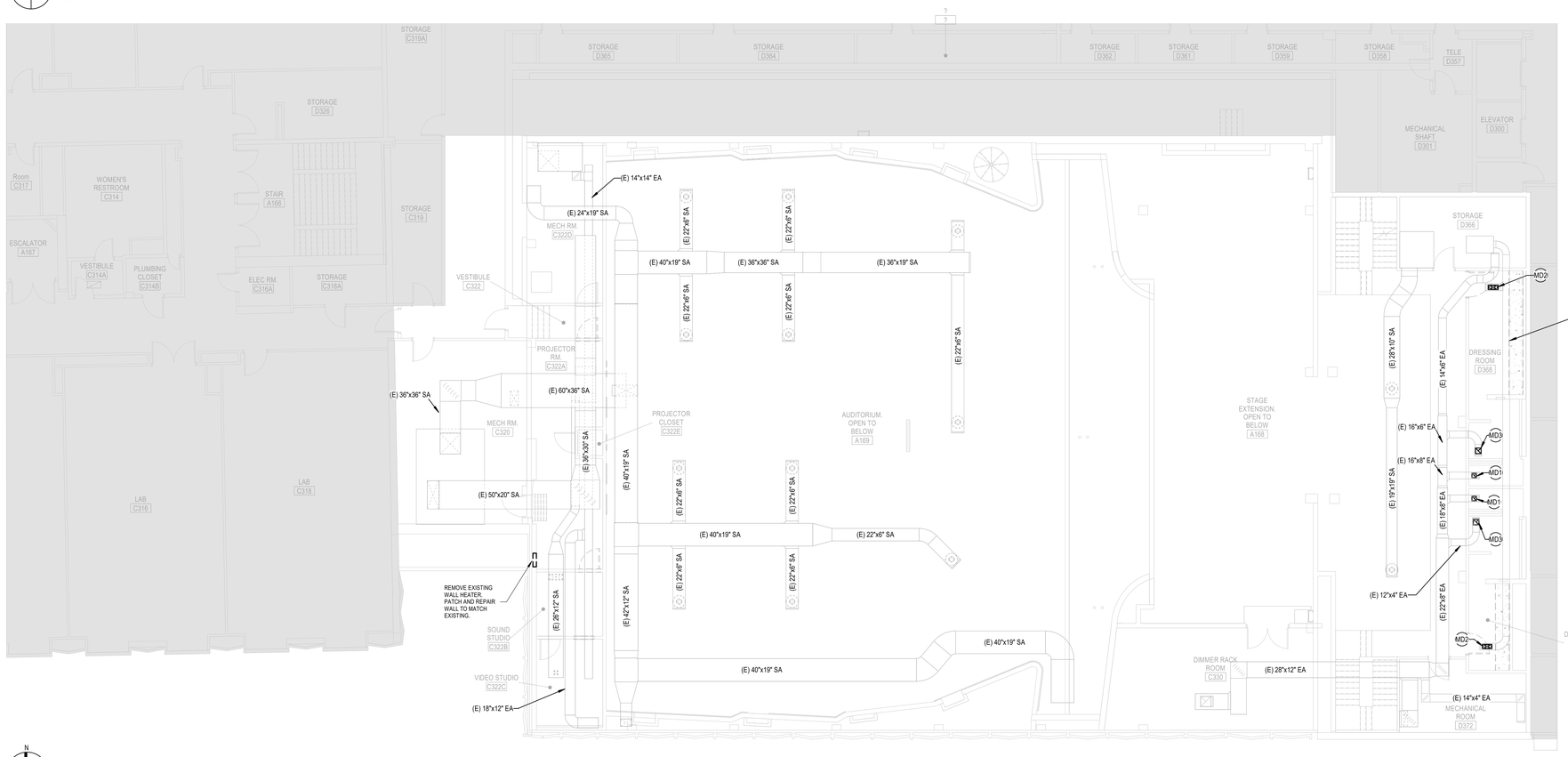
MECHANICAL ABBREVIATIONS

M.002.00



SECOND FLOOR - MECHANICAL DEMOLITION PLAN

SCALE: 1/8" = 1'-0"



THIRD FLOOR - MECHANICAL DEMOLITION PLAN

SCALE: 1/8" = 1'-0"

SHEET NOTES

MD1 DEMO 8X8 GRILLE AND PREPARE DUCTWORK FOR CONNECTION OF NEW GRILLE IN NEW CEILING. SEE NEW WORK FOR MORE DETAILS.

MD2 DEMO 15X6 GRILLE AND PREPARE DUCTWORK FOR CONNECTION OF NEW GRILLE IN NEW CEILING. SEE NEW WORK FOR MORE DETAILS.

MD3 DEMO 10X10 GRILLE AND PREPARE DUCTWORK FOR CONNECTION OF NEW GRILLE IN NEW CEILING. SEE NEW WORK FOR MORE DETAILS.

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LEVEL 02 AND 03 - MECHANICAL DEMOLITION PLAN

MD.102.00

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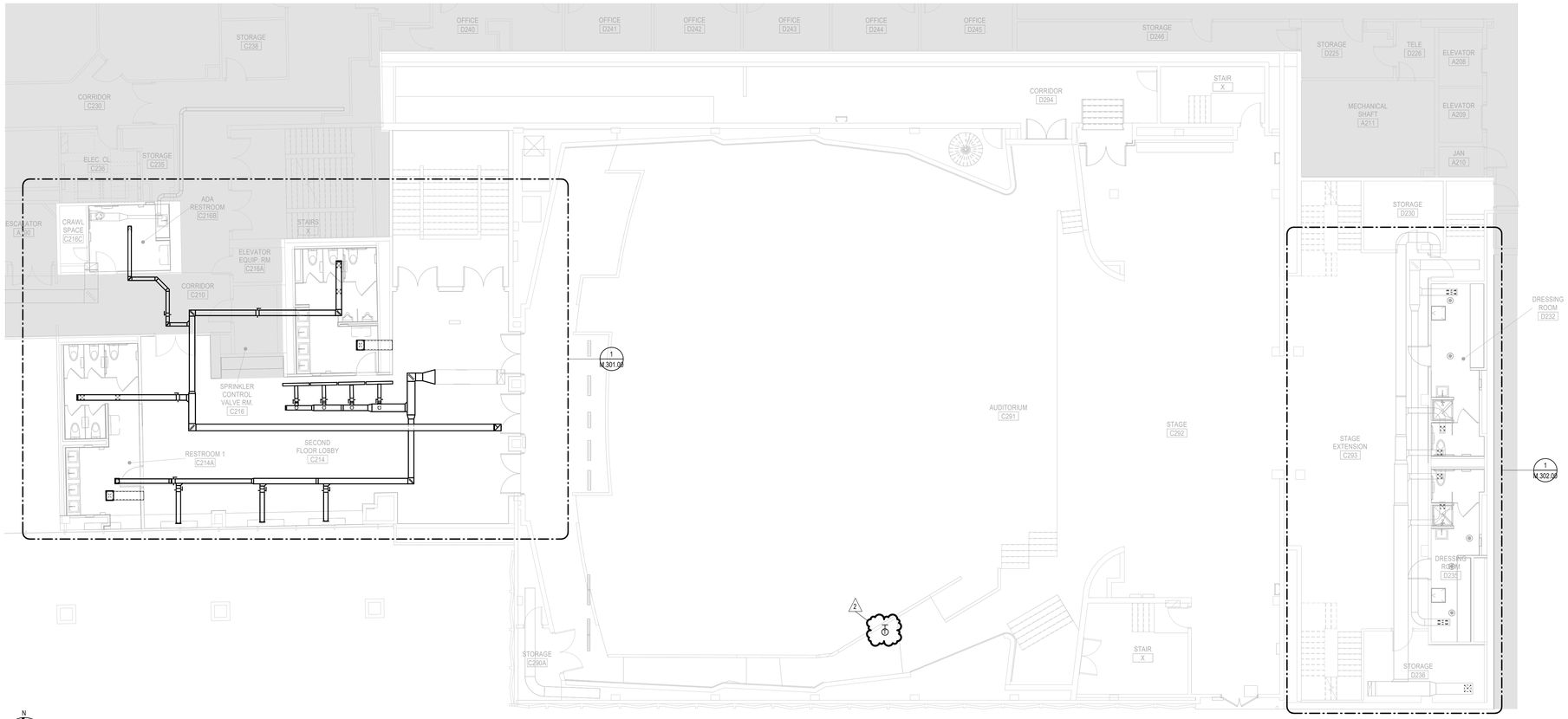
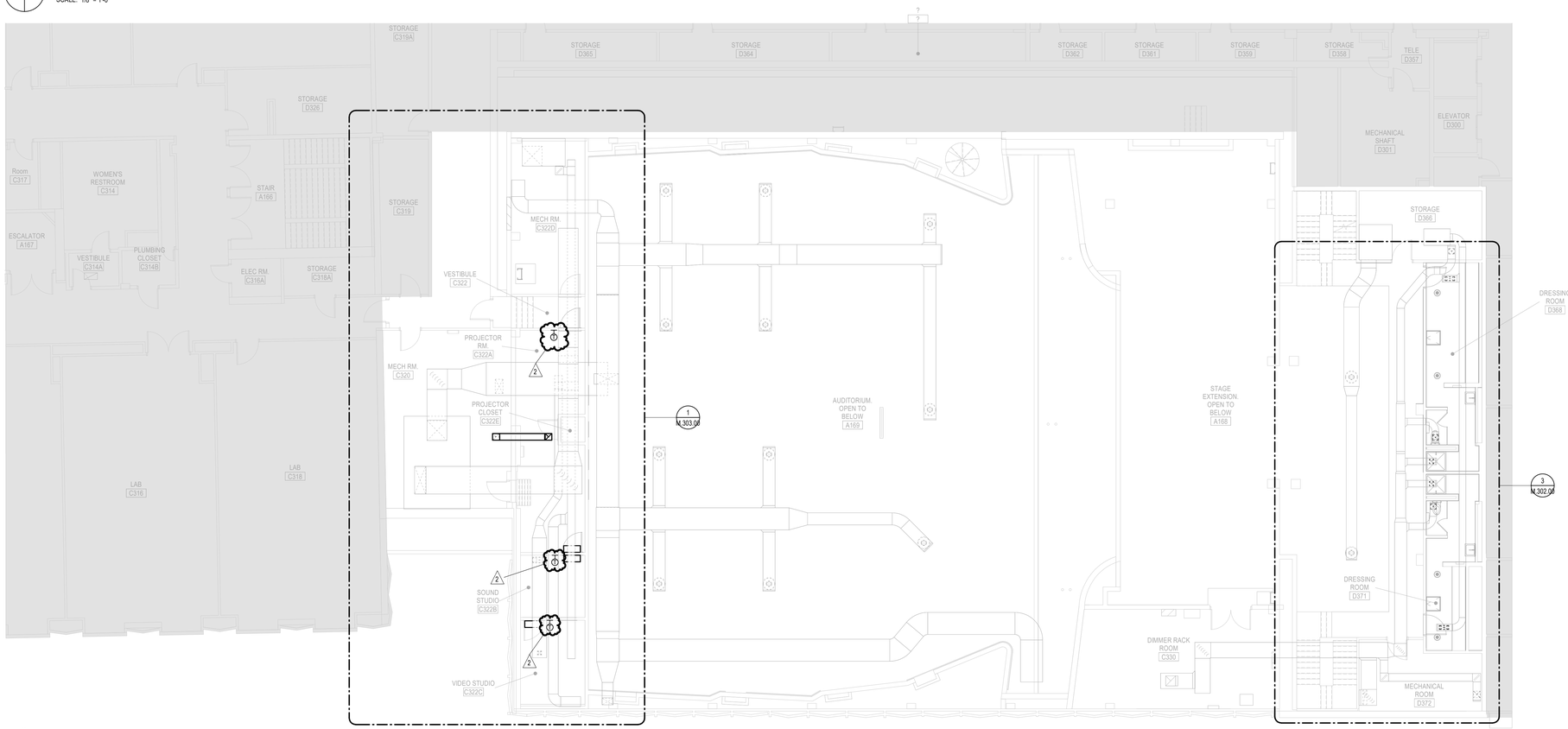


SECOND FLOOR - MECHANICAL PLAN

SCALE: 1/8" = 1'-0"



THIRD FLOOR - MECHANICAL PLAN

SCALE: 1/8" = 1'-0"

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LEVEL 02 - MECHANICAL PLAN

M.102.00

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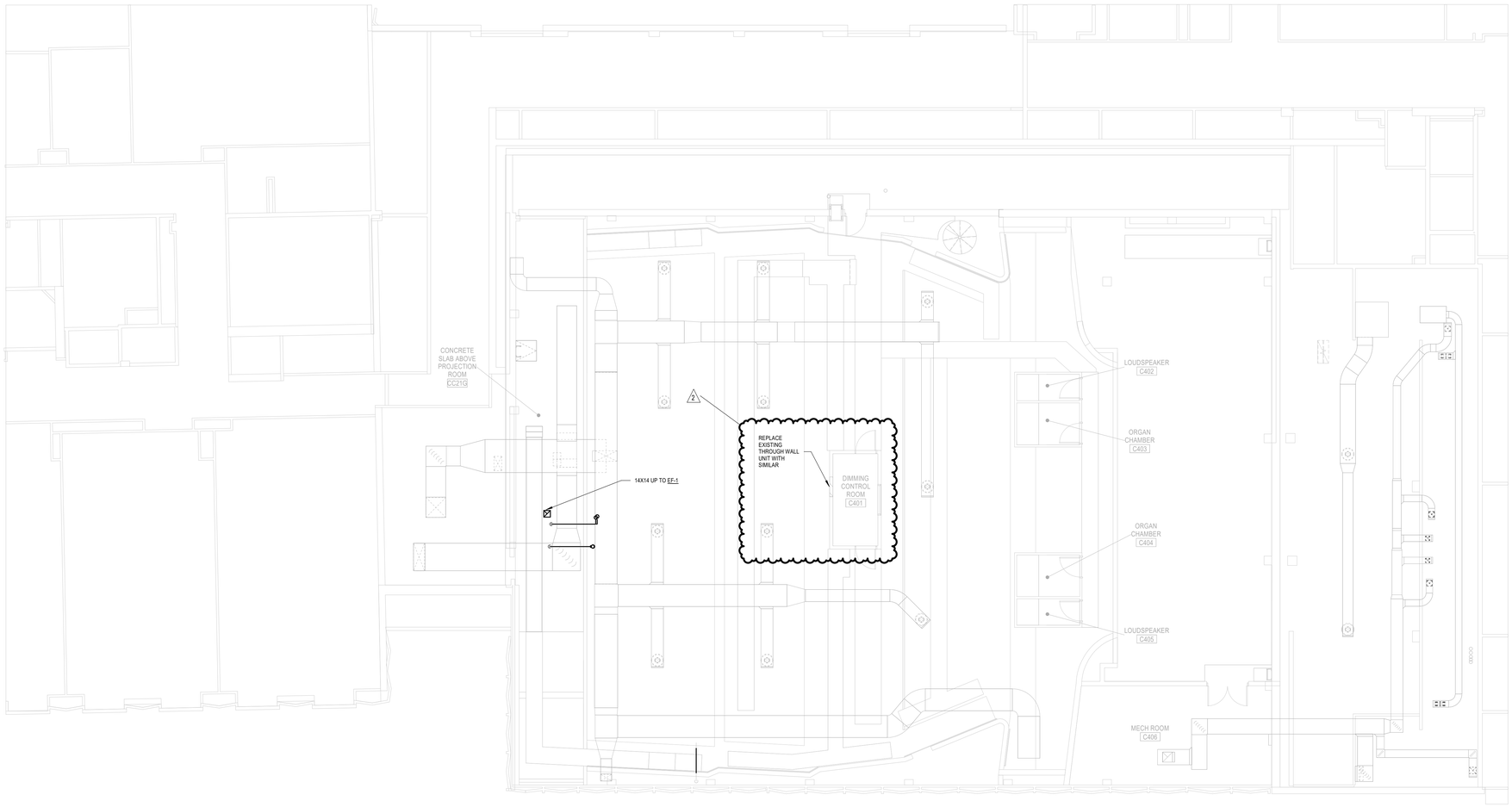

N

TOP OF SLAB DIMMER CONTROL ROOM

SCALE: 1/8" = 1'-0"

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LEVEL 03 - MEZZANINE MECHANICAL PLAN

M.103.00

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ROOF - MECHANICAL PLAN
SCALE: 1/8" = 1'-0"

SHEET NOTES

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ROOF - MECHANICAL PLAN

M.104.00

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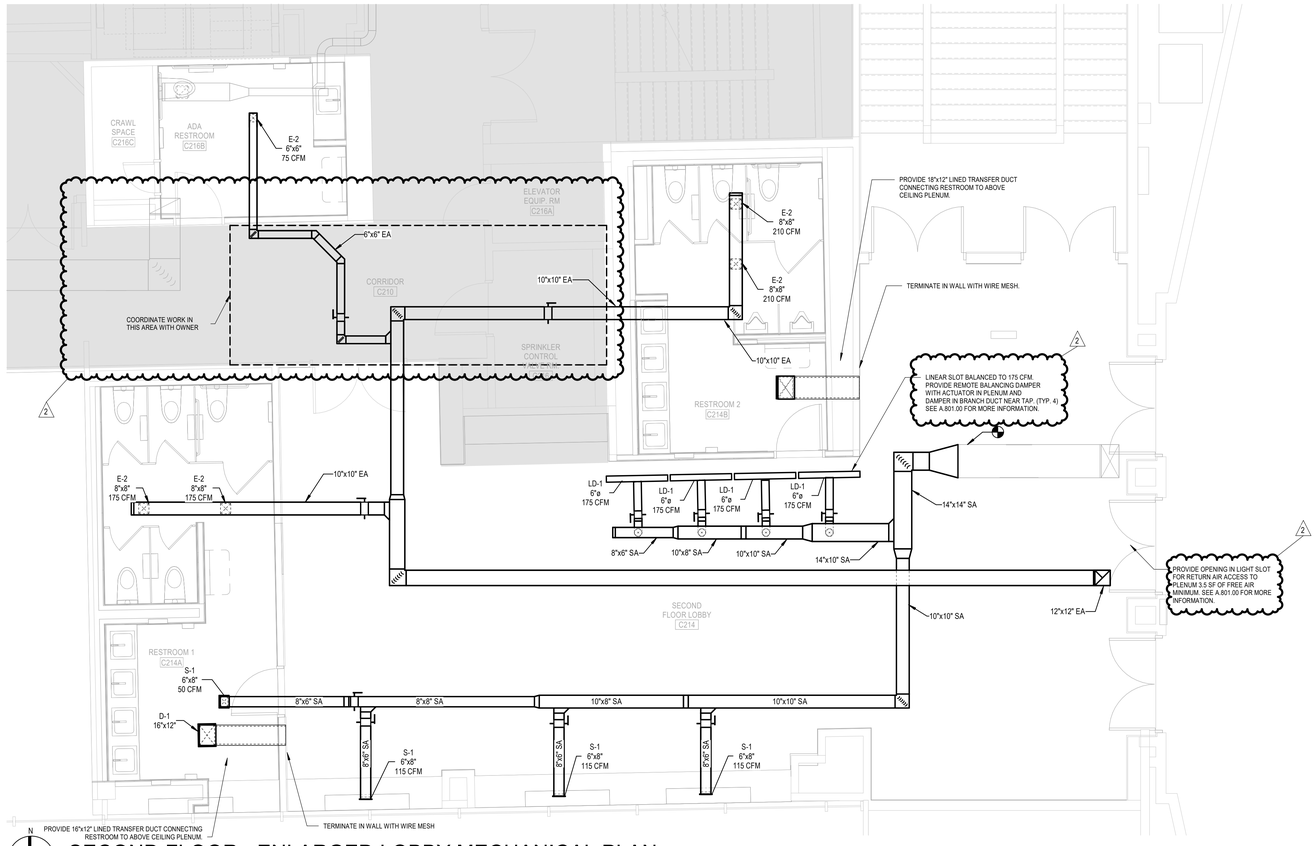

SECOND FLOOR - ENLARGED LOBBY MECHANICAL PLAN

SCALE: 1/4" = 1'-0"

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ENLARGED MECHANICAL PLANS - 2ND FLOOR LOBBY

M.301.00

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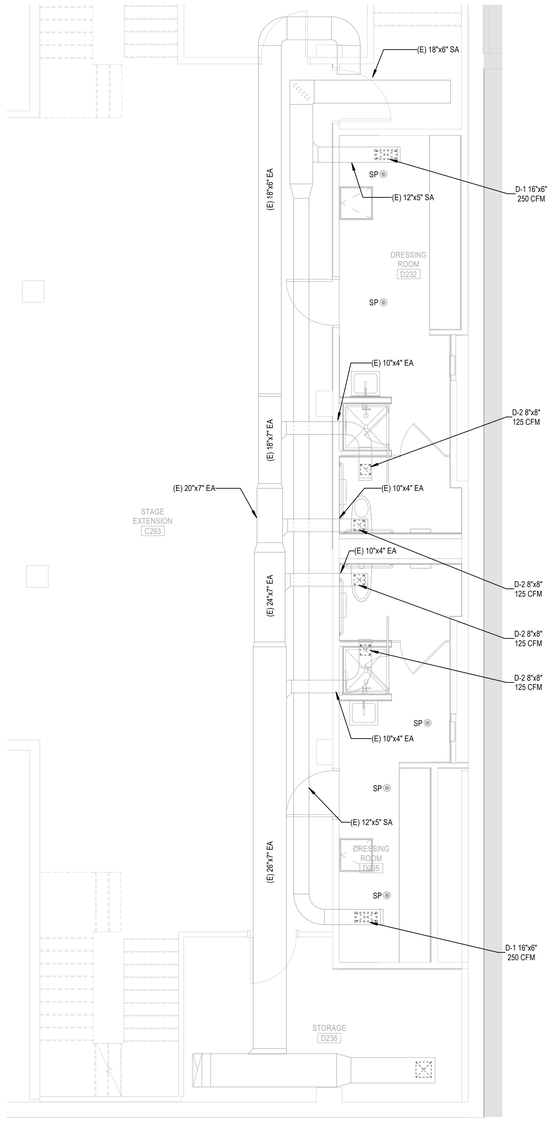
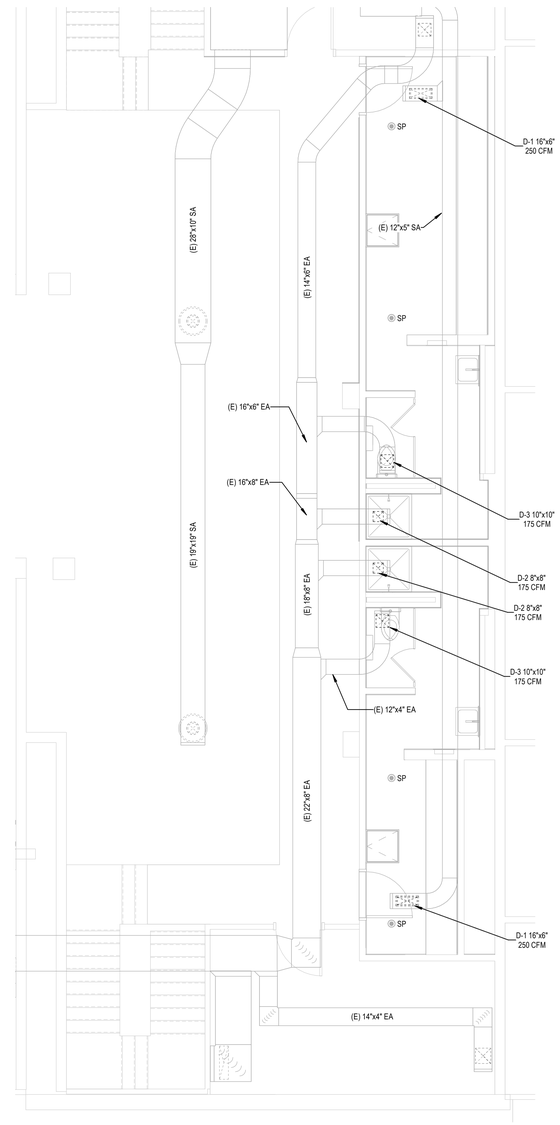


1 SECOND FLOOR - ENLARGED DRESSING ROOMS
M.302.00 SCALE: 1/4" = 1'-0"



3 THIRD FLOOR - ENLARGED DRESSING ROOMS
M.302.00 SCALE: 1/4" = 1'-0"

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ENLARGED MECHANICAL PLANS - 2ND AND 3RD FLOOR DRESSING ROOMS

M.302.00

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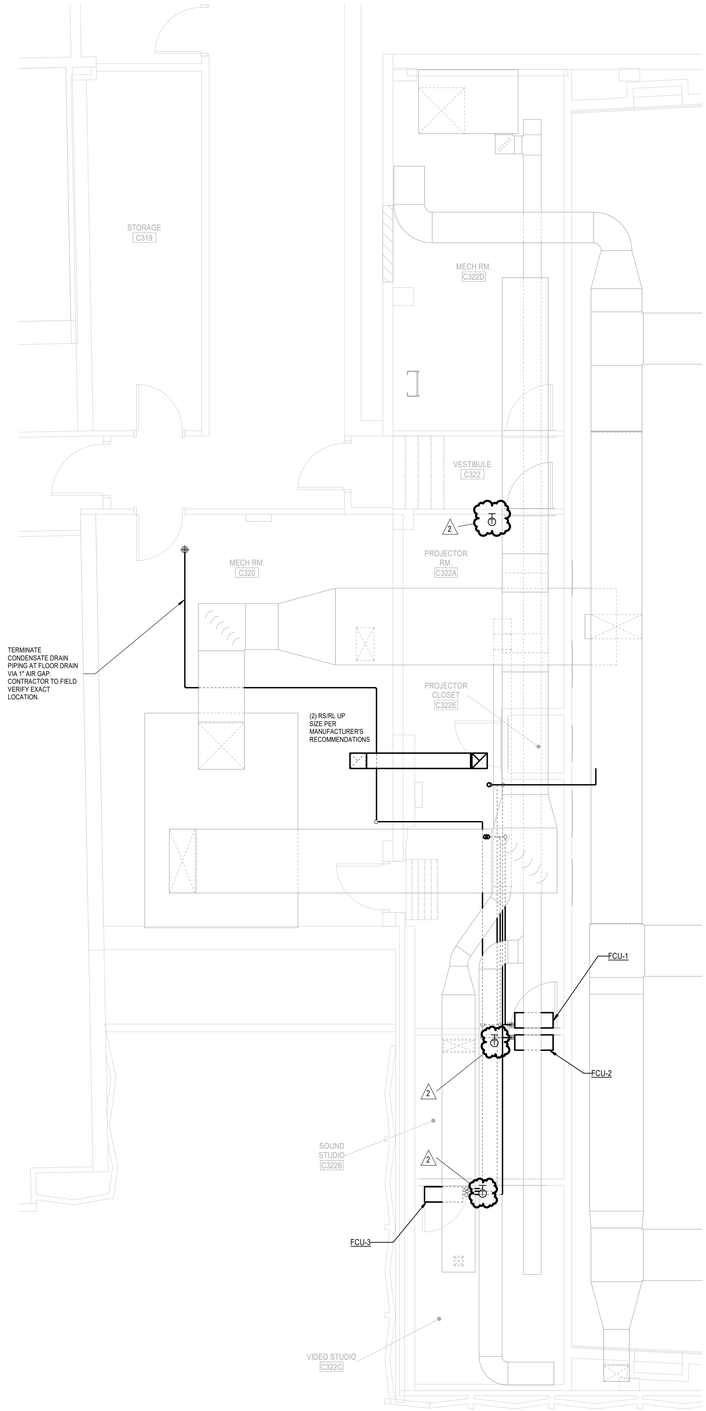

THIRD FLOOR - ENLARGED AV/IT ROOMS

SCALE: 1/4" = 1'-0"

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ENLARGED MECHANICAL PLANS - 3RD FLOOR AV ROOMS

M.303.00

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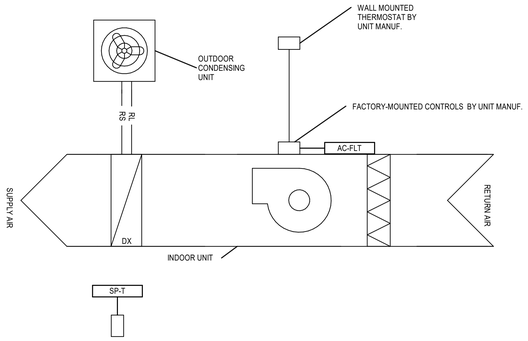

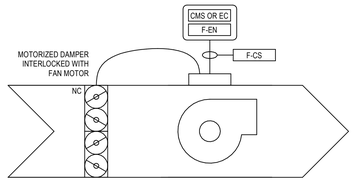

GENERAL
1. THIS CONTROL SEQUENCE APPLIES TO THE FOLLOWING UNITS:
   INDOOR UNITS FCU-1, FCU-2, FCU-3, AND OUTDOOR UNITS CU-1, CU-2

2. THE BUILDING AUTOMATION SYSTEM (BAS) SHALL MONITOR ROOM TEMPERATURE.
3. PROVIDE ADEQUATE DEAD-BANDS TO PREVENT SHORT-CYCLING OF UNIT.
4. CONTROL OF UNITS SHALL BE FACTORY FURNISHED CONTROLS.

CONTROL SEQUENCE
1. THE UNIT SHALL RUN CONTINUOUSLY.
2. UNIT OPERATES ON INTERNAL CONTROLS TO MAINTAIN SPACE TEMPERATURE SETPOINT.

SAFETIES
1. THE FOLLOWING SAFETIES SHALL SHUT DOWN ITS RESPECTIVE UNIT, AND INITIATE AN ALARM THROUGH THE BCS AFTER APPROPRIATE TIME DELAYS WHERE SPECIFIED:
   a. UNIT CONTROLLER OR INTERNAL SAFETIES INDICATE A "FAULT." - DELAY: NONE. UNIT SHALL SHUT DOWN AND REPORT THROUGH THE BCS.

ALARMS
1. THE CONTROL SYSTEM SHALL ANNUNCIATE AN ALARM TO THE BCS IF ANY OF THE FOLLOWING CONDITIONS ARE MET:
   a. SPACE TEMPERATURE IS OFF SETPOINT (>5°F), DELAY: 5 MINUTES.
   b. UNIT IS COMMANDED TO START AND INTERNAL SAFETIES INDICATE FAULT, DELAY: NONE.

SPLIT AIR CONDITIONING UNIT POINT SCHEDULE

POINT	DESCRIPTION	TYPE
SP-T	SPACE TEMPERATURE	ANALOG INPUT
AC-FLT	AC UNIT "FAULT"	DIGITAL INPUT

GENERAL EXHAUST
GENERAL
THIS SEQUENCE APPLIES TO ALL FANS.

RUN CONDITIONS - INTERLOCKED:
THE FAN(S) EF --- SHALL BE INTERLOCKED TO RUN WHENEVER ASSOCIATED AIR HANDLING UNIT RUNS UNLESS SHUTDOWN ON SAFETIES.

EXHAUST AIR DAMPER:
THE EXHAUST AIR DAMPER SHALL OPEN ANYTIME THE UNIT RUNS AND SHALL CLOSE ANYTIME THE UNIT STOPS. THE EXHAUST AIR DAMPER SHALL CLOSE 30 SEC (ADJ.) AFTER THE FAN STOPS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
2. DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.

DAMPER STATUS:
THE FAN SHALL BE ENABLED AFTER THE DAMPER STATUS HAS PROVEN.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. DAMPER FAILURE: COMMANDED OPEN, BUT THE STATUS IS CLOSED.
2. DAMPER IN HAND: COMMANDED CLOSED, BUT THE STATUS IS OPEN.

FAN STATUS:
THE CONTROLLER SHALL MONITOR THE FAN STATUS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:
1. FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
2. FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
3. FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

EXHAUST/TRANSFER FAN CONTROL POINTS SCHEDULE (GENERAL)

POINT NAME	HARDWARE POINTS				SOFTWARE POINTS						SHOW ON GRAPHIC
	ANALOG INPUT	ANALOG OUTPUT	BINARY INPUT	BINARY OUTPUT	ANALOG VALUE	BINARY VALUE	LOOP	SCHED	TREND	ALARM	
Exhaust Air Damper Status			x						x		x
Fan Status			x						x		x
Exhaust Air Damper				x					x		x
Fan Start/Stop				x					x		x
Exhaust Air Damper Failure										x	
Exhaust Air Damper in Hand										x	
Fan Failure										x	
Fan in Hand										x	
Fan Runtime Exceeded										x	
TOTALS	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**4**	**5**	**4**
TOTAL HARDWARE	4										
TOTAL SOFTWARE	9										

Notes:

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ISSUE FOR ADDENDUM #3-C1651
01.23.25
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#3 01/23/25

57-23140-00

MECHANICAL CONTROLS

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2
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SPLIT SYSTEM INDOOR UNIT SCHEDULE

REMARKS:
1. PROVIDE BACNET INTERFACE FOR FULL INTEGRATION WITH THE BUILDING AUTOMATION SYSTEM.
2. PROVIDE VIBRATION ISOLATION PER SPECIFICATION AND COMPLY WITH MANUFACTURER INSTALLATION REQUIREMENTS.
3. PROVIDE INTEGRAL CONDENSATE PUMP.
4. PROVIDE CUT OVER WATER VALVE FOR UNIT.
5. BACNET GATEWAY TO PROVIDE GRAPHICS ON CENTRAL CONTROLS.

2

ID	AREA SERVED	TYPE	DESIGN AIRFLOW	NOMINAL CAPACITY (TON)	TOTAL CAPACITY (BTUH)	SENSIBLE CAPACITY (BTUH)	DB (°F)	WB (°F)	ELECTRICAL DATA				WEIGHT (LBS)	MANUFACTURER	MODEL	OUTDOOR UNIT MARK	REMARKS
									MCA (A)	MOCP (A)	VOLT (V)	PHASE					
FCU-1	PROJECTOR ROOM - C322A	WALL MOUNTED	750	2	22,400	16,360	80	67	NA	NA	NA	NA	30.5	DAIKIN	FTKF24AXVJU	CU-2	1-5
FCU-2	SOUND STUDIO - C322B	WALL MOUNTED	435	1	8,600	6,880	80	67	NA	NA	NA	NA	19	DAIKIN	FTXV12AVJU	CU-1	1-5
FCU-3	VIDEO STUDIO - C322C	WALL MOUNTED	435	1	8,600	6,880	80	67	NA	NA	NA	NA	19	DAIKIN	FTXV12AVJU	CU-1	1-5

2

SPLIT SYSTEM CONDENSING UNIT SCHEDULE

REMARKS:
1. MOUNT ON ROOF CURB PER DETAIL 1/M.800.00
2. R-410A REFRIGERANT.
3. ELECTRICAL TO PROVIDE DISCONNECT.

ID	LOCATION	TYPE	COMPRESSOR DATA			AMBIENT DB TEMP (°F)		SEER	EER	SOUND PRESS (dBA)	ELECTRICAL				WEIGHT (LBS)	MANUFACTURER	MODEL	INDOOR UNIT MARK	REMARKS
			CAPACITY (TON)	REFRIGERANT	LOW AMBIENT KIT	SUMMER	WINTER				V	PH	MCA A	MOCP A					
CU-1	ROOF	OUTDOOR CONDENSING UNIT	1.5	R-32	YES	95	47	21	12	54	208	1	15.6	20	127	DAIKIN	2MXM18	FCU-2, FCU-3	1-3
CU-2	ROOF	OUTDOOR CONDENSING UNIT	2	R-32	YES	95	47	21.0	12	55.0	208	1	14.23	20	101	DAIKIN	RKF24AXVJU	FCU-1	1-3

LINEAR SLOT DIFFUSERS SCHEDULE

REMARKS:

1. SEE PLANS FOR NECK SIZES

MARK	MAX STATIC PRESSURE DROP (IN WG)	MAX NC @ PRESSURE DROP SHOWN	PLENUM INCLUDED (Y/N)	LENGTH (IN)	SLOT		FRAME TYPE	MATERIAL	FINISH	BASIS OF DESIGN		REMARKS
					WIDTH (IN)	QTY				MANUFACTURER	MODEL	
LD-1	0.1	15	Y	48	1	2	SURFACE	ALUMINUM	BLACK	PRICE	CF-AS2-1.0	

2

GRILLES, REGISTERS, AND DIFFUSERS SCHEDULE

REMARKS:

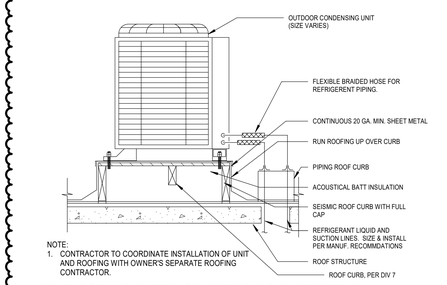
1. SEE PLANS FOR FACE AND NECK SIZE.

MARK	MAX STATIC PRESSURE DROP (IN WG)	MAX NC @ PRESSURE DROP SHOWN	DAMPER		FACE (W" x H")	FRAME TYPE	MATERIAL	FINISH	BASIS OF DESIGN		REMARKS
			INCLUDED (Y/N)	DESCRIPTION					MANUFACTURER	MODEL	
D-1	0.1	<20	Y	OBD	SEE PLANS	SURFACE	ALUMINUM	WHITE ENAMEL	TITUS	300FL	1
D-2	0.1	<20	Y	OBD	SEE PLANS	SURFACE	ALUMINUM	WHITE ENAMEL	TITUS	50F	1
D-3	0.1	<20	Y	OBD	SEE PLANS	SURFACE	ALUMINUM	WHITE ENAMEL	TITUS	50F	1
E-2	0.1	<20	Y	OBD	SEE PLANS	SURFACE	ALUMINUM	WHITE ENAMEL	TITUS	50F	1
S-1	0.1	<20	Y	OBD	SEE PLANS	SURFACE	ALUMINUM	BLACK	TITUS	300FL	1

FAN SCHEDULE

REMARKS:
1. PROVIDE UNIT MOUNTED DISCONNECT SWITCH

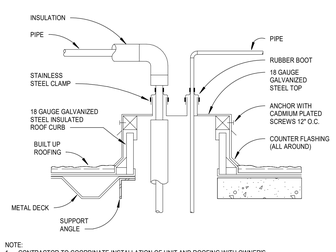
ID	SERVES	TYPE	ARRANGEMENT	FAN							SOUND PRESS LEVEL (dBA)	ELECTRICAL				WEIGHT	BASIS OF DESIGN		REMARKS
				DESCRIPTION	AIRFLOW	OUTLET VELOCITY	ESP	RPM	DRIVE TYPE	MOTOR		RLA	MOCP	VOLT	PH		MANUFACTURER	MODEL	
					DESIGN (CFM)					POWER									
EF-1	RESTROOMS	EXHAUST	DOWNBLAST	CENTRIFUGAL	845	1292 FPM	0.5	1816	DIRECT	0.33	63	2.8	15.0 A	208 V	1	33 LB	COOK	ACE-D VF	1



NOTE:
1. CONTRACTOR TO COORDINATE INSTALLATION OF UNIT AND ROOFING WITH OWNER'S SEPARATE ROOFING CONTRACTOR.

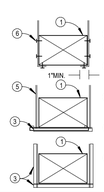
1 M.800.00 ROOF MOUNTED CONDENSING UNIT DETAIL
NO SCALE

2



NOTE:
1. CONTRACTOR TO COORDINATE INSTALLATION OF UNIT AND ROOFING WITH OWNER'S SEPARATE ROOFING CONTRACTOR.
2. REFER TO DRAWINGS FOR QUANTITY AND SIZE OF PIPES TO RUN THRU ROOF.

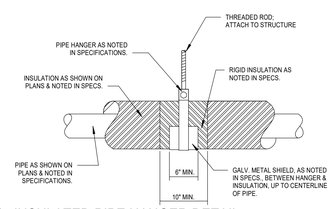
2 M.800.00 PIPING ROOF CURB DETAIL
NO SCALE



KEY NOTES:
1. DUCT
2. SHEET METAL STRAP 1" (25.4mm) WIDE, OF SAME METAL GAUGE AS DUCT.
3. STEEL ANGLE, NOT LESS THAN 1"x 1"x 1/8" (25.4 x 25.4 x 3 mm), SIZED TO MATCH DUCT.
4. SHEET METAL BAND, 1" (25.4mm) WIDE OF SAME METAL GAUGE AS DUCT.
5. ALL THREAD HANGER ROD WITH ACCESSORIES AS USED FOR LIGHT PIPE HANGER.
6. SELF TAPPING CADMIUM PLATED HEX HEADED SHEET METAL SCREW STRAPS TO BE TIGHT AGAINST DUCT.

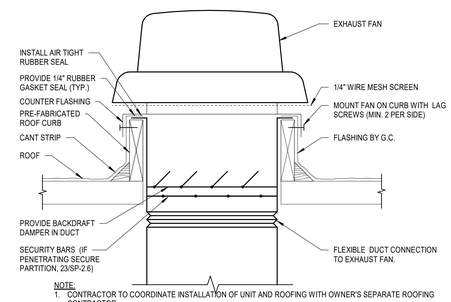
HANGER SIZES FOR RECTANGULAR DUCT			
MAX. LENGTH ANY SIDE	HANGER	HORIZONTAL SUPPORT ANGLE	MAXIMUM SPACING
30"	1"x 18 GAUGE STRAP	NONE REQUIRED	10'-0"
36"	1/4" ROUND ROD	1-1/2" x 1-1/2" x 1/8"	8'-0"
48"	1/4" ROUND ROD	2" x 2" x 1/8"	8'-0"
60"	5/16" ROUND ROD	2" x 2" x 1/8"	8'-0"
84"	3/8" ROUND ROD	2" x 2" x 1/8"	8'-0"

3 M.800.00 DUCT HANGING DETAIL
NO SCALE



4 M.800.00 INSULATED PIPE HANGER DETAIL
NO SCALE

2



NOTE:
1. CONTRACTOR TO COORDINATE INSTALLATION OF UNIT AND ROOFING WITH OWNER'S SEPARATE ROOFING CONTRACTOR.
2. PROVIDE MINIMUM LENGTH EQUAL TO 3X FAN DIAMETER OF STRAIGHT DUCT AT FAN INLET OR STRAIGHT LENGTH AS RECOMMENDED BY FAN MANUFACTURER, WHICHEVER IS MORE STRINGENT.

5 M.800.00 DOWNBLAST EXHAUST FAN
NO SCALE

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MECHANICAL SCHEDULES AND DETAILS

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GENERAL PLUMBING NOTES

1.1 GENERAL PLUMBING NOTES

A. THESE NOTES SHALL BE GENERALLY APPLIED TO ALL PLUMBING DRAWINGS. AS THEY ARE GENERAL IN NATURE, THEY MAY NOT BE SPECIFICALLY CALLED OUT ON THE PLANS. REFERENCE THE INDIVIDUAL DRAWINGS AS WELL AS DIVISION 22 SPECIFICATIONS FOR ADDITIONAL CONTRACTUAL REQUIREMENTS.

B. SHOULD ANY CONFLICT OCCUR BETWEEN ANY PORTIONS OF THE CONTRACT DOCUMENTS (DRAWINGS AND SPECIFICATIONS), THE CONTRACTOR IS DEEMED TO HAVE BASED THEIR BID/PRICE ON THE MORE EXPENSIVE MATERIAL, EQUIPMENT, PRODUCT OR WORK, UNLESS THEY HAVE REQUESTED AND OBTAINED A WRITTEN CLARIFICATION OR DECISION IN REGARD TO THE CONFLICT FROM THE ARCHITECT/ENGINEER.

C. DRAWINGS AND MEASUREMENTS:
   1. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL SCOPE OF THE WORK I.E., ARRANGEMENT OF SYSTEMS AND EQUIPMENT, EXCEPT WHEN THEY HAVE BEEN SPECIFICALLY DIMENSIONED OR DETAILED.
   2. PLUMBING PLANS ARE INTENDED TO SHOW SIZE, CAPACITY, APPROXIMATE LOCATION, DIRECTION, AND GENERAL RELATIONSHIP OF ONE WORK TRADE TO ANOTHER.
   3. COORDINATION: THE PLUMBING DESIGN SHALL BE COORDINATED WITH ALL OTHER ASPECTS OF THE BUILDING. TO THAT END, THE PLUMBING CONTRACTOR IS RESPONSIBLE FOR REVIEWING THE ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL AND CIVIL DRAWINGS WHERE AVAILABLE, AS WELL AS PHYSICALLY OBSERVING FIELD CONDITIONS BEFORE PERFORMING ANY WORK. EXTRAS WILL NOT BE PAID TO MOVE PIPING DUE TO CONFLICTS ARISING FROM LACK OF COORDINATION.
      a. REFER TO THE ARCHITECTURAL DRAWINGS FOR BUILDING ELEVATIONS, CEILING DETAILS, PARTITIONS, AND OCCUPANCIES.
      b. REFER TO STRUCTURAL DRAWINGS TO COORDINATE PIPING LAYOUT WITH STRUCTURAL ELEMENTS OF THE BUILDING.
      c. REFER TO THE FIRE PROTECTION DRAWINGS (WHEN AVAILABLE) AND MECHANICAL DRAWINGS TO ASSESS THE CONGESTION ABOVE CEILINGS. THE PLUMBING CONTRACTOR SHALL SPECIFICALLY BE CONSCIOUS OF ANY HORIZONTAL MECHANICAL EQUIPMENT LOCATIONS AS WELL AS THEIR CLEAR SERVICE SPACE REQUIREMENTS IN ADDITION TO ANY DUCTWORK OR HYDRONIC PIPING.
      d. CONTRACT DRAWINGS SHALL ONLY SERVE TO SHOW THE GENERAL ARRANGEMENT OF EQUIPMENT AND STRUCTURE. SUCH DRAWINGS SHALL NOT BE CONSIDERED A SUBSTITUTE FOR FIELD VERIFICATION OF CONDITIONS. COORDINATION SHALL OCCUR PRIOR TO FABRICATION, PURCHASE, AND/OR INSTALLATION OF ALL WORK. DISCUSS, COORDINATE AND COOPERATE WITH OTHER TRADES AND COORDINATE THE WORK WITH THEIRS. COORDINATE CEILING CAVITY SPACE CAREFULLY WITH OTHER TRADES. BRING ANY CONFLICTS TO THE ATTENTION OF THE ARCHITECT/ENGINEER.
      e. AS THE DRAWINGS ARE OF SMALL SCALE, IT IS NOT POSSIBLE TO SHOW ALL NECESSARY OFFSETS, FITTINGS, AND ACCESSORIES. OBTAIN EXACT LOCATIONS, FIELD MEASUREMENTS, ETC., AT THE SITE PRIOR TO THE FABRICATION OF ANY MATERIAL OR ORDERING OF EQUIPMENT.
   4. THE DESIGN (DRAWINGS AND SPECIFICATIONS) ARE BASED ON THE CHARACTERISTICS OF THE EQUIPMENT SCHEDULED / SPECIFIED. ALL CHANGES REQUIRED BY THE USE OF OTHER MANUFACTURERS (INCLUDING MANUFACTURERS THAT ARE LISTED IN THE SPECIFICATIONS) SHALL BE MADE BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
      a. THESE CHANGES SHALL INCLUDE, BUT NOT BE LIMITED TO REVISIONS TO FOUNDATIONS, ELECTRICAL CHANGES, SPACE REQUIRED FOR PLACEMENT OF EQUIPMENT, EQUIPMENT BASES, PIPING, CONTROLS, WIRING, WALL OR BUILDING OPENINGS, SERVICE ACCESS REQUIREMENTS, PIPING AND STRUCTURAL MODIFICATIONS.

D. REFER TO THE CODE PLANS FOR FIRE AND/OR SMOKE CONSTRUCTION RATINGS. MAINTAIN INDICATED FIRE AND/OR SMOKE RATING OF WALLS, PARTITIONS, CEILINGS, AND FLOORS AT PIPE AND DUCT PENETRATIONS. SEAL PIPE AND DUCT PENETRATIONS WITH FIRESTOP MATERIALS. REFER TO DIVISION 07 SECTIONS PENETRATION FIRESTOPPING AND JOINT FIRESTOPPING FOR THROUGH-PENETRATION FIRESTOP ASSEMBLY PRODUCT SPECIFICATIONS. INSTALLATION OF FIRESTOP MATERIALS IS SPECIFIED AS WORK OF DIVISION 22.

E. WORK SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH THE **[NEW YORK CITY PLUMBING CODE 2022]**, LOCAL AMENDMENTS, LAWS AND GOVERNING BODIES. WHERE THE PLANS AND/OR SPECIFICATIONS EXCEED THE GOVERNING CODE REQUIREMENTS, THE PLANS AND SPECIFICATIONS WILL GOVERN.

F. PROVIDE COORDINATION DRAWINGS WHERE REQUIRED BY THE SPECIFICATIONS. RFIs RELATED TO COORDINATION ITEMS WILL NOT BE REVIEWED UNLESS COORDINATION DRAWINGS HAVE BEEN SUBMITTED.

G. REFER TO THE PLUMBING FIXTURE SCHEDULE FOR NON-ACCESSIBLE PLUMBING FIXTURE MOUNTING HEIGHTS. COORDINATE WITH THE ARCHITECTURAL PLANS FOR THE MOUNTING HEIGHT OF ACCESSIBLE PLUMBING FIXTURES.

H. ALL MATERIALS EXPOSED WITHIN AN AIR PLENUM SHALL BE NONCOMBUSTIBLE OR HAVE A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE-DEVELOPMENT INDEX OF NOT MORE THAN 50.

I. WHERE LOCATIONS OF ANY EXISTING UTILITY SERVICES ARE SHOWN, THEY SHALL BE CONSIDERED AS "APPROXIMATE". EXACT LOCATIONS OF ANY EXISTING UTILITY SERVICES SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO BEGINNING ANY CONSTRUCTION OR EXCAVATION. COORDINATE UTILITY SERVICE CONNECTION POINTS WITH EXTERIOR UNDERGROUND AND OVERHEAD UTILITIES AND SERVICES. COMPLY WITH REQUIREMENTS OF GOVERNING REGULATIONS, FRANCHISED SERVICE COMPANIES, AND CONTROLLING AGENCIES. THE CONTRACTOR IS RESPONSIBLE FOR AND SHALL BEAR ALL COSTS ASSOCIATED WITH DAMAGE TO ANY EXISTING UTILITIES DURING CONSTRUCTION.

J. EQUIPMENT LOCATION AND ACCESS
   1. LOCATE EQUIPMENT WHICH MUST BE SERVICED, OPERATED, OR MAINTAINED IN ACCESSIBLE LOCATIONS. EQUIPMENT SHALL INCLUDE BUT NOT BE LIMITED TO WATER HEATERS, WATER CONDITIONING EQUIPMENT, VALVES, TRAPS, CLEANOUTS, MOTORS, CONTROLLERS, AND LOW POINT DRAIN LOCATIONS. MINOR DEVIATIONS FROM THE CONTRACT DRAWINGS MAY BE ALLOWED TO PROVIDE BETTER ACCESSIBILITY UNDER THE CONDITION THE CHANGES ARE REVIEWED & APPROVED BY THE ARCHITECT/ENGINEER PRIOR TO MAKING THE CHANGE.
   2. INACCESSIBLE INSTALLATION: WHERE THE ENGINEER DETERMINES THAT THE CONTRACTOR HAS INSTALLED EQUIPMENT SUCH THAT IT IS NOT CONVENIENTLY ACCESSIBLE FOR OPERATION AND/OR MAINTENANCE, THE EQUIPMENT WILL BE REMOVED AND REINSTALLED OR REMEDIAL ACTION SHALL BE PERFORMED AS SO AS TO MAKE THE INSTALLATION CONVENIENTLY ACCESSIBLE AT NO ADDITIONAL COST TO THE OWNER. THE TERM "CONVENIENTLY ACCESSIBLE" IS DEFINED AS CAPABLE OF BEING REACHED WITHOUT THE USE OF LADDERS, OR WITHOUT CLIMBING OR CRAWLING UNDER OR OVER OBSTACLES SUCH AS ELECTRICAL CONDUIT, MOTORS, FANS, PUMPS, BELT GUARDS, TRANSFORMERS, HIGH VOLTAGE LINES, PIPING, AND DUCTWORK.
      a. EXCEPTION: ACCESSING VALVES FROM A LADDER IS ACCEPTABLE WHEN INSTALLED AS OUTLINED IN OTHER PARAGRAPHS OF THESE NOTES. ACCESSING POINT-OF-USE WATER HEATER(S) THAT ARE LOCATED ABOVE A CEILING WHERE INDICATED AND DETAILED ON THE DRAWINGS.

K. PIPE RUNS SHALL BE INSTALLED TO AVOID INTERFERENCE WITH OTHER WORK/TRADES. INSTALL PIPING AT RIGHT ANGLES TO OR PARALLEL WITH BUILDING WALLS OR COLUMN CENTER LINES. DIAGONAL PIPING RUNS ARE PROHIBITED UNLESS SPECIFICALLY INDICATED OTHERWISE. LOCATE GROUPS OF PIPES PARALLEL TO EACH OTHER. SPACE PIPING INCLUDING ANY INSULATION TO PROVIDE A 1-INCH MINIMUM CLEARANCE BETWEEN ADJACENT PIPING OR OTHER SURFACES. SPACE PIPING TO PERMIT VALVE SERVICING OR REPLACEMENT.

L. PLUMBING EQUIPMENT, PIPING, OR ACCESSORIES SHOULD NOT BE LOCATED WITHIN ELECTRICAL EQUIPMENT ROOMS UNLESS INDICATED ON THE DRAWINGS. WHERE PIPING AND EQUIPMENT ARE INDICATED TO BE INSTALLED WITHIN ELECTRICAL EQUIPMENT ROOMS, MAINTAIN THE ELECTRICAL CODE REQUIRED WORKING AND DEDICATED SPACES.

M. PLUMBING EQUIPMENT, PIPING, OR ACCESSORIES NOT USED IN CONNECTION WITH THE OPERATION OF THE ELEVATOR SHALL NOT BE INSTALLED IN ANY HOSTWAY, MACHINERY SPACE, MACHINE ROOM, CONTROL SPACE OR CONTROL ROOM.

N. PLUMBING EQUIPMENT, PIPING, OR ACCESSORIES SHALL NOT PASS THRU OR OVER ANY SERVER (COMM / IT) ROOMS.

O. RUN CW, HW AND HWC LINES FULL SIZE THE ENTIRE LENGTH OF THE PLUMBING CHASE. BRANCH OFF TO INDIVIDUAL PLUMBING FIXTURES WITH PIPE SIZES AS SHOWN ON THE PLUMBING FIXTURE CONNECTION SCHEDULE. REFER TO PLUMBING RISER / ISOMETRIC DIAGRAMS FOR PIPING SIZES NOT SHOWN ON THE PLANS OR PLUMBING FIXTURE CONNECTION SCHEDULE.

P. INSTALL HANGERS FOR METALLIC PIPE AND TUBING NOT TO EXCEED THE MAXIMUM HORIZONTAL AND VERTICAL SPACING AND MINIMUM HANGER ROD DIAMETERS TO COMPLY WITH THE **[NEW YORK CITY PLUMBING CODE 2022],** MSS SP-58 STANDARD PRACTICE FOR PIPE HANGERS AND SUPPORTS, LOCALLY ENFORCED CODES AND AHJ REQUIREMENTS, WHICHEVER ARE MOST STRINGENT. WHERE CONFLICTS ARISE BETWEEN THE PLUMBING CODE REQUIREMENTS, MSS SP-58 AND THE PROJECT SPECIFICATIONS, THE MOST RESTRICTIVE OR THE REQUIREMENT THAT SPECIFIES SUPPORTS WITH HIGHEST LOAD RATING OR SHORTEST HANGER SPACING SHALL APPLY.
   1. WHERE HANGER SPACING DOES NOT CORRESPOND WITH JOIST OR RIB SPACING, USE STRUCTURAL STEEL CHANNELS SECURED DIRECTLY TO JOIST AND RIB STRUCTURE TO MEET THE REQUIRED HANGER SPACING. THEN, SUSPEND THE EQUIPMENT AND PIPING FROM THE CHANNELS. HOLES WILL NOT BE DRILLED OR BURNED IN STRUCTURAL STEEL WITHOUT PRIOR WRITTEN APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD.
   2. PROVIDE ADDITIONAL SUPPORTS AT VALVES, STRAINERS, INLINE PUMPS AND OTHER HEAVY COMPONENTS. PROVIDE SUPPORT WITHIN ONE FOOT OF EACH PIPE ELBOW.
   3. INSTALL HANGERS FOR PLASTIC, FRP OR GLASS PIPING WITH THE MAXIMUM HORIZONTAL SPACING AND MINIMUM ROD DIAMETERS, TO COMPLY WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS, LOCALLY ENFORCED CODES, AND AUTHORITIES HAVING JURISDICTION REQUIREMENTS, WHICHEVER ARE MOST STRINGENT.
   4. SUPPORT VERTICAL RUNS OF PLASTIC, FRP OR GLASS PIPING TO COMPLY WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS, LOCALLY ENFORCED CODES, AND AUTHORITIES HAVING JURISDICTION REQUIREMENTS, WHICHEVER ARE MOST STRINGENT.
   5. THE USE OF CHAINS, WIRE, CABLE OR STRAP HANGERS ARE NOT ALLOWED FOR PIPE SUPPORTS.
   6. REFER TO GENERAL SEISMIC NOTES FOR ADDITIONAL REQUIREMENTS FOR PROJECTS SUBJECTED TO SEISMIC DESIGN REQUIREMENTS.

Q. PROVIDE SHUT OFF VALVES FOR ALL BRANCH WATER PIPING WHERE THE BRANCH CONNECTS TO THE MAIN. LOCATE / ORIENT THE VALVES TO PERMIT PROPER OPERATION AND ACCESS FOR MAINTENANCE. GENERALLY, LOCATE VALVE STEMS IN OVERHEAD PIPING IN HORIZONTAL POSITION. PROVIDE A UNION ADJACENT TO ONE END OF ALL THREADED END VALVES. AS A RULE, THE VALVES SHALL BE INSTALLED NO MORE THAN 18-INCHES ABOVE AN ACCESSIBLE CEILING. IF THE CEILING IS NOT ACCESSIBLE, PROVIDE A MINIMUM **[18" X 18"]** SIZE LOCKABLE ACCESS PANEL TO ACCESS TO SERVICE AND/OR REPLACE THE VALVES.
   1. ANY BRANCH PIPING FROM MAIN SERVING MORE THAN ONE PLUMBING FIXTURE SHALL HAVE SHUT-OFF VALVES.

R. SANITARY DRAINAGE PIPING SHALL SLOPED IN ACCORDANCE WITH THE TABLE BELOW FROM THE 2021 INTERNATIONAL PLUMBING CODE**.**
   1. GREASE WASTE DRAINAGE PIPING UPSTREAM OF A GREASE INTERCEPTOR SHALL SLOPE AT NOT LESS THAN 1/4 INCH PER FOOT.

PIPE SIZE (IN)	[ICC 2021] MINIMUM SLOPE (INCH PER LF)
< = 2.5	1/4
3 TO 6	1/8
> = 8	1/16

S. EACH PLUMBING VENT SHALL TERMINATE NOT LESS THAN 10 FEET FROM, OR NOT LESS THAN 3-FEET ABOVE, AN OPENABLE WINDOW, DOOR, OPENING, AIR INTAKE, OR VENT SHAFT, OR NOT LESS THAN 3-FEET IN EVERY DIRECTION FROM A LOT LINE, ALLEY AND STREET EXCEPTED. WHEN INSTALLED ABOVE THE ROOF, THE PLUMBING VENTS SHALL BE LOCATED **[18-INCHES ABOVE THE ROOF LEVEL]**

T. PROVIDE CLEANOUTS (FLOOR OR WALL AS REQUIRED) EVERY 100', AT AGGREGATE CHANGES IN DIRECTION IN EXCESS OF 45°, AT THE END OF ALL SANITARY AND STORM DRAIN RUNS, AND AT THE BASE OF ALL SEWER AND STORM DRAIN STACKS. PROVIDE WHETHER INDICATED ON PLANS OR NOT BASED ON ACTUAL FIELD ROUTING.

U. WATER HAMMER ARRESTORS WILL BE INSTALLED IN WATER PIPING ACCORDING TO PDI-WH 201. WATER HAMMER ARRESTERS SHALL BE INSTALLED WITH INLET ISOLATION VALVES TO ALLOW FOR MAINTENANCE.

V. THE DETAILS SHOWN ON THE DETAIL SHEETS APPLY TO ALL PLUMBING PLAN SHEETS. THE DETAILS ARE TO BE FOLLOWED FOR THE INSTALLATION OF ALL COMPONENTS AND EQUIPMENT SHOWN.

GENERAL SYMBOLS

SYMBOL	DESCRIPTION
	POINT OF DISCONNECT - DEMOLITION REMOVED FROM EXISTING
	POINT OF CONNECTION - NEW CONNECTS TO EXISTING
	AREA NOT IN CONTRACT

PIPING ANNOTATIONS

SCHEMATIC	3D	DESCRIPTION
		EXISTING TO REMAIN - (E) or EXIST
		ITEM TO BE DEMOLISHED - (D) or DEMO
18" CHWS	18" CHWS	PIPE SIZE TAG (DIAMETER WITH SYSTEM NAME)
		ABOVE GROUND PIPING
		BELOW GROUND PIPING
1/8" / 12" SLOPE	1/8" / 12" SLOPE	PIPE SLOPE
IE: -93' - 1"	IE: -93' - 8"	PIPE INVERT ELEVATION
DDC-xx		MECHANICAL EQUIPMENT TAG
		MECHANICAL EQUIPMENT CLEARANCE

PLUMBING SYMBOLS

SCHEMATIC	3D	DESCRIPTION
		DOMESTIC COLD WATER (LINETYPE)
		DOMESTIC HOT WATER (LINETYPE)
		DOMESTIC HOT WATER RECIRC (LINETYPE)
NV	NV	LAB NITROGEN VENT
AV	AV	ACID VENT
GV	GV	GREASE VENT
OV	OV	OIL VENT
IW	IW	INDIRECT WASTE
V	V	SANITARY VENT
CO	CO	CLEAN OUT
WCO	WCO	WALL CLEAN OUT
FCO	FCO	FLOOR CLEAN OUT
GCO	GCO	GRADE CLEAN OUT (DOUBLE CLEAN OUT)
		FLOOR DRAIN / FLOOR SINK
		ROOF DRAIN / OVERFLOW DRAIN
		DOWNSPOUT NOZZLE
		WALL HYDRANT
		HOSE BIBB
X		WATER HAMMER ARRESTER
AE		ANESTHESIA EVACUATOR
A		MEDICAL COMPRESSED AIR OUTLET
D		DEIONIZED WATER OUTLET
DS		DISTILLED WATER OUTLET
G		NATURAL GAS OUTLET
N		NITROGEN OUTLET
NO		NITROUS OXIDE OUTLET
		OXYGEN OUTLET
V		VACUUM INLET
XX		RISER TAG
8" ORD- 1,500 SF		ROOF DRAIN TAG
3" FS-		PLUMBING FIXTURE TAG

PIPING VALVES AND FITTINGS

SCHEMATIC	3D	DESCRIPTION
		PIPE DROP
		PIPE RISE
		PIPE TEE DOWN
		PIPE TEE UP
		CONCENTRIC REDUCER
		ECCENTRIC REDUCER
		PIPE CAP
		PIPE ALIGNMENT GUIDE
		PIPE ANCHOR
		FLOW DIRECTION
		EXPANSION JOINT
		FLEXIBLE CONNECTION
		UNION
		DIRECTION OF PIPE PITCH
		AQUASTAT
		EXPANSION LOOP
		BALANCING VALVE
		BALANCING VALVE W/ METERING POINTS
		BALL VALVE
		BUTTERFLY VALVE
		CHECK VALVE
		STEAM TRAP
		GATE VALVE
		CIRCUIT SETTER
		MANUAL AIR VENT
		AUTOMATIC AIR VENT
		PLUG VALVE
		PRESSURE GAUGE
		SOLENOID VALVE
		ANGLE VALVE
		AUTOMATIC CONTROL VALVE 2-WAY
		AUTOMATIC CONTROL VALVE 3-WAY
		AUTOMATIC FLOW CONTROL VALVE
		STRAINER
PT		PRESSURE AND TEMPERATURE TEST PORT
		THERMOMETER
		PRESSURE REDUCING VALVE (WATER SYSTEMS) PRESSURE REGULATING VALVE (GAS SYSTEMS)
		RELIEF VALVE
		FLOW MEASURING DEVICE
		BACKFLOW PREVENTER
		UNION

*** 3D VALVE REPRESENTATION IS AN EXAMPLE. VALVE IN MODEL MAY VARY DEPENDING ON APPLICATIONS. SEE SPECIFICATIONS.

SHEET INDEX

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P.002.00 PLUMBING ABBREVIATIONS

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PD.102.00 LEVEL 03 AND MEZZANINE - PLUMBING DEMOLITION PLAN

P.101.00 LEVEL 01 - PLUMBING PLAN
P.102.00 LEVEL 02 - PLUMBING PLAN
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P.202.00 ENLARGED PLUMBING PLANS - 1ST, 2ND AND 3RD FLOOR DRESSING ROOMS
P.203.00 ENLARGED PLUMBING PLANS - 3RD FLOOR AV ROOMS

P.600.00 PLUMBING SCHEDULES AND DETAILS

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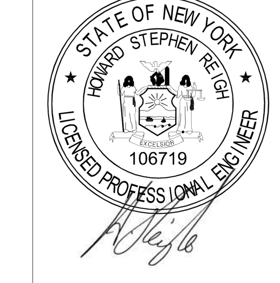

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25
REVISIONS

57-23140-00

PLUMBING GENERAL NOTES, SYMBOLS AND ABBREVIATIONS

P.001.00

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ABBREVIATIONS

#	NUMBER
&	AND
(D)	DEMOLISHED
(E)	EXISTING
(R)	RELOCATED
@	AT
°C	DEGREES CELSIUS
°F	DEGREES FAHRENHEIT
Ø	PHASE
Ø	DIAMETER
A	COMPRESSED AIR
A	AMPERE
A	AMP
A/C	AIR CONDITIONING(ER)
A/E	ARCHITECT/ENGINEER
AABC	ASSOCIATED AIR BALANCE COUNCIL
AAP	ALARM ANNUNCIATOR PANEL
AAP	AREA ALARM PANEL
AAV	AUTOMATIC AIR VENT
AAV	AIR ADMITTANCE VALVE
AB	ANCHOR BOLT
ABS	ACRYLONITRILE-BUTADIENE-STYRENE
AC	ALTERNATING CURRENT
AC	ACOUSTIC CEILING
ACC	AIR COOLED CONDENSER
ACC	ACCESSIBLE
ACCU	AIR COOLED CONDENSING UNIT
ACM	ALUMINUM COMPOSITE MATERIAL
ACST	ACOUSTIC
AD	AREA DRAIN
AD	ACCESS DOOR
ADDN	ADDITION OR ADDITIONAL
ADJ	ADJUSTABLE
ADJT	ADJACENT, ADJOINING
ADMIN	ADMINISTRATION
ADO	AUTOMATIC DOOR OPENER
AF	AIR FILTER
AFC	ABOVE FINISHED COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AGF	AIR GAP FITTING
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
AI	AREA INLET
AI	ANALOG INPUT
ALT	ALTERNATE
ALUM	ALUMINUM
AMB	AMBIENT
AMBA	AMERICAN BOILER MANUFACTURERS ASSOCIATION
AMP	AMPERE
ANCH	ANCHOR
AP	ACCESS PANEL
APC	ACOUSTIC PANEL CEILING
APPROX	APPROXIMATE
AR	ACID RESISTING
AR	ARGON
ARCH	ARCHITECTURAL
AS	AIR SEPARATOR
ASB	ASBESTOS
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASHRAE	AMERICAN SOCIETY OF HEATING REFRIGERATION AND AIR CONDITIONING ENGINEERS
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASPH	ASPHALT
AUTO	AUTOMATIC
AV	AUDIO-VIDEO, AUDIO-VISUAL
AV	ACID VENT
AV	AIR VENT
AVG	AVERAGE
AW	ACID WASTE
AWG	AMERICAN WIRE GAUGE
AWP	ACOUSTIC WALL PANEL
B	BOILER
B to B	BACK TO BACK
BAS	BUILDING AUTOMATION SYSTEM
BAT	BATTERY
BBO	BOILER BLOW OFF
BC	BALANCING COCK
BC	BARE COPPER
BCMU	BURNISHED CONCRETE MASONRY UNIT
BD	BOARD
BDD	BACK DRAFT DAMPER
BET	BETWEEN
BF	BOILER FEED
BFF	BELOW FINISH FLOOR
BFP	BACKFLOW PREVENTER
BFR	BELOW FLOOR
BFV	BUTTERFLY VALVE
BHP	BREAK HORSEPOWER
BI	BACKWARD INCLINED (FAN IMPELLER/WHEEL)
BKR	BREAKER
BL	BUILDING LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BLKHD	BULKHEAD
BM	BENCH MARK
BM(S)	BEAM(S)
BMS	BUILDING MANAGEMENT SYSTEM
BOD	BOTTOM OF DUCT
BOF	BOTTOM OF FOOTING
BOP	BOTTOM OF PIPE
BOT	BOTTOM
BPIP	BOILER PLANT INSTRUMENTATION PANEL
BRDG	BRIDGING
BRG	BEARING
BRKT	BRACKET
BSMT	BASEMENT
BT	BATHTUB
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BUR	BUILT UP ROOFING
BV	BALL VALVE
C	CONDUIT
C	CONDENSER WATER
CA	COMBUSTION AIR
CANT	CANTILEVER
CAP	CAPACITY
CAS	CASING
CBD	COUNTER-BALANCED DAMPER
CBD	CHALKBOARD
CC	COOLING COIL
CCR	CONTROL CONTRACTOR
CCTV	CLOSED CIRCUIT TELEVISION
CD	CONDENSATE DRAIN
CD	CEILING DIFFUSER
CD	CONSTRUCTION DOCUMENTS
CDA	CLEAN DRY AIR (COMPRESSED AIR)
CDF	COMBINATION DRINKING FOUNTAIN & BOTTLE FILLING STATION
CE	COVER ELEVATION
CEM	CEMENT
CENT	CENTRIFUGAL
CER	CERAMIC
CF	CUBIC FEET
CFCI	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CG	CORNER GUARD
CH	CHILLER
CH	CHANNEL
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CI	CAST IRON
CI	CURB INLET
CIP	CAST IN PLACE
CIP	CAST IRON PIPE
CIRC	CIRCULATING
CJ	CONTROL JOINT
CJ	CONSTRUCTION JOINT
CJA	CONTROL JOINT ABOVE
CKT	CIRCUIT
CKT BK	CIRCUIT BREAKER
CL	CENTER LINE
CL	CIRCUIT LINE
CLG	CEILING
CLOS	CLOSET
CLR	CLEAR
CM	CEILING MOUNTED
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
CO	CARBON MONOXIDE
CO	CONDUIT ONLY
CO2	CARBON DIOXIDE
COL	COLUMN
COMB	COMBINATION
COMM	COMMUNICATIONS
COMP	COMPRESSOR UNIT
COMP	COMPOSITE
COMPR	COMPRESSIBLE
CONC	CONCRETE
COND	CONDENSATE
CONF	CONFERENCE
CONFIG	CONFIGURATION
CONN(S)	CONNECTION(S)
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACT(OR)
CONV	CONVECTOR
COOR	COORDINATE
COORD	COORDINATE
CP	CONDENSATE PUMP
CP	COVER PLATE
CPS	CYCLES PER SECOND
CPT	CARPET
CPVC	CHLORINATED POLYVINYL CHLORIDE
CR	CORROSION RESISTANT
CRAC	COMPUTER ROOM AIR CONDITIONING UNIT
CS	COUNTERSINK
CS	COMBINATION SEWER
CS	CARBON STEEL
CSK	COUNTERSUNK
CSMU	CALCIUM SILICATE MASONRY UNIT
CSP	COMBINATION STANDPIPE
CSWK	CASEWORK
CT	COOLING TOWER
CT	CERAMIC TILE
CT	CURRENT TRANSFORMER
CTL	CONTROL
CTR	CENTER
CU	COPPER
CU	CONDENSING UNIT
CU	CUBIC
CU	COMBINATION UNIT
CUH	CABINET UNIT HEATER
CW	COLD WATER
CWP	CONDENSER WATER PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CWV	COMBINATION WASTE AND VENT
CY	CUBIC YARD
CYL	CYLINDER
D	DRAIN
D	DIFFUSER
D	DEPTH
D	DATA
d	PENNY (NAIL 10D)
DB	DECIBEL
DB	DRY BULB
DBA	DECIBELS A
DBL	DOUBLE
DC	DIRECT CURRENT
DC	DUST COLLECTOR
DCJ	DUMMY CONTROL JOINT
DDC	DIRECT DIGITAL CONTROL
DEG	DEGREE
DEMO	DEMOLISH OR DEMOLITION
DEPR	DEPRESS(ION)(ED)
DEPT	DEPARTMENT
DET	DETAIL
DET	DETENTION
DF	DRINKING FOUNTAIN
DFR	DIESEL FUEL RETURN
DFS	DIESEL FUEL SUPPLY
DFU	DRAINAGE FIXTURE UNIT
DFV	DIESEL FUEL VENT
DG	DOOR GRILLE
DH	DUCT HEATER
DHU	DEHUMIDIFICATION UNIT
DI	DEIONIZED WATER
DI	DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGONAL
DIC	DISCHARGE
DIFF	DIFFUSER
DIM	DIMENSION
DISC	DISCONNECT
DISC SW	DISCONNECT SWITCH
DISCH	DISCHARGE
DISTR	DISTRIBUTION
DIV	SPECIFICATION DIVISION
DL	DRUM LOUVER
DL	DEAD LOAD
DM	DAMPER MOTOR
DMPR	DAMPER
DN	DOWN
DO or "	DITTO
DOAS	DEDICATED OUTDOOR AIR SYSTEM UNIT
DOE	DEPARTMENT OF ENERGY
DP	DIFFERENTIAL PRESSURE
DPFG	DAMPROFFING
DPI	DIFFERENTIAL PRESSURE INDICATOR
DPS	DIFFERENTIAL PRESSURE SWITCH
DPT	DIFFERENTIAL PRESSURE TRANSMITTER
DR	DOOR
DR	DRAIN
DS	DISTILLED WATER
DS	DOWNSPOUT
DSN	DOWNSPOUT NOZZLE
DSP	DRY STANDPIPE
DSPR	DRY SPRINKLER PIPING
DSPR	DRY SPRINKLER PIPE
DSTB	DISTRIBUTED
DTL	DETAIL
DTR	DUCT THRU ROOF
DW	DISHWASHER
DWBP	DOMESTIC WATER BOOSTER PUMP
DWDI	DOUBLE WIDTH DOUBLE INLET
DWG(S)	DRAWING(S)
DWL(S)	DOWEL(S)
DWR	DRAWER
DWRP	DOMESTIC WATER RECIRCULATING PUMP
DX	DIRECT EXPANSION
DXS	DOUBLE EXTRA STRONG
E	EAST
EA	EACH
EA	EXHAUST AIR
EA	EACH FACE
EAT	ENTERING AIR TEMPERATURE
EB	ELECTRIC BASEBOARD RADIATION
EB	EXPANSION BOLT
EBH	ELECTRIC BASIN HEATER
EC	ELECTRICAL CONTRACTOR
ECON	ECONOMIZER
ECS	EMERGENCY COMMUNICATION SYSTEM
EDH	ELECTRIC DUCT HEATER
EE	EACH END
EER	ENERGY EFFICIENCY RATIO
EEW	EMERGENCY EYE WASH
EEWS	EMERGENCY EYE WASH SHOWER
EF	EXHAUST FAN
EF	EACH FACE
EFF	EFFICIENCY
EG	EXHAUST AIR GRILLE
EH	ELECTRICAL HEATER
EIFS	EXTEROR INSULATION AND FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELEVATION
ELAS	ELASTOMERIC
ELEC	ELECTRICAL(AL)
ELEV	ELEVATOR
EMCS	ENERGY MANAGEMENT CONTROL SYSTEM
EMD	ESTIMATED MAXIMUM DEMAND
EMER	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EMV	EMERGENCY MIXING VALVE
ENCL	ENCLOSURE
ENT	ENTERING
ENTR	ENTRANCE
EOMD	END OF MAIN DRIP
EP	ELECTRO-PNEUMATIC
EP	EXPLOSION PROOF
EPO	EMERGENCY POWER OFF
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ER	EXISTING (TO BE) RELOCATED
ER	EXHAUST REGISTER
ERA	ENERGY RECOVERY AIR
ERF	EPOXY RESIN FLOORING
ES	EMERGENCY SHOWER
ES	EXTRA STRONG
ESP	EXTERNAL STATIC PRESSURE
EST	ESTIMATE
ET	EXPANSION TANK
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EWT	ENTERING WATER TEMPERATURE
EXC	EXCAVATE
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION
EXP	EXPOSED
EXPL	EXPLOSION
EXT	EXTERIOR
F	FAHRENHEIT
F	FIRELINE
F	FURNACE
F	FACE
F	FIRE SERVICE
FA	FIRE ALARM
FA	FACE
FA	FRESH AIR
FAA	FIRE ALARM ANNUNCIATOR
FAB	FABRICATE(D)
FACP	FIRE ALARM CONTROL PANEL
FB	FACE BRICK
FC	FLUID COOLER
FCMU	FLUTED CONCRETE MASONRY UNIT
FCO	FLOOR CLEAN OUT
FCU	FAN COIL UNIT
FCV	FLOW CONTROL VALVE
FCW	FILTERED COLD WATER
FD	FLOOR DRAIN
FD	FIRE DAMPER
FDC	FIRE DEPARTMENT CONNECTION
FDN	FOUNDATION
FDNDR	FOUNDATION DRAIN
FDR	FEEDER
FDV	FIRE DEPARTMENT VALVE
FDVC	FIRE DEPARTMENT VALVE CABINET
FE	FIRE EXTINGUISHER
FEA	FUME HOOD EXHAUST AIR
FEC	FIRE EXTINGUISHER CABINET
FF	FINISH FLOOR
FH	FIRE HYDRANT
FH	FILTER HOUSING
FHC	FIRE HOSE CABINET
FIG	FIGURE
FIN	FINISHED
FIX	FIXTURE
FL	FLOOR
FLA	FULL LOAD AMPS
FLASH	FLASHING
FLEX	FLEXIBLE
FLG	FLANGE
FLG	FLOORING
FLM	FULL LENGTH MIRROR
FLUOR	FLUORESCENT
FM	FIRE MAIN
FM	FORCE MAIN
FM	FACTORY MUTUAL
FMCS	FACILITIES MANAGMENT CONTROL SYSTEM
FME	FLOW MEASURING EQUIPMENT
FNPT	FEMALE NPT
FO	FINISH OPENING
FO	FACE OF
FOC	FACE OF CONCRETE
FOF	FUEL OIL FILL
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOS	FACE OF STUD
FOV	FUEL OIL VENT
FOW	FACE OF WALL
FP	FIRE PUMP
FP	FIREPROOFING
FPB	FAN POWERED VAV TERMINAL
FPD	FIRE PUMP DISCHARGE
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FR	FIRE RESISTANT
FR	FIRE RESISTIVE
FR	FRAME
FRP	FIBERGLASS REINFORCED PANEL
FS	FLOW SWITCH
FS	FLOOR SINK
FSD	FIRE SMOKE DAMPER
FSEC	FOOD SERVICE EQUIPMENT CONTRACTOR
FT	FEET
FT	FIN TUBE
FT	FLOW TRANSMITTER
FTG	FOOTING
FURN	FURNISH(ED)
FUT	FUTURE
FV	FIELD VERIFY
FV	FACE VELOCITY
FVC	FIRE VALVE CABINET
FWC	FABRIC WALL COVERING
G	GRILLE
G	NATURAL GAS
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRAD BAR
GC	GENERAL CONTRACTOR
GCMU	GLAZED CONCRETE MASONRY UNIT
GCO	GRADE CLEAN OUT
GD	GARBAGE DISPOSAL
GEA	GREASE EXHAUST AIR
GEN	GENERATOR
GEN	GENERAL
GFA	GROSS FLOOR AREA
GFCMU	GROUND-FACE CONCRETE MASONRY UNIT
GFI, GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFRC	GLASS FIBER REINFORCED CONCRETE
GHR	GLYCOL-WATER HEATING RETURN
GHS	GLYCOL-WATER HEATING SUPPLY
GI	GALVANIZED IRON
GL	GLUE LAMINATED
GL	GLASS
GMU	GLASS MASONRY UNIT
GND	GROUND
GOVT	GOVERNMENT
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GUARD RAIL
GR	GRADE
GR	GRILLE
GRC	GLASS REINFORCED CONCRETE
GRC	GALVANIZED RIGID CONDUIT
GRC	GLASS REINFORCED CONCRETE
GRD	GRILLES, REGISTERS AND DIFFUSERS
GRGP	GLASS REINFORCED GYPSUM PLASTER
GRS	GALVANIZED RIGID STEEL
GRV	GRAVITY VENTILATOR
GS	GASOLINE
GV	GATE VALVE
GV	GREASE VENT
GVBF	GREASE VENT BELOW FLOOR
GW	GREASE WASTE
GWB	GYPSUM WALL BOARD
GWR	GEOTHERMAL WATER RETURN
GWS	GEOTHERMAL WATER SUPPLY
GYP	GYPSUM
H	HEIGHT
H1E	HOOK ONE END
H2	HYDROGEN
HB	HOSE BIB
HC	HEATING COIL
HC	HOLLOW CORE
HC	HANDICAP
HCB	HANDICAP BENCH
HCR	HOT/CHILLED WATER RETURN
HCS	HOT/CHILLED WATER SUPPLY
HCW	HARD COLD WATER
HD	HAND DRYER
HDBD	HARDBOARD
HDCP	HANDICAP
HDR	HEADER
HDWD	HARDWOOD
HDWR	HARDWARE
HE	HELIUM
HEV	HOSE END VALVE
HGR	HANGER
HID	HIGH INTENSITY DISCHARGE
HM	HOLLOW METAL
HOA	HAND-OFF-AUTOMATIC
HORIZ	HORIZONTAL
HP	HORSE POWER
HP	HEAT PUMP
HP	HIGH PRESSURE
HPC	HIGH PRESSURE STEAM CONDENSATE
HPNG	HIGH PRESSURE NATURAL GAS
HPR	HIGH PRESSURE STEAM RETURN
HPS	HIGH PRESSURE STEAM SUPPLY
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HRO	HOT REVERSE OSMOSIS
HROC	HOT REVERSE OSMOSIS RECIRCULATION
HRWR	HEAT RECOVERY WATER RETURN
HRWS	HEAT RECOVERY WATER SUPPLY
HS	HEADSTUD
HSPF	HEAT SEASONAL PERFORMANCE FACTOR
HSTR	HIGH STRENGTH
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HTWR	HIGH TEMPERATURE HOT WATER RETURN
HTWS	HIGH TEMPERATURE HOT WATER SUPPLY
HUM	HUMIDIFIER
HV	HEATING VENTILATING UNIT
HVAC	HEATING VENTILATING AND AIR CONDITIONING
HW	DOMESTIC HOT WATER
HWC	DOMESTIC HOT WATER RECIRCULATING
HWR	HEATING WATER RETURN
HWS	HEATING WATER SUPPLY
HX	HEAT EXCHANGER
HZ	HERTZ (FREQUENCY)
i.e.	THAT IS
IAQ	INDOOR AIR QUALITY
IAW	IN ACCORDANCE WITH
IB	INFRARED BURNER
IBC	INTERNATIONAL BUILDING CODE
IC	INTERCOM
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IECC	INTERNATIONAL ENERGY CONSERVATION CODE
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
IES	ILLUMINATING ENGINEERING SOCIETY
IF	INSIDE FACE
IG	ISOLATED GROUND
IH	INTAKE HOOD
IJ	ISOLATION JOINT
IJS	IN JOIST SPACE
IMC	INTERNATIONAL MECHANICAL CODE
IMC	INTERMEDIATE METAL CONDUIT
IN	INCH
IN HG	INCHES OF MERCURY (PRESSURE)
IN WC	INCHES OF WATER COLUMN (PRESSURE)
INC	INCLUDE(ING)
INSUL	INSULATION
INT	INTERIOR
IP	IRON PIPE
IPC	INTERNATIONAL PLUMBING CODE
IPS	IRON PIPE SIZE
IW	INDIRECT WASTE
JAN	JANITOR
JB	JUNCTION BOX
JCT	JUNCTION
JFB	JOINT FILLER BOARD
JST	JOIST
JT	JOINT
KCJ	KEYED CONSTRUCTION JOINT
KCP	KEENE'S CEMENT PLASTER
KD	KNOCKDOWN
KH	KITCHEN HOOD
KHE	KITCHEN HOOD EXHAUST FAN
KHS	KITCHEN HOOD SUPPLY FAN
KIT	KITCHEN
KO	KNOCKOUT
KS	KITCHEN SINK
KV	KILOVOLT
KVA	KILOVOLT AMPERES
KVAR	KILOVOLT AMPERES REACTIVE
KW	KILOWATT
KWH	KILOWATT HOUR
L	ANGLE
LA	LABRATORY COMPRESSED AIR
LAB	LABORATORY
LAM	LAMINATED
LAT	LEAVING AIR TEMPERATURE
LAV	LAVATORY
LB(S)	POUND(S)
LBR	LUMBER
LDG	LOADING
LF	LINEAR FOOT
LG	LENGTH (LONG)
LIN	LINEAR
LINO	LINOLEUM
LKR	LOCKER
LL	LIVE LOAD
LLH	LONG LENGTH HORIZONTAL
LLV	LONG LENGTH VERTICAL
LN2	LIQUID NITROGEN
LO2	LIQUID OXYGEN
LOC	LOCATION
LONG	LONGITUDINAL
LPG	LIQUIFIED PETROLEUM GAS (PROPANE)
LPR	LOW PRESSURE STEAM RETURN
LPS	LOW PRESSURE STEAM SUPPLY
LR	LIVING ROOM
LS	LAWN SPRINKLER
LSC	LIFE SAFETY CODE
LT	LIGHT
LTD	LINED TRANSFER DUCT
LTG	LIGHTING
LV	LOUVER
LV	LABORATORY VACUUM
LVG	LEAVING
LW	LONG WAY
LWT	LEAVING WATER TEMPERATURE
M	THOUSAND
MA	MIXED AIR
MA	MAKE-UP AIR
MA	MEDICAL COMPRESSED AIR
MAC	MACHINE
MAG	MAGNETIC
MAINT	MAINTENANCE
MAN	MANUAL
MAS	MASONRY
MATL	MATERIAL
MAU	MAKEUP AIR UNIT
MAV	MANUAL AIR VENT
MAX	MAXIMUM
MB	MACHINE BOLT
MBD	MARKER BOARD
MBH	THOUSAND BTU PER HOUR
MC	MECHANICAL CONTRACTOR
MC	MEDICINE CABINET
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MCM	METAL COMPOSITE MATERIAL
MD	MOTORIZED DAMPER
MDF	MEDIUM DENSITY FIBERBOARD
MDO	MEDIUM DENSITY OVERLAY
MECH	MECHANICAL
MEMB	MEMBRANE
MET	METAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MFRG	MANUFACTURING
MG	MOTOR GENERATOR
MH	MANHOLE
MH	METAL HALIDE
MH	MOP HOLDER
MIN	MINIMUM
MISC	MISCELLANEOUS
MISC	MISCELLANEOUS
ML	MOTORIZED LOUVER
MLDG	MOLDING
MLO	MAIN LUGS ONLY
MLWK	MILLWORK
MO	MASONRY OPENING
MOCP	MAXIMUM OVERCURRENT PROTECTION
MPG	MEDIUM PRESSURE GAS
MPR	MEDIUM PRESSURE STEAM RETURN
MPS	MEDIUM PRESSURE STEAM SUPPLY
MR	MIRROR
MR/S	MIRROR WITH SHELF
MS	MAGNETIC STARTER
MS	MOP SINK
MTD	MOUNTED
MTG	MOUNTING
MTL	METAL
MTWR	MEDIUM TEMP HOT WATER RETURN
MTWS	MEDIUM TEMP HOT WATER SUPPLY
MUL	MULLION
MV	MEDICAL VACUUM
MV	MERCURY VAPOR
MW	MARKER WALL
N	NITROGEN
N	NORTH
N2	LABORATORY NITROGEN
N2O	NITROUS OXIDE
N20	NITROUS OXIDE
N/A	NOT APPLICABLE
NA	NOT APPLICABLE
NAT	NATURAL
NC	NORMALLY CLOSED
NC	NOISE CRITERIA
NC	NURSE CALL
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSN.
NEUT	NEUTRAL
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO	NUMBER
NO2	NITROGEN DIOXIDE
NOM	NOMINAL
NRS	NON RISING STEM
NS	NEUTRAL SENSOR
NTS	NOT TO SCALE
NV	NITROGEN VENT
O2	OXYGEN
O to O	OUT TO OUT
O&M	OPERATION AND MAINTENANCE
OA	OUTSIDE AIR
OBSC	OBSCURE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OD	OVERFLOW DRAIN
OF	OUTSIDE FACE
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFF	OWNER FURNISHED OWNER INSTALLED
OFOI	OWNER FURNISHED OWNER INSTALLED
OHP	OVERHEAD POWER
OHT	OVERHEAD TELEPHONE
OPNG	OPENING
OPP	OPPOSITE
ORD	OVERFLOW ROOF DRAIN
OS&Y	OUTSIDE SCREW AND YOKE
OSD	OVERFLOW STORM DRAIN
OTCS	OPEN TO CEILING SPACE
OV	OIL VENT
OVFL	OVERFLOW
OVHD	OVERHEAD
OW	OIL WASTE
P	POLE(S)
P	PUMP
P/T	PRESSURE/TEMPERATURE TEST PORT
PA	PUBLIC ADDRESS
PAN B	PANIC BOLT
PAR	PARALLEL
PB	PULL BOX
PB	PUSH BUTTON
PB	PARTICLE BOARD
PBS	PUSH BUTTON STATION
PC	PUMPED CONDENSATE
PCD	PAPER CUP DISPENSER
PCF	POUNDS PER CUBIC FOOT
PCT	PORCELAIN CERAMIC TILE
PCV	PRESSURE CONTROL VALVE
PCWP	PROCESS COOLING WATER PUMP
PCWR	PROCESS COOLING WATER RETURN
PCWS	PROCESS COOLING WATER SUPPLY
PD	PRESSURE DROP
PD	PUMP DISCHARGE
PDI	PLUMBING & DRAINAGE INSTITUTE
PENT	PENTHOUSE
PERF	PERFORATED
PERP	PERPENDICULAR
PF	POWER FACTOR
PG	PRESSURE GAUGE
PG	PROPANE GAS
PH	PHASE
PHC	PRE-HEAT COIL
PI	POINT OF INTERSECTION
PI	PRESSURE INDICATOR
PIC	PORTABLE INSTRUMENT CONNECTION
PIV	POST INDICATOR VALVE
PL	PLACE(S)
PLAM	PLASTIC LAMINATE
PLAS	PLASTER
PLBG	PLUMBING
PLYWD	PLYWOOD
PNEU	PNEUMATIC
PNL	PANEL
POC	POINT OF CONNECTION
PORC	PORCELAIN
PPM	PARTS PER MILLION
PR	PAIR
PREFAB	PREFABRICATED
PROJ	PROJECT(OR) (ION)
PRV	PRESSURE REGULATING VALVE
PS	PIPE SUPPORT
PS	PROJECTION SCREEN
PSF	POUNDS PER SQUARE FOOT
PSFA	POUNDS PER SQUARE FOOT, ABSOLUTE
PSFG	POUNDS PER SQUARE FOOT, GAUGE
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH, ABSOLUTE
PSID	POUNDS PER SQUARE INCH, DIFFERENTIAL
PSIG	POUNDS PER SQUARE INCH, GAUGE
PSV	PRESSURE SAFETY (RELIEF) VALVE
PT	PLASTER TRAP
PT	POINT
PT	POTENTIAL TRANSFORMER
PTD	PAPER TOWEL DISPENSER
PTD/R	COMBINATION TOWEL DISPENSER/RECEPTACLE
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PWL	SOUND POWER LEVEL
PWR	POWER
QT	QUARRY TILE
QTR RND	QUARTER ROUND
QTY	QUANTITY
R	RISER
R	RADIUS
R	REGISTER
RA	RETURN AIR
RAD	RADIUS
RAD	RADIATOR
RAD	RADIATED
RAT	RETURN AIR TEMPERATURE
RB	RUBBER BASE
RC	REMOTE CHILLER
RC	REMOTE CONTROL
RCP	REFLECTED CEILING PLAN
RCP	REINFORCED CONCRETE PIPE
RCP	RADIANT CEILING PANEL
RCU	RECIPROCATING CHILLER UNIT
RCW	RECLAIMED WATER
RD	ROOF DRAIN
RD	REFRIGERANT DISCHARGE
RE	REFER TO
RE	REFERENCE
RECIRC	RECIRCULATING
RECP	RECEPTACLE
RECPT	RECEPTACLE
RECT	RECTANGLE(AR)
REF	REFERENCE
REFL	REFLECTED
REFR	REFRIGERANT
REG	REGISTER
REINF	REINFORCEMENT
RELA	RELIEF AIR
REM	REMOVABLE
REQ(D)	REQUIRE(D)
RESIL	RESILIENT
RESP	RESPONSIVE
RET	RETAINING
REV	REVISION(S)
RF	RETURN FAN
RF	RUBBER FLOOR
RFM	RECESSED FLOOR MAT
RH	RELATIVE HUMIDITY
RH	REFLIEF HOOD
RH	ROBE HOOK
RHC	REHEAT COIL
RHG	REFRIGERANT HOT GAS
RI&C	ROUGH IN AND CONNECT
RIJS	RISE IN JOIST SPACE
RL	REFRIGERANT LIQUID
RM	ROOM
RND	ROUND
RO	REVERSE OSMOSIS WATER
RO	ROUGH OPENING
ROC	REVERSE OSMOSIS RECIRCULATING
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
RTU	ROOF TOP UNIT
RV	REFRIGERANT VENT
RWL	RAIN WATER LEADER
S	SMOKE DAMPER
S	SOUTH
S	SANITARY SEWER
S	SPRINKLER LINE
S	SINK
S	SOAP DISH
SA	SUPPLY AIR
SA	SHOCK ABSORBER
SAN	SANITARY WASTE
SC	SECURITY
SC	SOLID CORE
SC	SHOWER CURTAIN
SC	SPECIAL COATING
SCCR	SHORT CIRCUIT CURRENT RATING
SCD	SEAT COVER DISPENSER
SCD	SECONDARY CONDENSATE DRAIN
SCH	SHOWER CURTAIN HOOK
SCHED	SCHEDULE
SCR	SILICON CONTROLED RECTIFIER
SCT	STRUCTURAL CLAY TILE
SCUT	SCUTTLE
SCW	SOFT COLD WATER
SD	SMOKE DAMPER
SD	STORM DRAIN
SD	SMOKE DETECTOR
SD	SOAP DISPENSER
SE	STEAM EXHAUST VENT
SEA	SMOKE EXHAUST AIR
SEC	SECONDARY
SEC	SECOND
SECT	SECTION
SECY	SECRETARY
SENS	SENSIBLE
SF	SUPPLY FAN
SF	SQUARE FOOT
SFA	SPRINKLER FLOW ALARM
SFCMU	SPLIT-FACE CONCRETE MASONRY UNIT
SFU	STRUCTURE FACING UNIT
SGL	SINGLE
SH	SHOWER
SHM	SECURITY HOLLOW METAL
SHT	SHEET
SHW	SOFT HOT WATER
SHWC	SOFT HOT WATER RECIRCULATING
SHWR	SOLAR HOT WATER RETURN
SHWS	SOLAR HOT WATER SUPPLY
SIM	SIMILAR
SK	SINK
SL	SHORT LEG
SLNT	SEALANT
SM	SPRINKLER MAIN
SM	SHEET METAL
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SND	SANITARY NAPKIN DISPOSAL
SNV	SANITARY NAPKIN VENDOR
SP	STATIC PRESSURE (H2O)
SP	STAND PIPE
SPD	SURGE PROTECTION DEVICE
SPEC	SPECIFICATION(S)
SPK	SPRINKLER
SPL	SOUND PRESSURE LEVEL
SPL	SPECIAL
SPL BLK	SPLASH BLOCK
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN	SQUARE INCHES
SS	STAINLESS STEEL
SS	SERVICE SINK
SS	SOLID SURFACE
SS	SOLID SEPARATOR
SSA	STORM SHELTER AREA
SST	SECONDARY STORM DRAINAGE
ST	STAIR
ST	STORM DRAINAGE
STAG'D	STAGGERED
STC	SOUND TRANSMISSION CLASS
STD	STANDARD
STE	SINGLE TAPERED END
STGR	STRINGER
STL	STEEL
STOR	STORAGE
STR	STRUCTURE(AL)
STRUCT	STRUCTURAL
SUB	SUBSTATION
SURF	SURFACE
SUSP	SUSPENDED
SV	SOLENOID VALVE
SV	STEAM VENT
SW	SHORT WAY
SW	SWITCH
SWBD	SWITCHBOARD
SWP	STEAM WORKING PRESSURE
SYM	SYMETRICAL
T	TEMPERED
T	THERMOSTAT
T	TREAD
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
TA	TRANSFER AIR
TAB	TEST(ING) ADJUST(ING) BALANCE(ING)
TAN	TANGENT
TB	TERMINAL BOX
TB	TOWEL BAR
TBD	TACK BOARD
TC	TIME CLOCK
TC	TEMPERATURE CONTROL
TCC	TEMPERATURE CONTOLS CONTRACTOR
TD	TRANSFER DUCT
TD	TRENCH DRAIN
TDH	TOTAL DYNAMIC HEAD
TDS	TOTAL DISOLVED SOLIDS
TEL	TELEPHONE
TEMP	TERMPORARY
TEMP	TEMPERATURE
TEMP	TEMPERED
TEMP	TEMPORARY
TERR	TERRAZZO
TEXT	TEXTURED
TGL	TOGGLE
TH	THRESHOLD
TH	TOWEL HOOK
THK	THICK(NESS)
TMR	TILT MIRROR UNIT
TMV	THERMOSTATIC MIXING VALVE
TOB	TOP OF BEAM
TOC	TOP OF CONCRETE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOIL	TOILET
TOM	TOP OF MASONRY
TOP	TOP OF PAVING
TOP	TOP OF PIPE
TOS	TOP OF STEEL
TOW	TOP OF WALL
TPV	TRAP PRIMER
TPV	TRAP PRIMER VALVE
TR	TRIP
TRANS	TRANSVERSE
TRD	TREAD
TS	TEMPERATURE SENSOR
TSP	TOTAL STATIC PRESSURE
TT	TEMPERATURE TRANSMITTER
TT	TERRAZZO TILE
TTD	TOILET TISSUE DISPENSER
TV	TELEVISION
TW	TACK WALL
TYP	TYPICAL
UC	UNIT COOLER
UC	UNDERCUT DOOR
UG	UNDERGROUND
UGE	UNDERGROUND ELECTRICAL
UGT	UNDERGROUND TELEPHONE
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORIES
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
URD	UNDERGROUND RESIDENTIAL DISTRIBUTION
US	UTILITY SHELF
UTIL	UTILITY
UV	UNIT VENTILATOR
V	VOLT
V	SANITARY VENT
V	VACUUM
VA	VOLT-AMPERE
VA	VALVE
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VB	VAPOR BARRIER
VB	VINYL BASE
VBF	VENT BELOW FLOOR
VCB	VENTED COVE BASE
VCP	VITRIFIED CLAY PIPE
VCT	VINYL COMPOSITION TILE
VD	VOLUME DAMPER
VEL	VELOCITY
VENT	VENTALATOR(TION)
VERT	VERTICAL
VEST	VESTIBULE
VF	VINYL FLOOR
VFD	VARIABLE FREQUENCY DRIVE
VIF	VERIFY IN FIELD
VM	VOLTMETER
VOL	VOLUME
VP	VACUUM PUMP
VP	VENEER PLASTER
VSMP	VARIABLE SPEED MOTOR CONTROLLER
VT	VINYL TILE
VTR	VENT THROUGH ROOF
VWC	VINYL WALL COVERING
W	WIRE
W	WIDE FLANGE
W	WEST
W	WATER SERVICE
W	WIDE(TH)
W	WASTE (PLUG)
W	WATT
W/	WITH
W/O	WITHOUT
WAGD	WASTE ANESTHETIC GAS DISPOSAL
WB	WET BULB
WC	WATER COLUMN
WC	WATER CLOSET
WC	WALL COVERING
WCC	WATER COOLED CONDENSER
WCL	WATER CLOSET/LAVATORY COMBINATION
WCO	WALL CLEAN OUT
WD	WOOD
WDW	WINDOW
WF	WASH FOUNTAIN
WFMD	WATER FLOW MEASURING DEVICE
WFU	WASTE FIXTURE UNIT
WG	WIRE GUARD
WG	WATER GAUGE
WH	WALL HYDRANT
WH	WATER HEATER
WHA	WATER HAMMER ARRESTOR
WHM	WATT HOUR METER
WI	WROUGHT IRON
WLR	WATER LOOP RETURN
WLS	WATER LOOP SUPPLY
WMG	WATER MOTOR GOING
WNSCT	WAINSCOT
WP	WEATHER-PROOF (NEMA 3R)
WP	WEATHERPROOF
WPB	WHIRLPOOL BATH
WPF	WATERPROOF
WPFG	WATERPROOFING
WR	WASTE RECEPTACLE
WR	WATER RESISTANT
WSHP	WATER SOURCE HEAT PUMP
WSP	WET STAND PIPE
WT	WEIGHT
WW	WARM WHITE
WWF	WELDED WIRE FABRIC
XFMR	TRANSFORMER
XMTR	TRANSMITTER
YD	YARD
YH	YARD HYDRANT
Z	IMPEDANCE
ZCB	ZONE CONTROL BOX
ZCV	ZONE CONTROL VALVE
ZVB	ZONE VALVE BOX

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LICENSED PROFESSIONAL ENGINEER

HAFT THEATER - INTERIOR RENOVATIONS
57-23140-00
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NEW YORK, NY 10001

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#3 01/23/25

57-23140-00

PLUMBING ABBREVIATIONS

P.002.00

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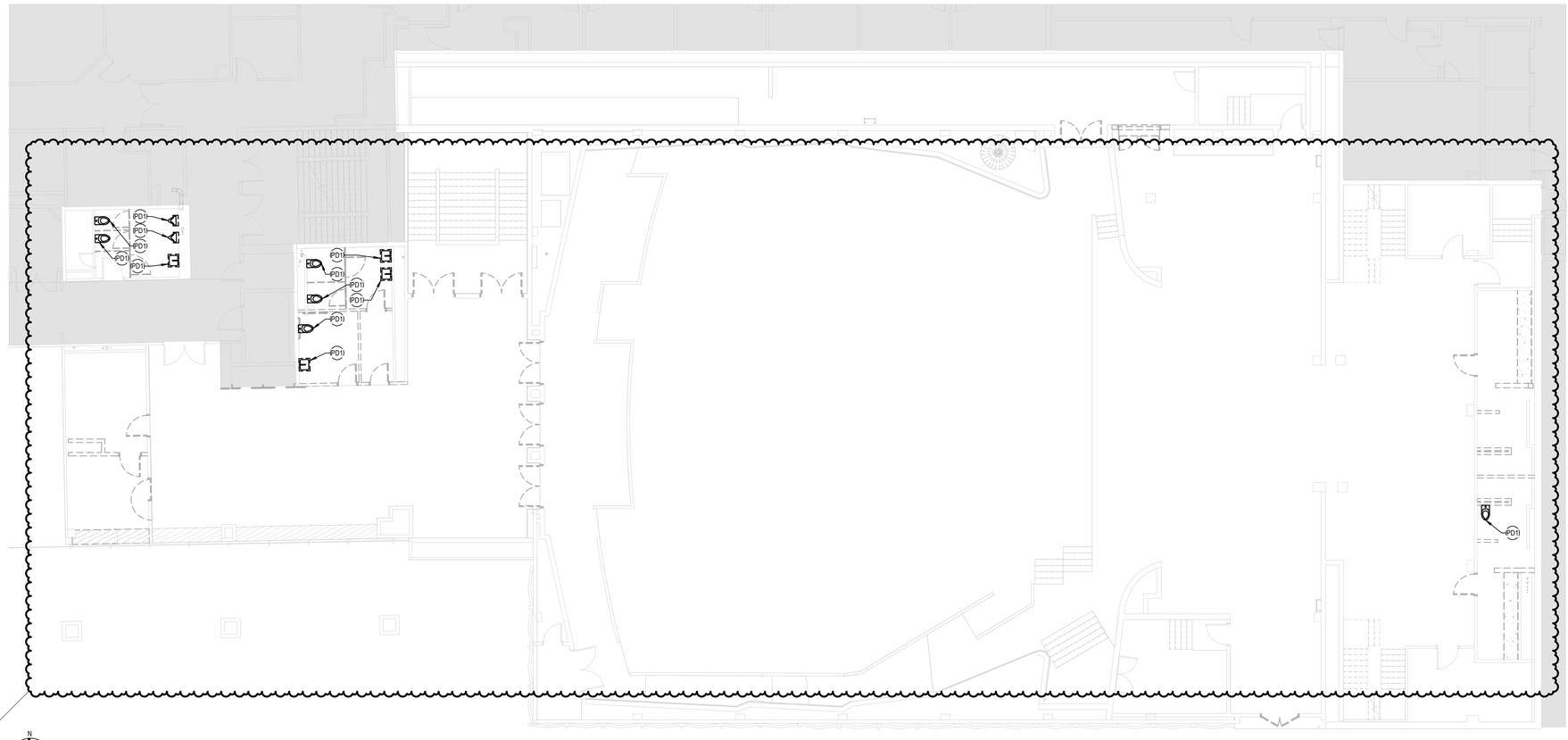
FIRST FLOOR - PLUMBING DEMOLITION PLAN
SCALE: 1/8" = 1'-0"



SECOND FLOOR - PLUMBING DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

SHEET NOTES

PD1 DEMO EXISTING PLUMBING FIXTURE. PREPARE PIPING FOR NEW CONNECTIONS. SEE NEW WORK PLAN FOR EXTENT OF NEW PIPING.

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LEVEL 01 AND 02 - PLUMBING DEMOLITION PLAN

PD.101.00

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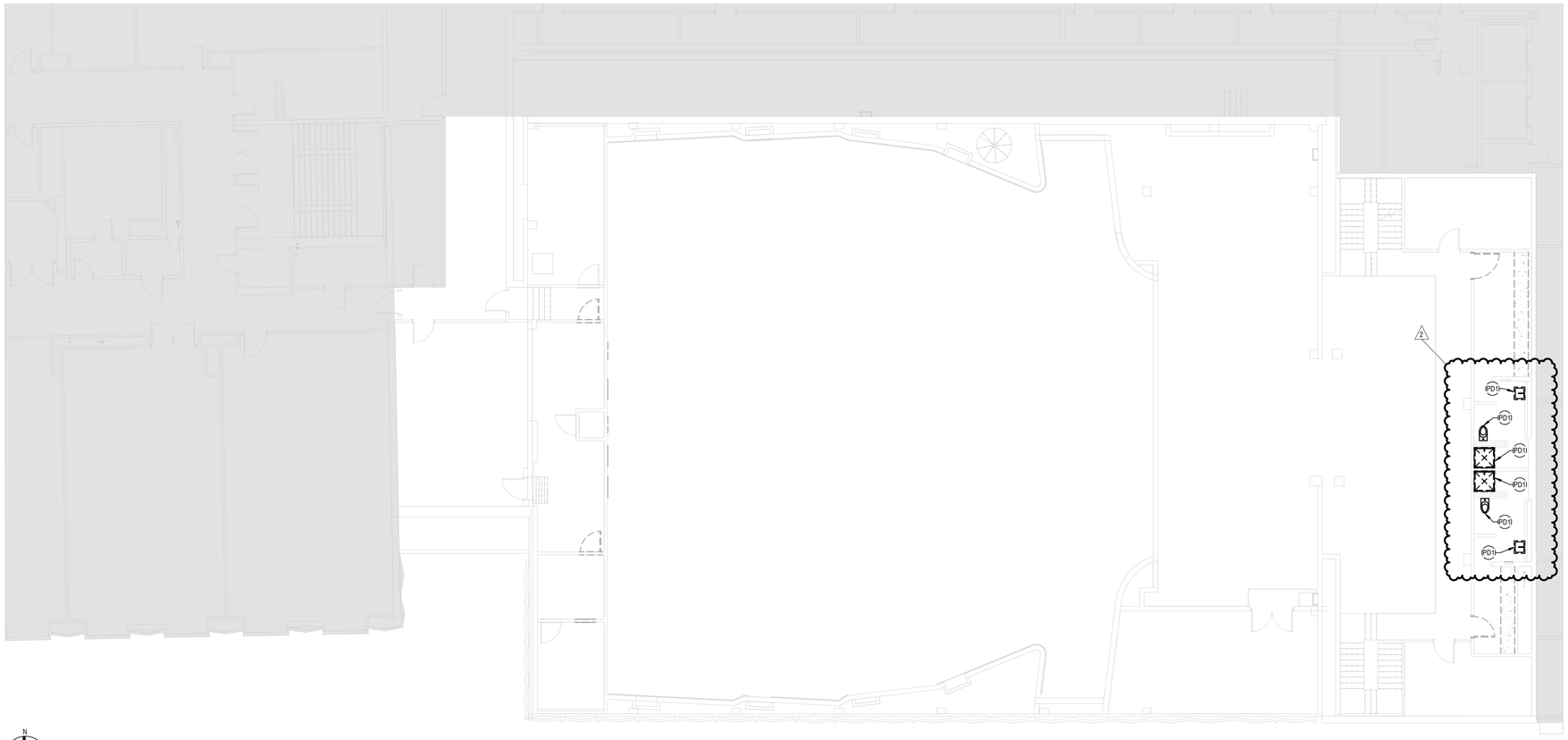

THIRD FLOOR - PLUMBING DEMOLITION PLAN

SCALE: 1/8" = 1'-0"

SHEET NOTES

PD1 DEMO EXISTING PLUMBING FIXTURE. PREPARE PIPING FOR NEW CONNECTIONS. SEE NEW WORK PLAN FOR EXTENT OF NEW PIPING.

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LEVEL 03 AND MEZZANINE - PLUMBING DEMOLITION PLAN

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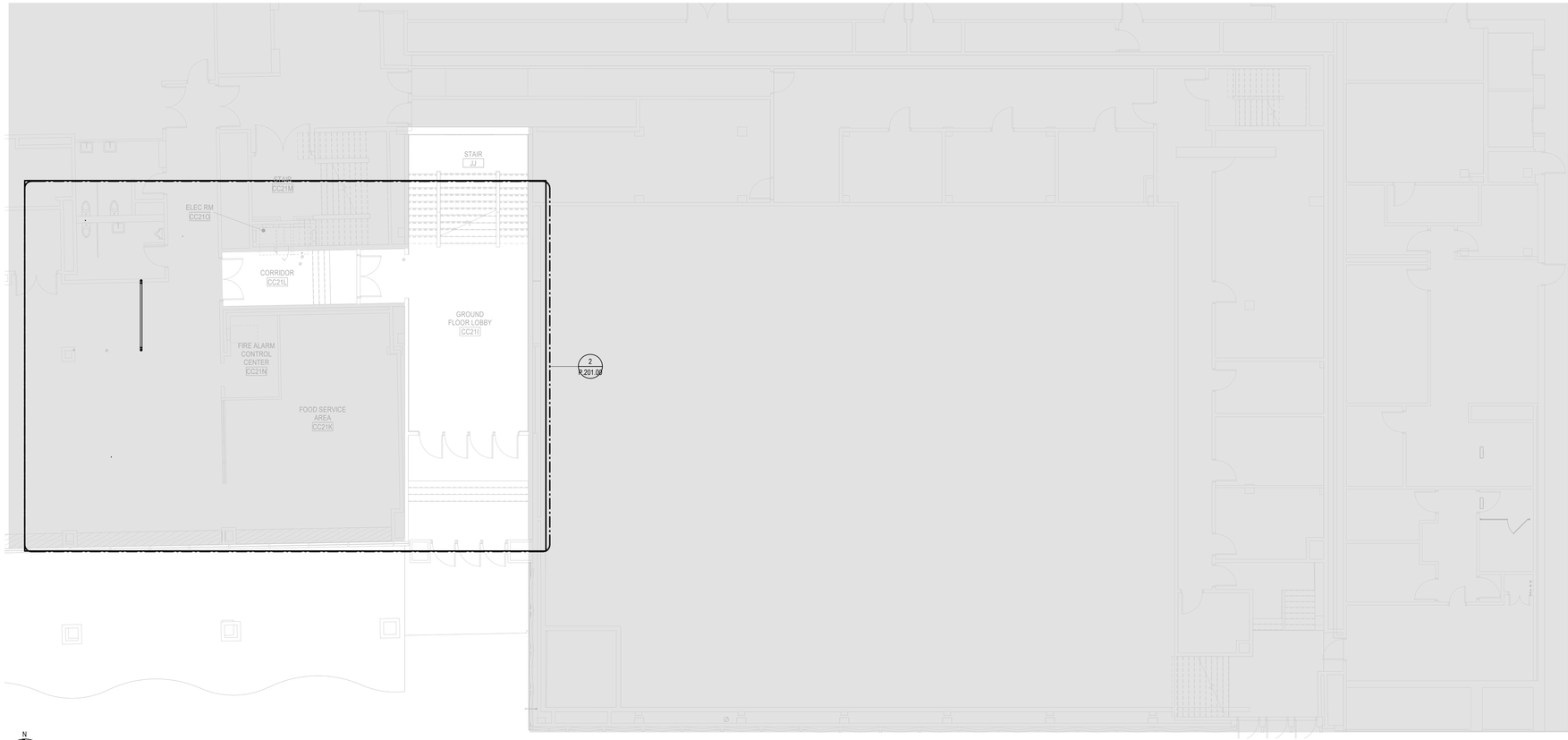

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FIRST FLOOR - PLUMBING PLAN

SCALE: 1/8" = 1'-0"

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LEVEL 01 - PLUMBING PLAN

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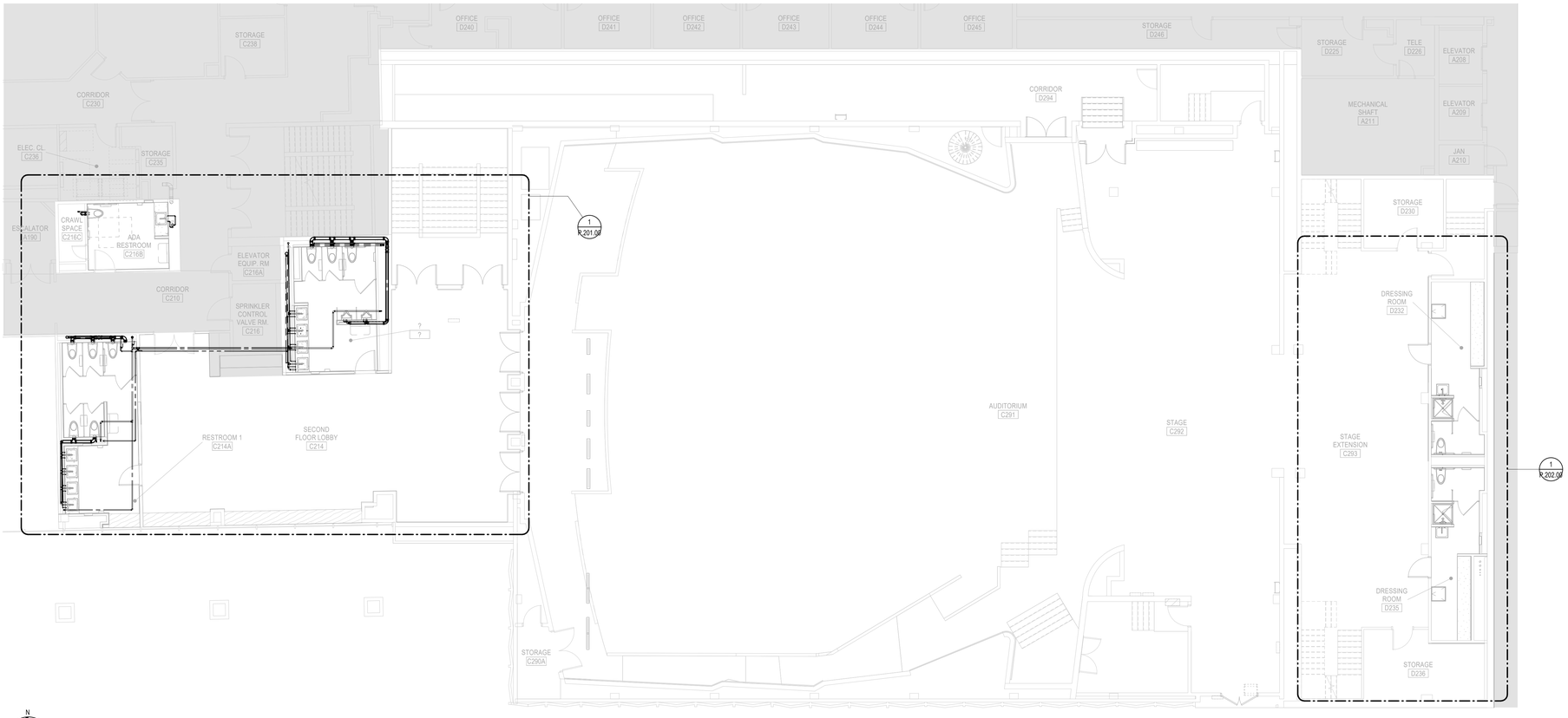

SECOND FLOOR - PLUMBING PLAN

SCALE: 1/8" = 1'-0"

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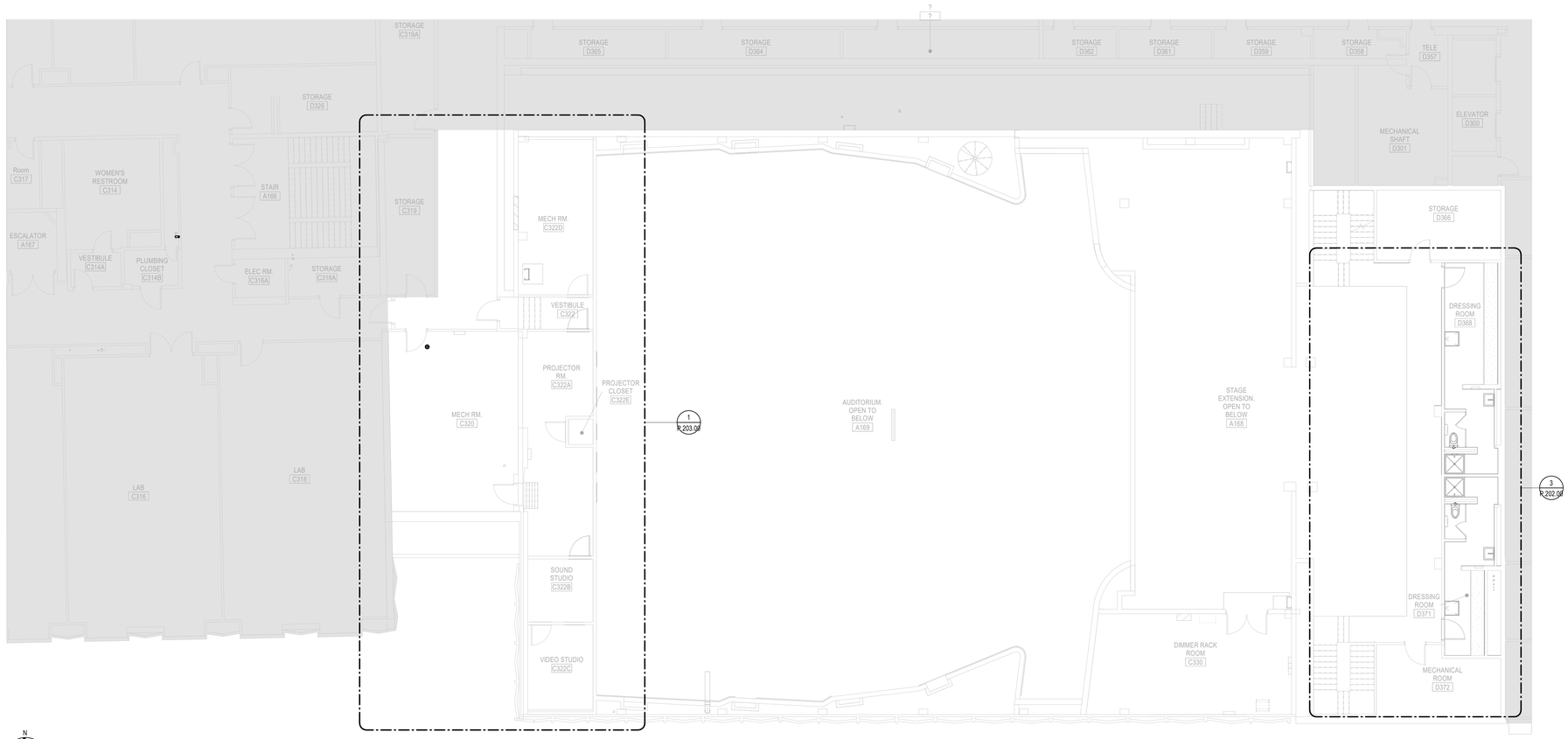

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THIRD FLOOR - PLUMBING PLAN

SCALE: 1/8" = 1'-0"

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LEVEL 03 - PLUMBING PLAN

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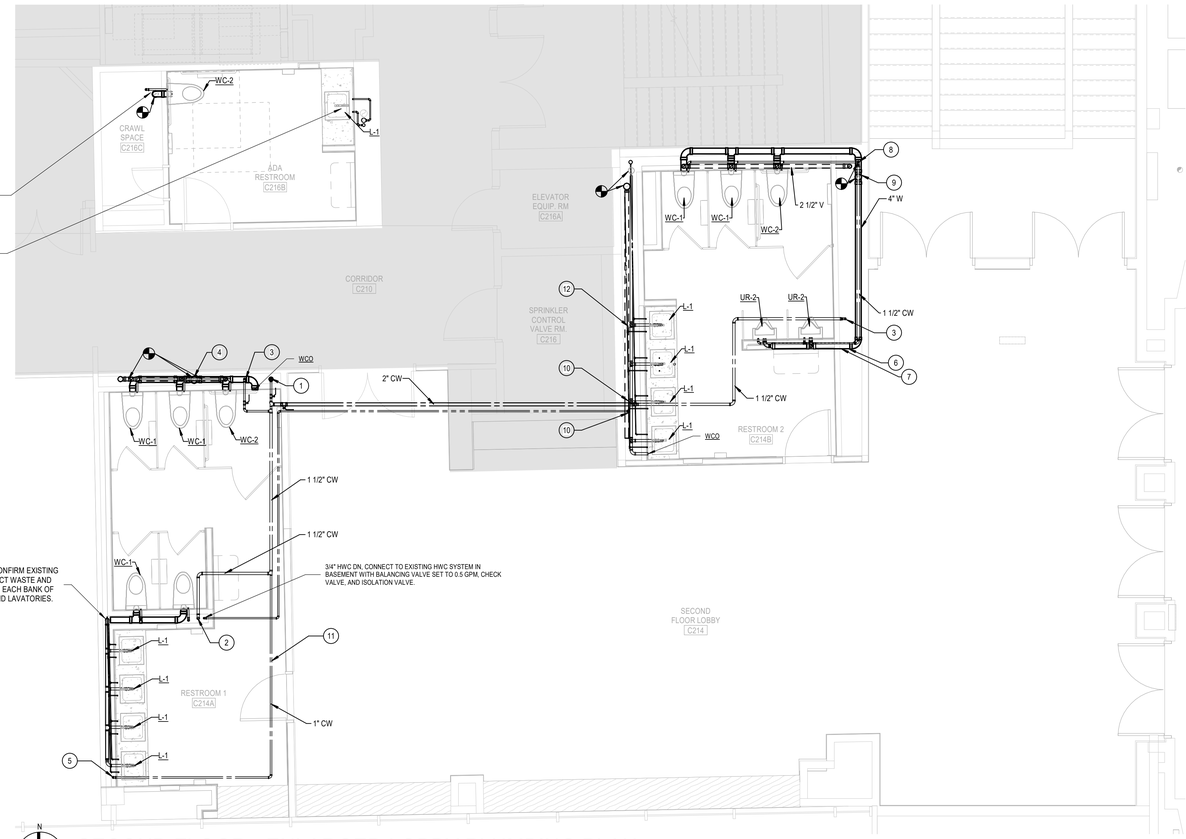
FIRST FLOOR - ENLARGED PLUMBING PLAN

SCALE: 1/4" = 1'-0"



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SECOND FLOOR - ENLARGED LOBBY PLUMBING PLAN

SCALE: 1/4" = 1'-0"

SHEET NOTES

1. 2-1/2" CW DN TO CELLAR. CONTRACTOR TO OFFSET AS NECESSARY IN CEILING OF LEVEL ONE AND FIND WALL TO GET TO CELLAR. CONTRACTOR TO FIELD VERIFY EXACT LOCATION OF 4" CW MAIN IN CELLAR AND CONNECT THIS BRANCH TO THE 4" CW MAIN WITH AN ISOLATION VALVE.
2. 1-1/4" CW DN TO SERVE BOTH WC'S IN CHASE. PROVIDE WATER HAMMER ARRESTOR AT END OF RUN AND STUB TO EACH FIXTURE.
3. 1-1/2" CW DN TO SERVE WC'S IN CHASE. PROVIDE WATER HAMMER ARRESTOR AT END OF RUN AND STUB TO EACH FIXTURE.
4. COLLECT EACH WATER CLOSET AND ROUTE TO THE EXISTING 4" SOIL STACK. COLLECT THE VENT FROM EACH WATER CLOSET TO A SINGLE 2-1/2" V PIPE AND CONNECT TO THE EXISTING 3" V STACK AT WEST OF CHASE.
5. 1" CW DN IN CHASE TO HEADER AND SERVE ALL LAVATORIES THIS WALL. PROVIDE CONNECTION AT EACH FIXTURE.
6. COLLECT EACH URINAL AND ROUTE TO THE EXISTING 4" SOIL STACK. COMBINE ALL LAVATORIES ALONG WALL TO A SINGLE WASTE DRAIN AND CONNECT TO SAME 4" SOIL STACK. COLLECT THE VENT FROM EACH URINAL TO A SINGLE 2-1/2" V PIPE AND CONNECT TO THE EXISTING 4" V STACK AT NORTH OF CHASE.
7. CONNECT 3 URINALS TO EXISTING CW RISER IN CHASE, PROVIDE A FULL SIZE HEADER TO LAST FIXTURE WITH WATER HAMMER ARRESTOR AND END OF RUN.
8. CONNECT 3 WATER CLOSETS TO EXISTING CW RISER IN CHASE. PROVIDE A FULL SIZE HEADER TO LAST FIXTURE WITH WATER HAMMER ARRESTOR AND END OF RUN.
9. COLLECT EACH WATER CLOSET AND ROUTE TO THE EXISTING 4" SOIL STACK. COLLECT THE VENT FROM EACH WATER CLOSET TO A SINGLE 2-1/2" V PIPE AND CONNECT TO THE EXISTING 4" V STACK AT EAST OF CHASE.
10. 1" CW DN IN CHASE. ROUTE TO EACH LAVATORY. CONNECT EACH LAVATORY TO HW RISER AT NORTH END OF CHASE WITH A 1" HEADER. ROUTE NEW HWC LINE TO CONNECT TO EXISTING HWC SYSTEM.
11. CONTRACTOR TO FIELD VERIFY EXISTENCE OF 3/4" H.W.R. PIPE DOWN AND RELOCATE TO NEW ADJACENT CHASE IF THE PIPE EXISTS.
12. COLLECT EACH LAVATORY TO A SINGLE WASTE DRAIN AND CONNECT TO EXISTING 4" WASTE STACK AT NORTH END OF CHASE. COLLECT EAXH LAVATORY'S VENT TO A SINGLE 2" V PIPE IN CHASE AND ROUTE TO CONNECT TO EXISTING VENT STACK AT NORTH END OF CHASE.

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LICENSED PROFESSIONAL ENGINEER

HAFT THEATER - INTERIOR RENOVATIONS

57-23140-00

343 WEST 27TH STREET
NEW YORK, NY 10001

ISSUE FOR ADDENDUM #3-C1651
01.23.25

REVISIONS
#3 01/23/25

57-23140-00

ENLARGED PLUMBING PLANS - 1ST AND 2ND FLOOR LOBBY

P.201.00

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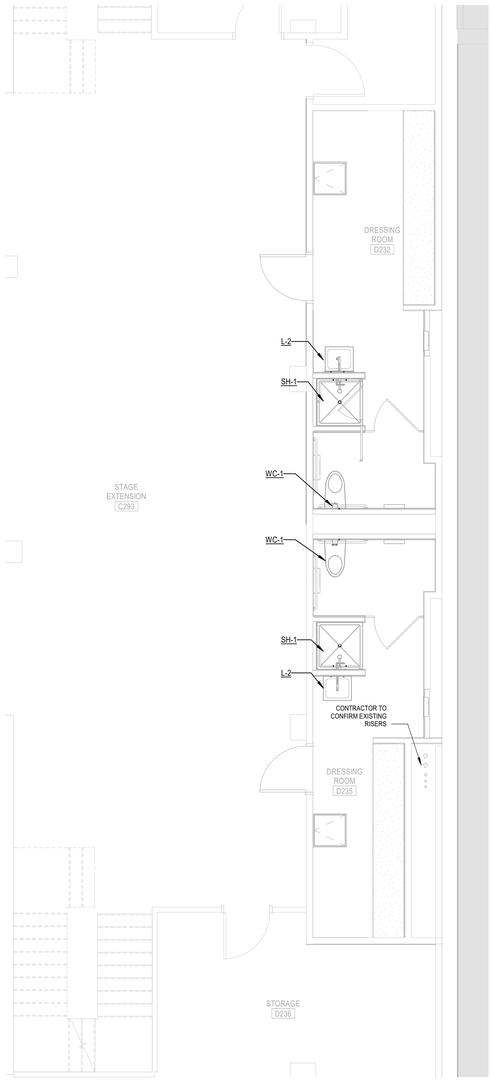

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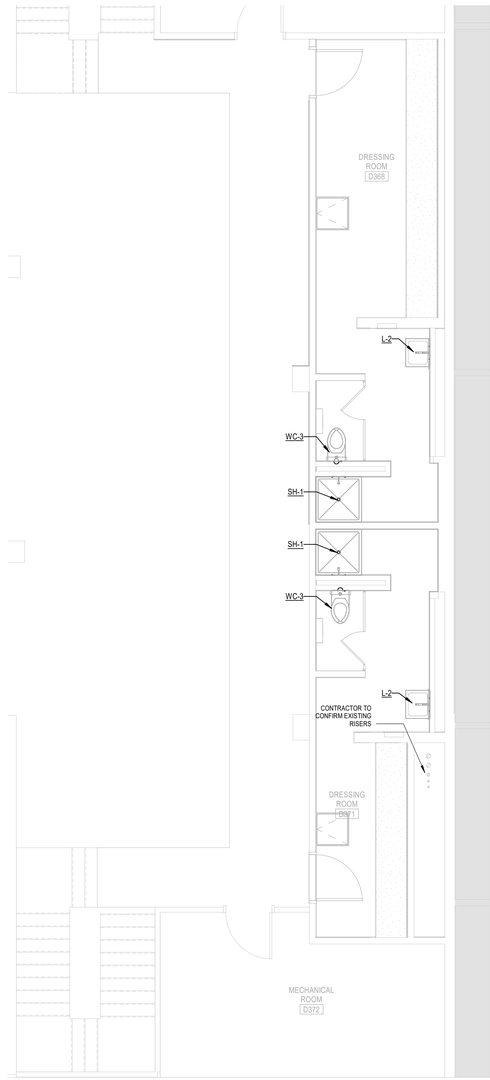
SECOND FLOOR - ENLARGED DRESSING ROOMS PLUMBING

SCALE: 1/4" = 1'-0"



N

THIRD FLOOR - ENLARGED DRESSING ROOMS PLUMBING

SCALE: 1/4" = 1'-0"

2

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ENLARGED PLUMBING PLANS - 1ST, 2ND AND 3RD FLOOR DRESSING ROOMS

P.202.00

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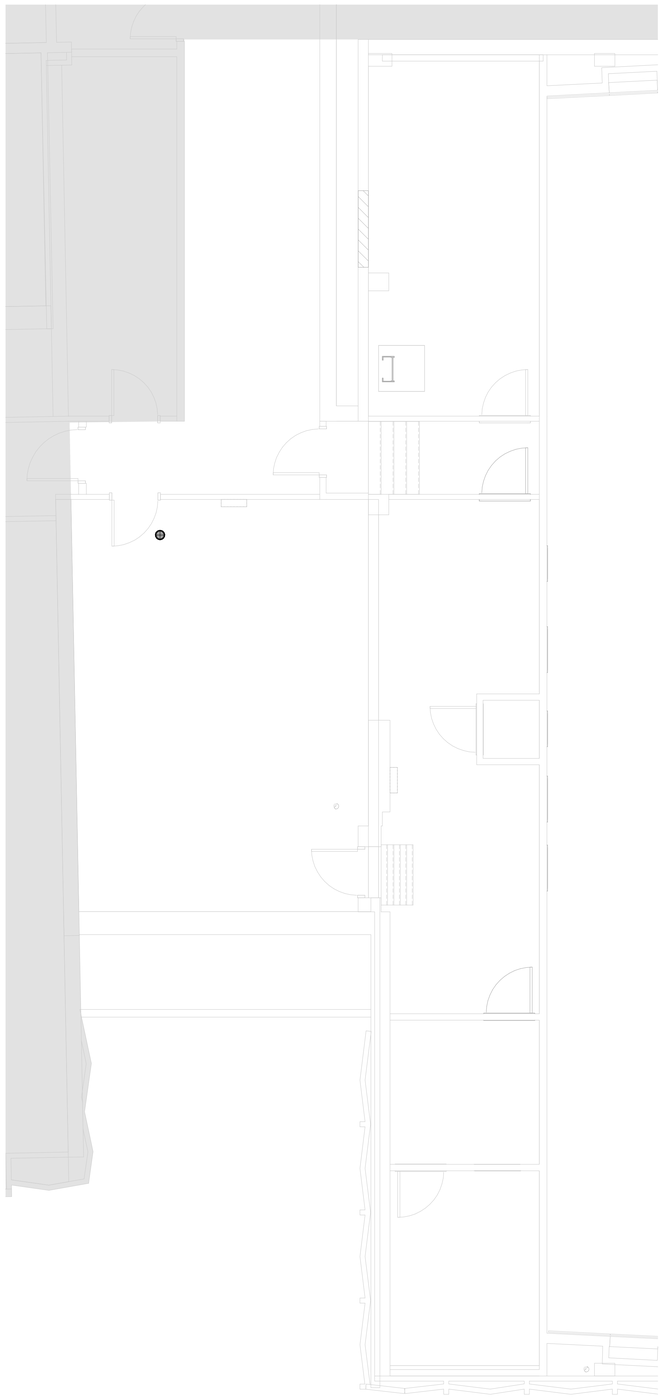

THIRD FLOOR - ENLARGED AV/IT ROOMS PLUMBING

SCALE: 1/4" = 1'-0"

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ENLARGED PLUMBING PLANS - 3RD FLOOR AV ROOMS

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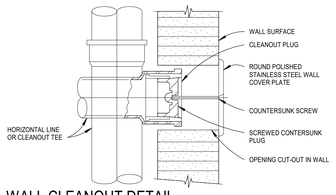
DOMESTIC FIXTURE SCHEDULE

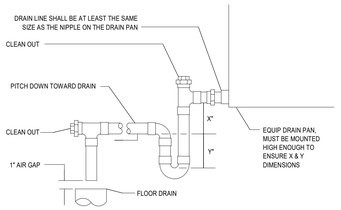
NOTES:
1.
2.
3.
4.
5.

ID	DESCRIPTION	QTY	MATERIAL DESCRIPTION	FINISH	TRIM				FLOW FIXTURE					FLUSH FIXTURE		PIPE CONNECTION SIZE (IN)							SPECIFICATION	BASIS OF DESIGN		NOTES
											WATER TEMP (°F)					WASTE			WATER							
					MANUFACTURER	MODEL	TYPE	MOTION SENSOR CONTROL	WATER FLOW (GPM)	TIMER DURATION (SEC)	COLD	HOT	MAX MIXED	VOL PER FLUSH (GAL)	MIN VOL PER FLUSH (GAL)	PRIMARY	AUX	INDIRECT	VENT	COLD	HOT	GAS		MANUFACTURER	MODEL	
L-1	LAVATORY - UNDERMOUNT	9	STAINLESS STEEL	STAINLESS STEEL	KOHLER	K-103BB76-SBNA-BN	ELECTRONIC	Yes	0.5	30	40	120	105			1-1/2"			1-1/2"	1/2"	1/2"		UNDERMOUNT LAVATORY WITH OVERFLOW. TOUCHLESS SINGLE-HOLE LAVATORY FAUCET, AC POWERED, BRUSHED NICKLE FINISH	ELKAY	ELUH12LV	
L-2	LAVATORY - WALL HUNG	4	WHITE VITREOUS CHINA	WHITE	KOHLER	K-103BB76-SBNA-BN	ELECTRONIC	Yes	0.5	30	40	120	105			1-1/2"			1-1/2"	1/2"	1/2"		WALL HUNG LAVATORY.TOUCHLESS SINGLE-HOLE LAVATORY FAUCET, AC POWERED, BRUSHED NICKLE FINISH	KOHLER	GREENWICH K-2031	
SH-1	SHOWER STALL	4					MANUAL	No	1	300	40	120	105			2"			1-1/2"	1/2"	1/2"		SINGLE THRESHOLD ADA SHOWER BASE WITH CENTER DRAIN	AMERICAN STANDARD	3838AM-FCOL 218	
UR-2	URINAL	2	WHITE VITREOUS CHINA	WHITE	MOEN	8316	ELECTRONIC	Yes			40		40	0.125	0.125	2"			1-1/2"	3/4"			WALL HUNG URINAL WITH WASHOUT ACTION, TOP SIZE 14" WITH EXTENDED RIM. BATTERY POWERED, SENSOR ACTIVATED FLUSHOMETER. MOUNT AT ADA HEIGHT.	KOHLER	BARDON K-4991-ET	
WC-1	WATER CLOSET - WALL HUNG	10	WHITE VITREOUS CHINA	WHITE	MOEN	8311	ELECTRONIC	Yes			40		40	1.28	1.28	4"			2"	1"			ELONGATED WALL HUNG WATER CLOSET, 1-1/2" TOP SPUD. BATTERY POWERED SENSOR ACTIVATED FLUSHOMETER.	KOHLER	KINGSTON K-4325	
WC-2	WATER CLOSET - WALL HUNG	3	WHITE VITREOUS CHINA	WHITE	MOEN	8311	ELECTRONIC	Yes			40		40	1.28	1.28	4"			2"	1"			ELONGATED WALL HUNG WATER CLOSET, 1-1/2" TOP SPUD. BATTERY POWERED SENSOR ACTIVATED FLUSHOMETER. MOUNT AT ADA HEIGHT.	KOHLER	KINGSTON K-4325	
WC-3	WATER CLOSET - FLOOR MOUN	2	WHITE VITREOUS CHINA	WHITE	MOEN	8311	ELECTRONIC	Yes			40		40	1.28	1.28	4"			2"	1"			ELONGATED FLOOR MOUNTED WATER CLOSET, 1-1/2" TOP SPUD, WITH CHURCH 295CT ELONGATED OPEN FRONT SEAT. SOLAR POWERED SENSOR ACTIVATED FLUSHOMETER.	KOHLER	KINGSTON K-25076-0	

2

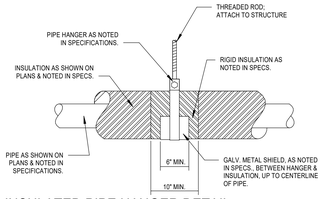


1 P.600.00 WALL CLEANOUT DETAIL
NO SCALE

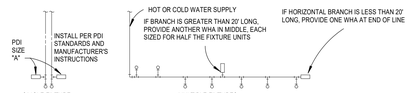


NSP = NEGATIVE STATIC PRESSURE IN DRAIN PAN
X" = 1" + SP
Y" = 1.5 x SP

2 P.600.00 CONDENSATE DRAIN P-TRAP DETAIL
NO SCALE



3 P.600.00 INSULATED PIPE HANGER DETAIL
NO SCALE



SINGLE FIXTURE

PDI SIZE	PIPE SIZE	FIXTURE UNIT LOAD
A	1/2"	1-11
B	3/4"	12-32
C	1"	33-60
D	1-1/4"	61-113
E	1-1/2"	114-154
F	2"	154-330

MULTIPLE FIXTURES

FIXTURE UNIT TABULATION		
FIXTURE	COLD	HOT
VALVE WATER CLOSET	10	--
TANK WATER CLOSET	5	--
URINAL	5	--
LAVATORY/SINK	1.5	1.5
JANITOR'S SINK	3	3
SHOWER/BATHTUB	2	2

INSTALL WATER HAMMER ARRESTERS IN WATER PIPING ACCORDING TO PDI-WH 201. INSTALL IN HORIZONTAL OR VERTICAL POSITION, BUT NEVER UPSIDE DOWN. INSTALL IN LINE WITH WATER FLOW DIRECTION IF POSSIBLE. SIZE THE UNITS AS SHOWN IN PDI-WH 201 OR PER THE TABLES SHOWN ABOVE.
PROVIDE WHA ON HW/CW FOR ALL TOILET GROUPS AND CLOTHES WASHERS.

4 P.600.00 WATER HAMMER ARRESTOR DETAIL
NO SCALE

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PLUMBING SCHEDULES AND DETAILS

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