FASHION INSTITUTE OF TECHNOLOGY
THE MUSEUM AT FIT
HISTORY GALLERY RENOVATION
INVITATION FOR BID NUMBER C1746

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SECTION I:
NOTICE TO BIDDERS

SECTION I: NOTICE TO BIDDERS

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

FIT is **ONLY** accepting electronic scanned bids for the subject project. You must email your bid to purchasingbids@fitnyc.edu in PDF format and it should include all the requested documents (See Attachment A – Bid Checklist) including a scanned image of your bid security (Certified Check of 2 percent or Bid Bond of 10 percent of your total bid price), we'll also need you to mail us the original copy of the bid security to have on file. The bid security must either be mailed to 227 W 27th Street, New York, NY 10001 or dropped off at 333 7th Avenue (16th Floor), New York, NY 10001. Bids must be received by **May 29, 2026, on or before 12:00 P.M**. All bidders will be notified of the bid results by the end of day of the bid due date. Bid results are not official until each package has been fully reviewed.

ATTACHMENT A - BID CHECKLIST

FASHION INSTITUTE OF TECHNOLOGY
THE MUSEUM AT FIT
HISTORY GALLERY RENOVATION
INVITATION FOR BID NUMBER C1746

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

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

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

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

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

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

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

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

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

☐ Did you include the Bid Security?

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

☐ 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. Did you include the certificate with your bid?

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

☐ Sub-contracting percentage shall **not exceed 50%** of the project cost.

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

ATTACHMENT B - CONTRACTOR REFERENCE SHEET
FASHION INSTITUTE OF TECHNOLOGY
THE MUSEUM AT FIT
HISTORY GALLERY RENOVATION
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FIT requests a minimum of three references for **completed** projects of similar size and scope. Please complete the following information for each reference: **(Do not list FIT as your projects of similar size and scope.)**

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

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

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

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

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

FIT

Interviewer: _____ Signature: _____Date: _____

SECTION II:
BID TERMS AND CONDITIONS

SECTION II. BID TERMS AND CONDITIONS

SPECIFICATIONS FOR
FASHION INSTITUTE OF TECHNOLOGY
THE MUSEUM AT FIT
HISTORY GALLERY RENOVATION
INVITATION FOR BID NUMBER C1746

I. INTRODUCTION

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

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

II. SUMMARY OF SCOPE OF WORK

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

Project Description**:** Provide labor, materials, tests, tools and equipment to complete the Renovation of FIT Museum's History Gallery on the First Floor of the Goodman Center. The work includes related mechanical, electrical, general construction, fire suppression and fire alarm work, selected portions of work on other floors (sub-basement, & Basement) having to do with Mechanical, Electrical & Plumbing infrastructure in support of interior renovations. Contractor to schedule and work with FIT's On-Call IT, Fire Alarm, and Security Devices & Wiring Contractor. Contractor shall be responsible for providing

all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, as per attached specifications and drawings. Contractor may begin survey and procurement of materials immediately following award.

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

III. BIDDER REQUIREMENTS

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

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

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

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

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

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

F. Bidder shall submit documentation of financial viability, including balance

sheets and profit and loss statement for the prior two (2) years, with the Bid.

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

IV. APPROVAL OF SUBCONTRACTORS

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

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

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

V. BID SECURITY

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

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

VI. PRE-BID SITE INSPECTION AND QUESTIONS

A **mandatory** Pre-Bid Site Inspection for prospective Bidders will be held on **May 5, 2026 at 11:00 A.M.** at the Fashion Institute of Technology, Feldman Building "C Building" Lobby, located at 27th Street (between 7th and 8th Avenues). **(If this bid is a rebid and you attended the original mandatory walkthrough, you are still required to attend the mandatory rebid walkthrough to remain eligible to bid.) Failure to attend shall be grounds for rejection of your Bid. Please also bring a business card.**

Bidder shall examine the Bid documents carefully. Before bidding, Bidder shall make any requests for interpretation of Bid documents or clarification of any ambiguity therein that should have been detected by a reasonably prudent Bidder. Questions shall be submitted in writing to the attention of Purchasing Department via email: purchasingbids@fitnyc.edu, no later than **May 11, 2026 on or before 3:00 P.M**. Answers shall be provided in the form of an Addendum and be posted on the FIT purchasing department website. Reference Bid number **C1746.**

VII. BID DESIGNATION

A. FIT is **ONLY** accepting electronic scanned bids for the subject project. You must email your bid to purchasingbids@fitnyc.edu in PDF format and it should include all the requested documents (See Attachment A – Bid Checklist) including a scanned image of your bid security (Certified Check of 2 percent or Bid Bond of 10 percent of your total bid price), we'll also need you to mail us the original copy of the bid security to have on file. The bid security must either be mailed to 227 W 27th Street, New York, NY 10001 or dropped off at 333 7th Avenue (16th Floor), New York, NY 10001. Bids must be received by **May 29, 2026 on or before 12:00 P.M**. All bidders will be notified of the bid results by the end of day of the bid due date. Bid results are not official until each package has been fully reviewed.

B. Bids received late will not be considered.

VIII. PREPARATION OF THE BIDS

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

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

C. FIT may reject any bid not prepared and submitted in accordance with the provisions of the Notice to Bidders, Bid Terms and Conditions, and Contract Terms and Conditions. Neither FIT nor the FIT Student Housing Corporation will be responsible for receipt of any Bid which does not comply with these instructions.

Only those Bids emailed to the FIT Purchasing Dept. inbox (purchasingbids@fitnyc.edu) on or before **May 29, 2026, on or before 12:00 PM** will be considered.

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

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

IX. AWARD OF CONTRACT

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

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

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

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

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

X. DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

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

XI. PREVAILING WAGE

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

condition of payment.

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

A copy of the prevailing wage schedule, for New York County, can be found at the New York State Department of Labor website. (PRC# **2026009147)**

www.labor.ny.gov

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

XII. M/WBE AND SDVOB

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

XIII. MISCELLANEOUS

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

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

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

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

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

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

SECTION III:
CONTRACT TERMS AND CONDITIONS

SECTION III. CONTRACT TERMS AND CONDITIONS

I. COMPLIANCE REQUIREMENTS

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

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

NONE

THE WORK:

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

WORKMANSHIP:

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

ON-SITE VERIFICATION:

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

COORDINATION OF THE WORK:

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

WORK HOURS:

Regular work hours are from **7:00 am to 5:00 pm, Monday through Friday. Note that the Special Exhibitions Gallery below is closed on Mondays and Tuesdays.** Access to the site on OFF hours including Saturday and Sunday must be coordinated in advance with FIT. **All the demolition work and any *noisy* work, such as but not limited to: rigging of the equipment or material to the roof, performing work on the exterior of the building (roof, façade), and crane installation shall be done during OFF hours.** Contractor will have reasonable access to the site in order to complete the work in the given time frame. Contractor shall comply with FIT's additional work rules related to such extended access. All labor costs required to meet this deadline are the sole responsibility of the

Contractor and shall be included in the contract price. FIT reserves the right to put the work on hold for any reason as many as three (3) occasions during the course of construction for a total duration of not more than 20 workdays.

PERFORMANCE AND PAYMENT BONDS

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

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

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

CONFLICTS, ERRORS AND OMISSIONS:

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

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

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

MANUFACTURER'S PRODUCTS AND FABRICATIONS:

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

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

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

DELIVERY AND STORAGE OF MATERIALS:

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

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

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

PROJECT SCHEDULE:

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

2. Time is of the essence. Contractor shall be required to commence work of **The Museum of FIT History Gallery Renovation w**ithin five (5) working days of receipt of a Notice to Proceed from FIT. The shop drawings process and ordering need to proceed first. Work shall commence on or about **June 15, 2026**. **The project shall be Substantially Completed no later than December 31, 2026.** Contractor must be de-mobilized and leave the job site on the ending date of work period. Only close- out, administrative tasks may continue beyond the closing date. Unless otherwise specified, the work is to be performed solely between the hours of **7:00 A.M. to 5:00 P.M.,** Monday through Friday, legal and union holidays excluded. All labor costs encountered to meet this deadline are the sole responsibility of the Contractor and shall be included in the Bid Price. FIT reserves the right, at no financial liability associated with the same, to put the Project work on hold for any reason on as many as three (3) occasions during the course of the construction for a total duration of not more than 20 workdays.

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

or the Facilities Department Designee.

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

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

PAYMENT:

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

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

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

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

LABOR HARMONY:

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

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

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

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

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

II. GENERAL NOTES

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

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

2. Contractor to determine coordination of trades.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

III. DEMOLITION NOTES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

14. Work is to conform to OSHA requirements.

IV. ADDITIONAL CONTRACTOR'S RESPONSIBILITIES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

13. Contractor may not store Hazardous Waste on site at any time. Contractor may not generate or accumulate Hazardous Waste on site without the written approval of FIT's Director of EHS Compliance. Contractor shall obtain FIT's Director of EHS Compliance approval at least ten (10) days before the Contractor generates or accumulates Hazardous Waste on site beginning with demolition work.

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

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

V. PERMITS

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

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

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

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

D. The Contractor shall be responsible for obtaining any other

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

VI. PROJECT MANAGER

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

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

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

   -the date

   -the number of workers at the site on said date

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

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

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

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

7. A full time supervisor is required.

VII. SUBMISSIONS AND SUBSTITUTIONS

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

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

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

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

VIII. PROGRESS PAYMENTS

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

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

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

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

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

6. No progress payments will be processed without submission by the Contractor

of properly executed Affidavit of Payment and Release of Liens (AIA Documents G706 and G706A or equivalent forms as may be requested by FIT), up-to-date weekly written reports and timeline in bar chart form, and all submittals, certificates, permits, etc. required pursuant to the terms of the contract.

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

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

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

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

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

IX. SITE VISITS BY ARCHITECT/ENGINEER

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

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

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

X. CHANGE ORDERS

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

Architect and Engineer and authorized by a representative of FIT.

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

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

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

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

XI. GUARANTEES

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

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

XII. FINAL PAYMENT

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

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

3. A Performance Bond and a Labor & Material Payment Bond, a copy of the "Contractor's Affidavit of Payment of Debts and Claims (AIA Document G706)" and "Consent of Surety to Final Payment (AIA Document G707)" shall be submitted by the Contractor prior to the release of final payment.

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

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

XIII. SUPPLEMENTAL CONDITIONS

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

XIV. PREVENTIVE MAINTENANCE SCHEDULE

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

BID ANALYSIS FORM FOLLOWS

ATTACHMENT C – BID ANALYSIS FORM
FASHION INSTITUTE OF TECHNOLOGY &
THE MUSEUM AT FIT HISTORY GALLERY RENOVATION
INVITATION FOR BID NUMBER C1746
NYS PREVAILING WAGE SCHEDULE PRC # 2026009147

BID BREAKDOWN

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

30	GENERAL REQUIREMENTS	$	$	$
31	GENERAL CONDITIONS	$	$	$

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

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

Contractor _____%, Subcontractor(s) _____%

For Bidding Purposes: the following sections pricing should cover the following items:
General Requirements: permits & licenses; project meetings; administrative overhead for submissions and shop drawings; progress photos; temporary facilities & controls; storage & protection of materials; project closeout; and project record documents.
General Conditions: supervision of work; all testing; coordination drawings; safety programs; insurance and performance & payment bonds.

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

Company Name and Address of Bidder:

_____

_____

_____

Signature of Bidder _____ Date_____

Printed Name and Title of Representative:_____

Telephone #:_____

Email Address: _____

EIN#:_____

IMPORTANT:
This bid analysis form is the **only** pricing format acceptable. Bidders **must** submit pricing using this form. **FIT will not accept bid responses on any other form.**
NOTE:
FIT will not sign any bidder generated contract, agreement or scope of work. FIT Bid and Terms and Conditions apply. Bidder requirement for FIT to sign any document will be grounds for rejection. Bidder inclusion of any conditions, clarifications, exceptions or changes which are not in compliance with FIT Bid and Terms and Conditions will be grounds for rejection.

SECTION IV.
GENERAL REQUIREMENTS

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01010 -- SUMMARY OF THE WORK

.01 - Work Under The Contract

The Work shall be as described in the Contract Documents.

.02 - Work by Others

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

.03 - Items Not Included

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

A. Items indicated "By Others".

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

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

.04 - Openings and Chases

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

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

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

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

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

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

.05 - Surveys and Layout

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

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

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

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

.06 - Scheduling

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

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

1. The Work shall not be delayed.

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

.07 - Contractor Use of Premises

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

01080 -- PERMITS AND COMPLIANCE

.01 - Permits and Licenses

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

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

.02 - Compliance

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

.03 - Additional Compliance

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

.04 - Royalties and Patents

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

01200 -- PROJECT MEETINGS

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

A. Coordinate the Work.

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

C. Review requisitions, proposals and change orders.

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

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

F. Review progress payments.

.02 - Initial Job Meeting (Orientation Meeting)

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

.03 - Job Progress Meetings

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

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

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

01300 -- SUBMITTALS

.01 - Schedules & Records

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

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

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

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

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

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

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

01311 – PROJECT ANALYSIS

.01 - Project Control and Progress Meetings

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

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

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

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

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

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

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

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

.02 – Payment

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

.03 - Time of Completion

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

01340 -- SHOP DRAWINGS AND SAMPLES

.01 - Contractor Submittal

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

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

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

1. Project title

2. Contract name

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

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

5. Name of person or firm preparing Shop Drawings

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

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

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

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

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

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

1. Project title

2. Contract name

3. Date of submission

4. Name and quality of the material

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

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

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

.02 - Contractor Review

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

.03 - Contractor Responsibility

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

.04 - Commencement of Work

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

01380 -- PROGRESS PHOTOGRAPHS

.01 - Contractor Submission

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

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

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

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

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

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

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

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

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

01500 -- TEMPORARY FACILITIES AND CONTROLS

.01 - Requirements

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

.02 - Temporary Lighting and Electric Service

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

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

.03 - Material Hoists

A. General

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

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

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

B. The Contractor shall:

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

2. Furnish all labor required for the Work.

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

A. The Contractor shall:

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

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

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

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

c. Leave such equipment in perfect condition.

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

.05- Temporary Enclosures

The Contractor shall:

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

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

.06 - Temporary Fence Enclosures

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

.07 - Maintenance of Permanent Roadways

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

.08 – Traffic Control

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

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

.09 - Fire Prevention Control

The Contractor Shall:

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

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

.10 - Pollution Control

The Contractor shall:

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

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

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

D. Refrain from burning trash or waste materials.

.11 - Temporary Field Office

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

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

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

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

B. The Contractor shall:

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

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

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

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

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

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

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

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

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

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

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

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

.12 - Rubbish Removal

A. The Contractor shall:

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

2. Clean all enclosed structures daily.

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

B. The Contractor shall conform with the following:

1. Burning of rubbish shall not be permitted.

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

.13 - Discontinuance, Changes and Removal

The Contractor shall:

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

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

.14 - Project Identification

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

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

.15 - Moisture and Condensation Control

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

.16 - Protective Services

The Contractor shall provide security services required by the Contract.

01600 -- MATERIAL AND EQUIPMENT

.01 - Storage and Protection

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

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

01700 -- PROJECT CLOSE OUT

.01 - Final Cleanup

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

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

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

.02 - Required Close Out Documentation

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

1. The Contractor's general guarantee.

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

3. All certificates obtained in connection with the Work.

4. All final photographs of the Work.

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

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

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

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

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

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

.03 - Orientation Instruction

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

.04 - Project Close Out Inspections

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

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

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

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

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

01720 -- PROJECT RECORD DOCUMENTS

.01 - Project Record Drawings

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

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

C. Project Record Requirements

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

(a) Approved changes in the Work.

(b) Location of underground Work and concealed Work.

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

(d) Any relocation of Work.

(e) All changed in dimensions.

(f) All access doors.

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

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

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

(b) Any change in floor elevations.

(c) Any structural changes.

(d) Any substitutions.

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

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

(g) All invert elevations of manholes.

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

(i) Any approved change order.

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

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

01740 -- WARRANTIES, GUARANTEES, AND BONDS

See the Contract Documents for details.

SECTION V.
GENERAL CONDITIONS

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ARTICLE 1 -- DEFINITIONS

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

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

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

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

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

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

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

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

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

Furnish - To deliver to the site ready for installation.

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 2 -- CONTRACT DOCUMENTS

Section 2.01 - Captions

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

Section 2.02 - Conflicting Conditions

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

Section 2.03 - Notice and Service Thereof

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

Section 2.04 - Nomenclature

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

Section 2.05 - Invalid Provisions

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

ARTICLE 3 -- INTERPRETATION OF CONTRACT DOCUMENTS

Section 3.01 – Owner/Architect

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

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

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

Section 3.02 - Meaning and Intent of Contract Documents

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

Section 3.03 - Order of Preference

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

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

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

ARTICLE 4 -- MATERIALS AND LABOR

Section 4.01 - Contractor's Obligations

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

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

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

Section 4.02 - Contractor's Title to Materials

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

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

Section 4.03 - "Or Equal" Clause

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

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

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

Section 4.04 - Quality, Quantity and Labeling

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

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

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

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

ARTICLE 5 -- CONTRACTOR

Section 5.01 - Supervision by Contractor

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

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

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

Section 5.02 - Representations of Contractor

The Contractor represents and warrants:

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

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

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

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

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

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

SECTION 5.03 – COPIES OF CONTRACT DOCUMENTS FOR CONTRACTORS

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

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

SECTION 5.04 - MEETINGS

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

SECTION 5.05 – RELATED WORK

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

SECTION 5.06 – ERRORS OR DISCREPANCIES

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

ARTICLE 6 -- SITE CONDITIONS

SECTION 6.01 – SUBSURFACE OR SITE CONDITIONS FOUND DIFFERENT

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

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

SECTION 6.02 – VERIFYING DIMENSIONS AND CONDITIONS

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

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

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

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

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

SECTION 6.03 - SURVEYS

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

ARTICLE 7 -- INSPECTION AND ACCEPTANCE

SECTION 7.01 – ACCESS TO THE WORK

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

SECTION 7.02 – NOTICE FOR TESTING

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

SECTION 7.03 – REEXAMINATION OF WORK

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

SECTION 7.04 – INSPECTION OF WORK

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

SECTION 7.05 – DEFECTIVE OR DAMAGED WORK

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

SECTION 7.06 - TESTING

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

SECTION 7.07 - ACCEPTANCE

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

ARTICLE 8 -- CHANGES IN THE WORK

SECTION 8.01 - CHANGES

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

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

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

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

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

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

   c. Materials

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

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

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

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

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

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

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

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

SECTION 8.02 – OVERHEAD AND PROFIT ALLOWANCE

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

Example A:

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

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

Example B:

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

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

Example C:

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

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

Example D:

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

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

Example E:

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

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

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

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

SECTION 8.02A – DEDUCT CHANGE ORDER

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

SECTION 8.03 – FORM OF CHANGE ORDERS

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

ARTICLE 9 -- TIME OF COMPLETION

SECTION 9.01 – TIME OF COMPLETION

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

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

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

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

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

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

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

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

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

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

1. all of the Work, or

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

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

ARTICLE 10 -- TERMINATION OR SUSPENSION

SECTION 10.01 – TERMINATION FOR CAUSE

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

SECTION 10.02 – TERMINATION FOR CONVENIENCE OF OWNER

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

SECTION 10.03 – OWNER’S RIGHT TO DO WORK

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

SECTION 10.04 – SUSPENSION OF WORK

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

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

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

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

ARTICLE 11 -- DISPUTES

SECTION 11.01 – CLAIMS FOR EXTRA WORK

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

1. Promptly comply with said order.

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

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

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

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

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

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

SECTION 11.02 – CLAIMS FOR DELAY

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

SECTION 11.03 – FINALITY OF DECISIONS

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

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

ARTICLE 12 -- SUBCONTRACTS

SECTION 12.01 – SUBCONTRACTING

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

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

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

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

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

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

ARTICLE 13 -- CONTRACT COORDINATION AND COOPERATION

SECTION 13.01 – COOPERATION WITH OTHER CONTRACTORS

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

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

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

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

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

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

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

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

SECTION 13.02 – SEPARATE CONTRACTS

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

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

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

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

SECTION 13.03 – COORDINATED COMPOSITE DRAWINGS

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

ARTICLE 14 -- PROTECTION OF RIGHTS, PERSONS AND PROPERTY

SECTION 14.01 – ACCIDENT PREVENTION

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

SECTION 14.02 – SAFETY PROGRAMS

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

SECTION 14.03 – PROTECTION OF WORK AND PROPERTY

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

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

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

SECTION 14.04 – ADJOINING PROPERTY

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

SECTION 14.05 – RISKS ASSUMED BY THE CONTRACTOR

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

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

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

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

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

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

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

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

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

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

ARTICLE 15--INSURANCE AND CONTRACT SECURITY

SECTION 15.01 – INSURANCE PROVIDED BY CONTRACTOR

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

The Contractor shall provide insurance as follows:

1. Workers' Compensation and Employers Liability Insurance

    a. Statutory Workers' Compensation (including occupational disease)

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

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

Coverage shall provide and encompass the following:

a. Written on an occurrence form;

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

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

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

4. Umbrella/excess liability insurance with limits of:

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

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

Certificates shall be forwarded to Owner in care of: Purchasing

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

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

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

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

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

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

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

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

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

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

SECTION 15.01A – OTHER INSURANCE PROVIDED BY CONTRACTOR

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

SECTION 15.02 – GENERAL CONFORMANCE

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

SECTION 15.03 – CONTRACT SECURITY

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

SECTION 15.04 – ADDITIONAL OR SUBSTITUTE BOND

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

SECTION 15.05 – FAILURE TO COMPLY WITH PROVISIONS OF ARTICLE 15

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

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

SECTION 16.01 – OCCUPANCY PRIOR TO ACCEPTANCE

NOT APPLICABLE

ARTICLE 17 -- PAYMENT

SECTION 17.01 – PROVISION FOR PAYMENT

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SECTION 17.03 – RELEASE AND CONSENT OF SURETY

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

SECTION 17.04 - LIENS

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

SECTION 17.05 – WITHHOLDING OF PAYMENTS

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

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

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

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

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

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

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

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

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

SECTION 17.07 – FALSE STATEMENTS/INFORMATION

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

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

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

ARTICLE 18 -- TAX EXEMPTION

SECTION 18.01 – TAX EXEMPTION

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

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

ARTICLE 19 -- GUARANTEE

SECTION 19.01 - GUARANTEE

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

ARTICLE 20 -- STANDARD PROVISIONS

SECTION 20.01 – PROVISIONS REQUIRED BY LAW DEEMED INSERTED

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

SECTION 20.02 – COMPLIANCE WITH LAWS, RULES AND REGULATIONS

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

SECTION 20.03 – LAW GOVERNING THE CONTRACT

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

SECTION 20.04 - ASSIGNMENT

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

SECTION 20.05 – NO THIRD PARTY RIGHTS

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

SECTION 20.06 – CONTRACT DEEMED EXECUTORY

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

SECTION 20.07 – ANTI-RIOT PROVISIONS

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

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

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

SECTION 20.08 – DOMESTIC STEEL

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

SECTION 20.09 – PROTECTION OF LIVES AND HEALTH

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

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

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

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

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

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

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

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

SECTION 20.10 – PROHIBITED INTERESTS / ETHICAL CONDUCT

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

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

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

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

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

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

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

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

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

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

SECTION 20.11 – STATE AND FEDERAL LABOR LAW PROVISIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

H. The Contractor specifically agrees:

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

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

SECTION 20.12 - NONDISCRIMINATION

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

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

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

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

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

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

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

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

SECTION 20.13 – LIMITATION ON ACTIONS

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

SECTION 20.14 – WAIVER OF REMEDIES

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

SECTION 20.15 – WAIVER OF CERTAIN CAUSES OF ACTION

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

SECTION 20.16 – CONTRACTOR RELATIONSHIP

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

SECTION 20.17 – FAILURE TO COMPLY WITH THIS ARTICLE

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

SECTION 20.18 – YEAR 2000 WARRANTY

SECTION DELETED

SECTION 20.19 – FALSE RECORDS/KICKBACKS

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

ARTICLE 21- COOPERATION WITH INVESTIGATIONS

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

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

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

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

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

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

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

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

SECTION VI.
LABOR & MATERIAL PAYMENT BOND

LABOR & MATERIAL PAYMENT BOND

KNOW ALL BY THESE PRESENTS:

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

_____

as Principal, hereinafter called Principal, and _____

_____
(Here insert the legal title of Surety)

_____
(Address)

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

_____and /100 Dollars ($_____)

WHEREAS, Principal has by written agreement dated _____

entered into a Contract with Owner for _____

_____

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

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

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

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

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

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

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

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

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

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

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

Signed this_____day of_____20__.

IN THE PRESENCE OF:

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

Telephone (____)_____

Fax No. _____

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

STATE OF_____) ss:

COUNTY OF_____)

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

_____

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

STATE OF_____)ss:

COUNTY OF_____)

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

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

_____
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

STATE OF_____) ss:

COUNTY OF_____)

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

_____
Notary Public

ACKNOWLEDGEMENT OF SURETY

STATE OF NEW YORK)

COUNTY OF_____) ss:

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

_____
Notary Public

SECTION VII.
PERFORMANCE BOND

PERFORMANCE BOND

KNOW ALL BY THESE PRESENTS:

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

_____

as Principal, hereinafter called Principal, and _____

_____
(Here insert the legal title of Surety)

_____
(Address)

as Surety, hereinafter called Surety, are held and firmly bound unto The Fashion Institute of Technology, as applicable, as Obligee, hereinafter called Owner, in the amount of _____

_____and _____ /100 Dollars ($_____) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR has by written agreement dated _____

entered into a Contract with Owner for _____

_____

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

9. Definitions:

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

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

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

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

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

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

Signed this_____day of_____20__.

IN THE PRESENCE OF:

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

_____ (Address)

_____ (City, State, Zip)

_____ (Address)

_____ (City, State, Zip)

Telephone (____)_____

Fax No. _____

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

STATE OF_____) ss:

COUNTY OF_____)

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

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

_____
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

STATE OF_____)ss:

COUNTY OF_____)

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

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

_____
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

STATE OF_____) ss:

COUNTY OF_____)

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

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

_____

Notary Public

ACKNOWLEDGEMENT OF SURETY

STATE OF NEW YORK)

COUNTY OF_____) ss:

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

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

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

_____

Notary Public

SECTION VIII.
FORM OF BID

FORM OF BID

(Contract for Total of All Materials and Labor)

The Fashion Institute of Technology
(Owner)

For:

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

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

_____Dollars

($_____).

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

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

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

SECTION IX.

NON-COLLUSIVE BIDDING CERTIFICATION

Non-collusive Bidding Certification

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

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

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

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

Firm Name _____

Address _____

_____

By_____
(Signature and Title)

Dated: _____

Telephone (____)_____Fax No. (____)_____

_____
(Taxpayer ID or Social Security Number)

ACKNOWLEDGEMENT OF BIDDER, IF A CORPORATION

STATE OF NEW YORK)
COUNTY OF_____) ss:

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

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

_____, that (s)he is the_____of _____

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

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

_____
Notary Public

ACKNOWLEDGEMENT OF BIDDER, IF A PARTNERSHIP

STATE OF NEW YORK)
COUNTY OF_____) ss:

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

_____
Notary Public

ACKNOWLEDGEMENT OF BIDDER, IF AN INDIVIDUAL

STATE OF NEW YORK)
COUNTY OF_____) ss:

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

_____
Notary Public

SECTION X:

SUBSTITUTION FORM REQUEST

FASHION INSTITUTE OF TECHNOLOGY

SUBSTITUTION REQUEST FORM

1.1 CONDITIONS OF SUBSTITUTIONS

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

1.2 SUBSTITUTION REQUEST

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

Specification Section and Title: _____

Paragraph_____ Page_____ Specified Item _____

Proposed Substitution: _____

Manufacturer:_____ Address:_____ Phone: _____

Trade Name:_____ Model No: _____

Price Difference:_____ or No Change _____

The Undersigned certifies:

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

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____ FAX: _____

ARCHITECT'S REVIEW AND ACTION

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

Signed by: _____

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

SECTION XI.
CONTRACT

TO BE SIGNED ONLY UPON AWARD

CONTRACT

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

_____

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

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

_____

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

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

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

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

Fashion Institute of Technology

_____

Sherry Brabham, VP of Finance

_____

(Name of Contractor)

By_____

(Signature)

_____

(Print Name and Title)

ACKNOWLEDGEMENT OF CONTRACTOR, IF A CORPORATION

STATE OF_____)
COUNTY OF_____) ss:

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

_____
Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR, IF A PARTNERSHIP

STATE OF_____)
COUNTY OF_____) ss:

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

_____
Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR, IF AN INDIVIDUAL

STATE OF_____)
COUNTY OF_____) ss:

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

_____
Notary Public

SECTION XII.
AFFIRMATIVE ACTION FORM

MONTHLY CONTRACTOR'S COMPLIANCE REPORT FORM AAP 7.0

INSTRUCTION SHEET

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

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

PART B- PAYMENTS TO SUBCONTRACTORS AND SUPPLIERS

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

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

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

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

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

DEFINITIONS

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

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

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

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

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

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

MONTHLY CONTRACTOR'S COMPLIANCE REPORT

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

CONTRACTOR INFORMATION

Name_____ Federal ID No. _____

Address_____

Contact Person_____ Telephone Number _____

PROJECT INFORMATION

Institution_____ City and Zip Code _____

Work Description _____

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

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

Address_____ Phone#_____ Intended Payment$._____

Address _____ Percent Complete_____ Amount Paid to Date$_____

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

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

Work Description _____

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

Address_____ Phone #_____ Intended Payment$._____

Address _____ Percent Complete_____ Amount Paid to Date$_____

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

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

Work Description _____

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

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

_____ _____
Signature of Principal or Officer Date

SECTION XIII.
CHANGE ORDER FORM

CHANGE ORDER

TO:

Contractor:_____ Contract No. _____

Street: _____ Contract Date: _____

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

Phone No. _____ Total Approved Change Orders: _____

Current Contract Amount: $_____

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

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

_____Dollars.

Labor = _____

Materials = _____

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

Recommended by:
CONSTRUCTION MANAGER OR ARCHITECT

Name: _____

_____

By: _____ Date: _____

Approved by:

Name:_____

By: _____ Date:_____

Accepted by:
CONTRACTOR

Name:_____

By: _____ Date: _____

OWNER

Name:_____

By: _____ Date: _____

SECTION XIV.
CONTRACTOR'S
TRADE PAYMENT BREAKDOWN

TRADE PAYMENT BREAKDOWN

PROJECT: _____ **CONTRACT # C**

CONTRACTOR: _____

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

EXHIBIT A: SAFETY EHS PLAN

EXHIBIT A. SAFTEY EHS PLAN

FASHION INSTITUTE OF TECHNOLOGY

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

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

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

A) When proposed work will:

1) use regulated hazardous chemicals;

2) have the potential to generate fumes, vapors or dusts;

3) involve cutting torches or other spark-generating equipment ("hot" work);

4) generate any waste;

5) involve high-energy systems or

6) require any type of air monitoring.

B) When work involves the removal of less than 25 liner feet, or 10 square feet, of asbestos-containing material (that is greater than 1% asbestos). For work involving more than these amounts of asbestos, Contractor must consult with the EHS Department for additional guidelines.

C) When work involves the use of tools and equipment in areas where FIT employees or students are present.

D) When work involves construction, other than minor repairs or alterations to on-campus facilities.

E) When work involves dangerous environments, such as confined spaces, hazardous energy, use scaffolds greater than 10 feet high, or vehicle-mounted articulated booms.

II) Use the outline below to develop the work-specific EHS Plan. Contractor shall amend the work-specific EHS Plan as needed to accommodate work on-campus as it proceeds.

DESCRIPTION OF CONTENTS OF WORK-SPECIFIC EHS PLAN

III) GENERAL INFORMATION – PROJECT PLANNING

A) List primary information about Contractor's firm and that of sub-

contractors, if any, Project Name, FIT Bid Number and Contractor's safety-related performance measurements on Table 1.

B) Describe the scope of work and list a breakdown of its specific tasks.

C) Provide a project schedule that, at a minimum, shows the anticipated start date of the work, the duration of each phase of the work, the anticipated date of completion of each phase, and the project completion date.

D) List name of Contractor's on-site EHS Coordinator and the names of all OSHA- competent persons needed to carry out the scope of work on Table 2. The EHS Coordinator shall serve as the primary contact with FIT's Director of EHS Compliance during all work.

IV) WORK-SPECIFIC HAZARD ANALYSIS/RISK ASSESSMENT

A) Describe each task associated with the work of the project.

B) List the potential hazards, if any, associated with each task.

C) Provide copies of Contractor's EH&S program applicable to scope of work.

D) List the types of protective work practices or personal protective equipment (PPE) Contractor will employ to carry-out each task.

E) Describe the types of exposure assessments that are needed to address potential hazardous exposures related to the work of the project. These include:

1) Work practices and engineering controls Contractor will use to prevent exposure of Contractor's employees to hazardous chemicals or hazardous energy;

2) Work practices and engineering controls Contractor will use to prevent exposure of FIT students and staff to any detectable chemical exposure;

3) Contractor's use of respiratory protection and other protective equipment (PPE) and

4) Qualitative or quantitative monitoring protocols, personal and area monitoring equipment, and contaminant action levels.

F) Attach copies of certified documentation of "Hazard Assessment and Equipment Selection" required by 29 CFR 1910.132 (d)(2) that complies with 1910 Subpart I Appendix B for all tasks in the work-specific EHS Plan.

G) Attach a copy of Contractor's written Hazard Communication Program that OSHA requires for the work-specific EHS Plan.

V) WORK-SPECIFIC ENVIRONMENTAL, HEALTH AND SAFETY ELEMENTS

A) To address health and safety issues, the work-specific EHS Plan shall:

1) Describe criteria for upgrading or downgrading personal protective equipment (PPE) or modifying work practices to control hazardous exposures during the work;

2) Describe criteria Contractor will use to set up exclusion zones, including physical barriers and decontamination zones, as needed to prevent spread of debris and restrict access of unauthorized persons to work areas;

3) List equipment Contractor will use for routine and emergency on-site communication;

4) Describe utility clearance and marking procedures to prevent damage to buried utilities, or to lines, piping, or cables located inside of walls and ceilings, if applicable;

5) Describe decontamination and cleaning procedures for Contractor's employees and equipment to prevent the spread of debris. This includes procedures during work, at the end of each work day, and at the completion of the project before FIT's final inspection of the work area;

6) Identify measures to manage dangerous environments, such as confined spaces, scaffold work greater than 10 feet, or articulated booms;

7) List "Hot Work" procedures involved in the work of the project. This may include, but not be limited to, work such as welding, burning, open flames, tar melting or other type of melting pots, grinding that throws sparks. (See Appendix 1 - "Daily Safety Management Work Permit");

8) Identify the need for air monitoring or special testing to carry out the work. Include a listing of monitoring equipment or special tests and the Action Levels that Contractor will apply to project work;

9) Describe safety procedures for excavations more than four 4 feet deep and sloping or shoring procedures where excavations will exceed 5 feet deep;

10) Describe fire protection and explosive hazard review;

11) List the name and address of Contractor's on-contract Confined Space rescue team;

12) Describe spill control procedures for chemical products Contractor will have on-campus during work. Include a listing of spill control or containment supplies that Contractor will have on-hand in case of a spill;

13) Describe the need for site coordination with FIT employees, other contractors on-site and other adjacent work groups. This includes identification of hazardous energy Lock Out and Tag Out

requirements to make to work area safe and

14) Provide a listing of other safety equipment that Contractor will have on site during the work of the project.

B) To address oil, chemical and waste management issues, the work-specific EHS Plan shall:

1) Provide estimates of the types and amounts of waste (both hazardous and non-hazardous) that Contractor anticipates the work will generate. As applicable, provide a copy of a waste analysis plan that lists the types of analysis required, the USEPA SW-846 method number and the method detection limits;

2) Provide facility name, USEPA ID number, and a contact name for each facility that will transport and dispose of each of the waste streams identified above. Provide this information for any facility that will dispose of residuals from the treatment of project waste, as applicable;

3) On a copy of a drawing that will be provided by FIT, identify location where Contractor proposes to accumulate waste during work, to set-up exclusion zones and to provide employee decontamination areas;

4) Provide a statement that describes the methods that Contractor will use to minimize the amount of waste generated from the work of the project;

5) Provide a tabular listing, along with copies of Safety Data Sheets (SDS), for any chemical products that Contractor intends to store or use on-site during the work. The listing shall include the product name, manufacturer's name, type, amounts, intended storage location on FIT site, the specific use of the chemical and identification of any NYCDEP/USEPA regulated hazardous substances that Contractor intends to store or use on-site during the work. In all cases, Contractor must submit the listing before chemical products are delivered to the FIT campus;

6) On a copy of a drawing that will be provided by FIT, identify location where Contractor proposes to store chemical products on-site during work;

7) Identify the need, if any, to amend existing FIT emergency contingency planning documents. Such documents include, but are not limited to: Spill Prevention Control and Countermeasure Plan, Spill Prevention Report, Right-to-Know Survey and

8) List permits and Certificates of Fitness (NYCDEP, NYSDEC, USEPA, FDNY) needed to carry-out the scope of work and have copies on-site of permits and Certificates to carry-out project work.

VI) ON-SITE DOCUMENTATION

A) Contractor shall record initial and daily safety-related procedures on Table 3. These shall include:

1) Before start of the work, FIT's Project Manager will conduct a FIT Hazard Communication briefing for Contractor's employees;

2) Before start of the work, FIT's Project Manager and Contractor's on-site EHS Coordinator shall conduct a briefing for FIT employees in areas adjacent to work areas about proposed work;

3) Review of FIT Emergency Evacuation Procedures;

4) Listing of initial and ongoing project status meetings on-site with FIT Project Manager to address EHS concerns safety and health and

5) Scheduled and unscheduled employee safety briefings, toolbox talks.

B) Contractor shall provide a summary of the on-site EHS Coordinator's EHS-related training and experience relevant to the work of the project.

C) Contractor's employees shall sign-in daily with FIT Security in the A-Building Lobby.

D) For each work shift necessary to complete the project, Contractor's on-site EHS Coordinator shall open and fill out the "Daily Safety Management Work Permit" (See Appendix 1) at the start of each work shift and close the Permit at the end of each work shift.

VII) EMERGENCY RESPONSE PLANNING

Contractor shall review the summary of the Emergency Response Contact Names listed on Table 4 and provide the information as follows:

A) On a site map that will be provided by FIT, identify the primary and secondary routes for the evacuation of Contractor's employees, including the "rally point" where Contractor's employees will assemble and carry-out an accountability check in case of an evacuation;

B) List emergency response contacts with titles and telephone numbers. Contractor shall immediately call FIT Security and the FIT Project Manager in the event of a spill of oil, chemicals, waste water, or hazardous materials;

C) Identify the name, address and route to nearest hospital or Contractor's wellness center and

D) Provide a listing of emergency equipment for first aid, personal protection, spill response, fire protection and rescue.

TABLE 1

Project Name: _____ Bid Number: _____

CONTACTOR ORGANIZATION CHART AND SAFETY DATA

COMPANY	:	Name: Address: Phone:
President	:	Name: Phone:
Vice President – Operations		Name: Phone:
Director of Environmental, Health, and Safety	:	Name: Phone:
Contractor EHS Program Development	:	Name: Phone:
OSHA Total Case Recordable Rate (TCRR)	:	
Days Away from work, or Restricted work or job Transfer (DART)	:	
Experience Modification Rate (EMR)	:	

Listing of On-site Subcontractors for project work, as applicable -

COMPANY NAME	ADDRESS	PHONE NUMBER	TASKS

TABLE 2

ON-SITE SUPERVISORY PERSONNEL

TITLE	:	**NAME(S) AND ON-SITE PHONE NUMBER**
On-site EHS Coordinator	:	
Contractor Project Managers	:	
FIT's Project Manager(s)	:	
Contractor's Competent Persons		List all that Apply – Indicate not applicable areas for department /project work as "NA" For subcontractor employees, place subcontractor firm name in parenthesis after the employee's name
• Confined Spaces	:	
• Excavations	:	
• Industrial Hygiene	:	
• Electrical--Lock Out/Tag Out	:	
• PPE, Respiratory Protection	:	
• Hazard Communication (Required for each department and project. Identify responsible employee for each subcontractor)	:	
• Fall Protection	:	
• Scaffolds	:	
• Cranes & Derricks	:	
• Blasting & Use of Explosives	:	

TABLE 2 (Cont'd)

ON-SITE SUPERVISORY PERSONNEL	**Page 2 of 2**
• Asbestos (Attach copies of Company license, supervisor and handler certificates for all employee that will perform work)	:
• Lead	
• Silica	
• Hot Work (Complete and submit permits daily - see Appendix 1)	
• FDNY Certificate of Fitness-Torch Operations	
• FDNY Certificate of Fitness-Fire Guard	
• FDNY Certificate of Fitness-Fire proofing	
• FDNY Certificate of Fitness-Powder Activated Tools	
• FDNY Certificate of Fitness-Air Compressors_____	
• FDNY Certificate of Fitness-Use of LPG and Use in Tar Kettles	
• FDNY REFRIGERATING SYSTEM OPERATING ENGINEER	
• FDNY Certificate of Fitness-Other_____	
• FDNY Certificate of Fitness-Other_____	
•	
•	

TABLE 3

LISTING OF REQUIRED EMPLOYEE/SUPERVISORY BRIEFINGS

DATE	TOPIC	Comments	TYPE (Monthly Supervisor/Bi-weekly Employee/Supervisor	Comments
	FIT Haz Com Briefing	At start of Work		
	Briefing for FIT Employees in work area(s)	FIT briefing for all FIT Department Supervisors in areas where work may potentially affect FIT employees or students at start of work. Record name of FIT employee(s) briefed	Complete Daily Safety Management Work Permit (See Appendix 1)	
	Review of FIT Emergency Evacuation Procedures	At start of Work		

TABLE 4

EMERGENCY CONTACT NAMES & TELEPHONE NUMBERS

TITLE	CONTACT NAME	EMERGENCY PHONE NUMBERS
Contractor: MAIN OFFICE		
Contractor President:		
On-site EHS Coordinator		
FIT Facilities Management	**Executive Director:** Allen King	Phone: 212-217-4424
FIT Environmental, Health and Safety Department	**Director:** Paul DeBiase paul_debiase@fitnyc.edu **Coordinator:** TBD	Phone: 212-217-3752 Phone: 212-217-3754
Contractor Project Manager(s)		
FIT Public Safety	Central Control	212-217-7777, or Use Red Phone
Occupational Safety And Health Administration, – Area Director	Provide Zip Code for the location of Accident	800-321-6742
Location of nearest hospital and/or contractor's wellness center		
Rally Point and Accountability Check Location	In case of Building Evacuation Alarm	

Note: Call FIT Central Control at 212-217-7777 in case or any emergency such as fire, chemical spills, injury requiring medical treatment, or exposure of contractor or FIT personnel to fumes, vapors, or dusts.

EXHIBIT B: PREVAILING WAGE SCHEDULE

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Fashion Institute of Technolog

Sam Li, Director of Procurement Serv.
227 W 27th St
New York NY 10001

Schedule Year	2025 through 2026
Date Requested	03/31/2026
PRC#	2026009147

Location	Fashion Institute of Technolog
Project ID#	C1746
Project Type	Provide labor, materials, tests, tools and equipment to complete the Renovation of FIT Museum?s History Gallery on the First Floor of the Goodman Center.

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Rate Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2025 through June 2026. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Contractor Registry

Effective December 30, 2024 all contractors and subcontractors submitting bids or performing construction work on public work projects, or private projects covered by Article 8 of the Labor Law, are required to register with the New York State Department of Labor (NYSDOL) under Labor Law Section 220-i. To register, contractors and subcontractors must submit an application through NYSDOL's Contractor Registry portal which is available through the agency's Management System for Protecting Worker Rights (MPWR) https://mpwr-public.labor.ny.gov/en/login.

For additional information, please visit online.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission: a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion online.

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website

www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemperaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment.Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed $100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds $25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of $50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Fashion Institute of Technolog

Sam Li, Director of Procurement Serv.
227 W 27th St
New York NY 10001

Schedule Year 2025 through 2026
Date Requested 03/31/2026
PRC# 2026009147

Location	Fashion Institute of Technolog
Project ID#	C1746
Project Type	Provide labor, materials, tests, tools and equipment to complete the Renovation of FIT Museum?s History Gallery on the First Floor of the Goodman Center.

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information
All information must be supplied

Federal Employer Identification Number: _____

Name: _____

Address: _____

_____

City: _____ State: _____ Zip: _____

Amount of Contract: $_____

Approximate Starting Date: ____/____/____

Approximate Completion Date: ____/____/____

Contract Type:
- [ ] (01) General Construction
- [ ] (02) Heating/Ventilation
- [ ] (03) Electrical
- [ ] (04) Plumbing
- [ ] (05) Other : _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to $1,500 for a first offense and up to $5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, https://dol.ny.gov/public-work-and-prevailing-wage
If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov .

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website *www.labor.ny.gov* or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

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1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

NEW YORK STATE OF OPPORTUNITY. Department of Labor

Required Notice under Article 25-B of the Labor Law

Attention All Employees, Contractors and Subcontractors: You are Covered by the Construction Industry Fair Play Act

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor**, you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

- **Civil Penalty** — First offense: Up to $2,500 per employee

  Subsequent offense(s): Up to $5,000 per employee

- **Criminal Penalty** — First offense: Misdemeanor - up to 30 days in jail, up to a $25,000 fine and debarment from performing public work for up to one year.

  Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a $50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)

WE ARE YOUR DOL

NEW YORK STATE Department of Labor

New York State Department of Labor
Bureau of Public Work

Attention Employees

THIS IS A:

PUBLIC WORK PROJECT

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at: https://dol.ny.gov/bureau-public-work

If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is $250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training “prior to the performing any work on the project.”

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.)*
- Training roster, attendance record of other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is $3 million in Bronx, Kings, New York, Queens and, Richmond counties; $1.5 million in Nassau, Suffolk and Westchester counties; and $500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirement s on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.
Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.
Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.
Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

*Contractor Registry (LL 220-I): Effective December 30th, 2024
Labor Law Section 220-i(6) prohibits contractors from bidding on public work and prohibits both contractors and subcontractors from commencing work on private and public projects subject to prevailing wage requirements. This section requires contractors to submit their Certificate of Registration with their bid materials. Each Certificate of Registration will have a unique registration number. Failure to provide proof of registration, as required by Labor Law Section 220-i, as a minimum qualification will result in the bidder being deemed non-responsive. There is a public database of registered contractors and subcontractors available online at data.ny.gov to confirm registration validity. For additional information on how to register and the requirements, visit https://dol.ny.gov/public-work-contractor-and-subcontractor-registry-landing

*Electronic Certified Payroll (LL 220-J): Effective December 31st, 2025
Effective December 31, 2025, all contractors and subcontractors who perform public work, or covered private work subject to the prevailing wage, will be required to submit certified payrolls electronically to the Bureau of Public Work and Prevailing Wage Enforcement. Additional information about the electronic certified payroll submission system will be made available on the Department's Website at https://dol.ny.gov/Electronic-Payroll

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. Payrolls must be maintained for at least three (3) years from the projects date of completion. Additionally, as per Article 6 of the Labor Law, contractors and subcontractors are required to establish, maintain, and preserve for not less that six (6) years, contemporaneous, true, and accurate payroll records.

At a minimum, payrolls must show the following information for each person employed on a public work project: Name; Address, Last 4 Digits of Social Security number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

Payroll records and transcripts are required to be kept on site during all the time that work under that contract is being performed.

NOTE: *For more detailed information regarding Article 9 prevailing wage contracts, please refer to "General Provisions of Laws Covering Workers on Article 9 Public Work Building Service Contracts".*

If you have any questions concerning the attached schedule or would like additional information, please write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12240

OR

Contact the nearest BUREAU of PUBLIC WORK District Office

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004

Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year.

All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Shift Work

If the timeline of the contract requires shift work be performed to meet deadlines, the BPWE will enforce the shift work rate as the required rate on the project whether or not shift work is specifically addressed in the contract.

Paid Prenatal Leave

Every employer shall be required to provide to its employees twenty hours of paid prenatal personal leave during any fifty-two week calendar period. Paid prenatal personal leave shall mean leave taken for the health care services received by an employee during their pregnancy or related to such pregnancy, including physical examinations, medical procedures, monitoring and testing, and discussions with a healthcare provider related to the pregnancy. Paid prenatal personal leave may be taken in hourly increments. Benefits for paid prenatal personal leave shall be paid in hourly installments. Employees shall receive compensation at the employee's regular rate of pay, or the applicable minimum wage established by the labor law, whichever is greater, for the use of Paid Prenatal leave.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12226

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

New York County General Construction

Asbestos Worker — 04/01/2026

JOB DESCRIPTION Asbestos Worker **DISTRICT** 4

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

WAGES
Per Hour:

	07/01/2025	01/05/2026
Asbestos Worker Removal & Abatement ONLY*	$ 48.25	$ 48.50

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

SUPPLEMENTAL BENEFITS
Per Hour:

Asbestos Worker Removal & Abatement Only	$ 15.71	$ 18.02

OVERTIME PAY
See (B, B2, *E, J) on OVERTIME PAGE
*Hours worked on Saturdays are paid at time and one half only if forty hours have been worked during the week.

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

REGISTERED APPRENTICES
Apprentice Removal & Abatement Only:

1000 hour terms at the following percentage of Journeyman's wages per hour.

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

SUPPLEMENTAL BENEFITS Per Hour:

All Terms:	$ 15.71	$ 18.02

4-12a - Removal Only

Boilermaker — 04/01/2026

JOB DESCRIPTION Boilermaker **DISTRICT** 4

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

WAGES

Per Hour:	07/01/2025	01/01/2026
Boilermaker	$ 68.88	$ 70.38
Repairs & Renovations	68.88	70.38

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

SUPPLEMENTAL BENEFITS
Per Hour:

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

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

OVERTIME PAY
See (*B, O, **U) on OVERTIME PAGE
Note:* Includes 9th & 10th hours, double for 11th or more.

** Labor Day ONLY, if worked.

Repairs & Renovation see (B,E,Q) on OT Page

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 12, 15, 25, 26, 29) on HOLIDAY PAGE

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

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

SUPPLEMENTAL BENEFITS:

33.5% of Hourly Wage Paid Plus Amount Below:

1st	2nd	3rd	4th	5th	6th	7th
$20.36	21.28	22.22	23.12	24.07	25.00	25.93

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

4-5

Broadband — 04/01/2026

JOB DESCRIPTION Broadband **DISTRICT** 4

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

PARTIAL COUNTIES
Orange: Entire County except Village of Greenwood Lake, Village of Highland Falls, Town of Tuxedo, and Town of Patterson

WAGES

Per Hour:	07/01/2025	07/01/2026
Field Tech Install/Repair	$ 53.97	$ 55.59

"Broadband", "Broadband Service", or "Broadband Internet" means mass-market retail service by wire or radio that provides the capability to transmit data to and receive data from all or substantially all internet endpoints, including any capabilities that are incidental to and enable the operation of the communications service, but excluding dial-up internet access service.

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

Applies to projects receiving ConnectAll funding that are subject to New York State Labor Law §224-E.

SUPPLEMENTAL BENEFITS
Per Hour:
$ 23.54

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

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

4-CWA-Dist1

Carpenter — 04/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

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

WAGES

Per hour:	07/01/2025
Piledriver	$ 61.59 + 10.16*

Dockbuilder $ 61.59
+ 10.16*

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

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 46.48

OVERTIME PAY
See (B, E2, O) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE.

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

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour
(1)year terms:

1st	2nd	3rd	4th
$ 27.98 + 5.66*	$ 33.58 + 5.66*	$ 41.96 + 5.66*	$ 50.35 + 5.66*

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

Supplemental benefits per hour:

All Terms: $ 33.03

8-1556 Db

Carpenter 04/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

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

WAGES
Per hour: 07/01/2025

Carpet/Resilient
Floor Coverer $ 59.05
+ 8.39*
*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS
Per hour:
$ 40.49

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

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

Paid for 1st & 2nd yr.
Apprentices See (5,6,11,13,16,18,19,25)
Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

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

1st	2nd	3rd	4th
$ 26.54 + 2.00*	$ 29.60 + 2.54*	$ 34.05 + 3.00*	$ 42.40 + 3.94*

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

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 15.84	$ 16.95	$ 20.29	$ 21.35

8-2287

Carpenter — 04/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

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

WAGES
Per Hour: 07/01/2025

Marine Construction:

Marine Diver	$ 76.46
	+ 10.16*
Marine Tender	$ 56.00
	+ 10.16*

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

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 46.48

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 13, 16, 18, 19, 25) on HOLIDAY PAGE

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

1st year	$ 27.98
	+ 5.66*
2nd year	33.58
	+ 5.66*
3rd year	41.96
	+ 5.66*
4th year	50.35
	+ 5.66*

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

Supplemental Benefits
Per Hour:

All terms	$ 33.03

8-1456MC

Carpenter — 04/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

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

WAGES
Per hour: 07/01/2025

Building

Millwright	$ 60.83
	+ 13.12*

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

SUPPLEMENTAL BENEFITS
Per hour:

Millwright $ 45.91

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

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

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

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

1st.	2nd.	3rd.	4th.
$ 32.74	$ 38.39	$ 44.04	$ 55.34
+ 7.08*	+ 8.25*	+ 9.42*	+ 11.76*

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

Supplemental benefits per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$ 31.16	$ 33.69	$ 36.87	$ 41.29

8-740.1

Carpenter 04/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

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

WAGES
Per Hour:

	07/01/2025
Timberman	$ 56.59
	+ 10.42*

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

SUPPLEMENTAL BENEFITS
Per Hour:

	07/01/2025
	$ 45.79

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

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

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

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

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

1st	2nd	3rd	4th
$ 25.96	$ 31.07	$ 38.72	$ 46.38
+ 5.71*	+ 5.71*	+ 5.71*	+ 5.71*

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

Supplemental benefits per hour:
All terms $ 32.78

8-1556 Tm

Carpenter 04/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

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

PARTIAL COUNTIES
Orange: South of but including the following, Waterloo Mills, Slate Hill, New Hampton, Goshen, Blooming Grove, Mountainville, east to the Hudson River.
Putnam: South of but including the following, Cold Spring, TompkinsCorner, Mahopac, Croton Falls, east to Connecticut border.
Suffolk: West of Port Jefferson and Patchogue Road to Route 112 to the Atlantic Ocean.

WAGES
Per hour: 07/01/2025

Core Drilling:
Driller $ 47.88
+ 3.45*

Driller Helper $ 37.58
+ 3.45*

Note: Hazardous Waste Pay Differential:
For Level C, an additional 15% above wage rate per hour
For Level B, an additional 15% above wage rate per hour
For Level A, an additional 15% above wage rate per hour
Note: When required to work on water: an additional $ 3.00 per hour.

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

SUPPLEMENTAL BENEFITS
Per hour:

Driller and Helper $ 31.04

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

HOLIDAY
Paid: See (5, 6, 13, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 25) on HOLIDAY PAGE

8-1536-CoreDriller

Carpenter 04/01/2026

JOB DESCRIPTION Carpenter **DISTRICT** 8

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

PARTIAL COUNTIES
Nassau: The portion of the county that lies west of Seaford Creek and south of the Southern State Parkway.

WAGES
Per hour: 07/01/2025

Show Exhibit $ 56.75
+ 10.00**

Bldg. Carpenter* $ 59.05
+ 8.39**

* Not applicable in Putnam County
**This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour worked:

Show Exhibit $ 45.94

Bldg. Carpenter 40.49

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

HOLIDAY
Paid: See (1) on HOLIDAY PAGE

Overtime: See (5,6,11,13,16,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour: Show Exhibit

(1) year terms:

1st.	2nd.	3rd.	4th.
$ 22.70	$ 28.38	$ 36.89	$ 45.40
+ 5.00*	+ 5.00*	+ 5.00*	+ 5.00*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:
All terms $ 31.10

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

1st	2nd	3rd	4th
$ 24.20	$ 27.20	$ 31.45	$ 39.33
+ 2.14*	+ 2.59*	+ 3.09*	+ 4.09*

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

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 16.11	$ 17.16	$ 20.26	$ 21.26

8-EXHIB

Carpenter - Heavy&Highway 04/01/2026

JOB DESCRIPTION Carpenter - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

PARTIAL COUNTIES
Nassau: That portion of the county that lies West of Seaford Creek and South of the Southern State Parkway.

WAGES
Per hour:

	07/01/2025
Heavy & Highway	
Carpenter	$ 61.59
	+ 10.16*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour worked:

Heavy & Highway
Carpenter $ 46.48

OVERTIME PAY
See (B, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 13, 25) on HOLIDAY PAGE

For 1st & 2nd year Apprentices
Paid: See (5,6,11,13,25)

REGISTERED APPRENTICES
Wage per hour:
One (1) year terms:

1st	2nd	3rd	4th

Heavy & Highway	$ 27.98	$ 33.58	$ 41.96	$ 50.35
	+ 5.66*	+ 5.66*	+ 5.66*	+ 5.66*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits:
Per Hour:

All terms
$ 33.03

8-NYC H/H

Electrician — 04/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour: 07/01/2025

Tree Trimmer	$ 35.24
Ground Person	20.69

Applies to line clearance, tree work, and right-of-way preparation on all new or existing overhead, electrical, telephone, and CATV lines.

SUPPLEMENTAL BENEFITS
Per hour:

Tree Trimmer	$ 13.20
Ground Person	7.75

OVERTIME PAY
See (B, *H, Q) on OVERTIME PAGE
*Worked performed on Sundays & Holidays outside of 7.00am - 4.00pm shall be paid at double time, in addition to the holiday pay if applicable.

HOLIDAY
Paid: See (5, 6, 10, 11, 15, 16, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 11, 15, 16, 26) on HOLIDAY PAGE
(An additional floating holiday after four years service)

9-3T

Electrician — 04/01/2026

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2025	04/15/2026
Electrician	$ 33.50	$ 33.50
Telephone	33.50	33.50

Maintenance and Jobbing-Electrical and teledata work of limited duration and scope, consisting of repairs and/or replacement of electrical and teledata equipment.

- Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.

SUPPLEMENTAL BENEFITS
Journeyworker:

07/01/2025	04/15/2026
$ 29.51	$ 30.01
31.63*	32.13*

* Applies to overtime hours

OVERTIME PAY
See (B, H) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

9-3m

Electrician **04/01/2026**

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond, Westchester

WAGES

Per hour:	07/01/2025	03/12/2026
Service Technician	$ 38.40	$ 39.45

Service and Maintenance on Alarm and Security Systems.

Maintenance, repair and /or replacement of defective (or damaged) equipment on, but not limited to, Burglar - Fire - Security - CCTV - Card Access - Life Safety Systems and associated devices. (Whether by service contract of T&M by customer request.)

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker:	$ 22.76	$ 23.33

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE

9-3H

Electrician **04/01/2026**

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per Hour:	07/01/2025	01/01/2026	04/15/2026
Electrician Audio/Sound and Temporary Light/ Power	$ 62.00	$ 62.00	$ 64.00
Solar-Photovoltaic Systems			
Group 1 All tasks not listed in Group 2	62.00	62.00	64.00
Group 2	33.50	33.50	33.50

D.C portion and associated mechanical equipment related to solar systems,
(excluding battery storage and its associated equipment) including work related to
Weather Stations and Data Acquisitions/Monitoring Systems on solar photovoltaic systems.

Mounting of PV modules.
Mounting of DC optimizers to back of modules if the installation calls for this equipment.
Mounting of microinverters to back of modules and install trunk cabling on racking if called for.
Module to module connection of PV modules to adjacent modules. If racking manufacturer provides integrated inter-row cable management, install string jumper to complete the string in full in same sub-array.
If racking manufacturer does not provide integrated inter-row cable management, run conduit between rows, bond it and run string jumper to complete string in full in same sub-array.
Installation of weather stations and other weather station relevant sensors as specified.
Installation of data acquisition system (DAS) for PV system monitoring.

SHIFT WORK

Evening (Swing Shift):

Electrician Audio/Sound and Temporary Light/ Power	$ 72.75	$ 72.75	$ 75.10

Night (Graveyard Shift):

Electrician Audio/Sound and Temporary Light	$ 81.49	81.49	84.12

SUPPLEMENTAL BENEFITS
Per Hour:

Electrician	$ 70.75	$ 71.25	$ 74.25
	74.66*	75.16*	78.30*
Swing Shift:	79.78	80.28	83.59
	84.38*	84.88*	88.33*
Graveyard Shift:	87.44	87.93	91.49
	92.59*	93.09*	96.81*
Temporary Light/Power:	30.83	31.33	32.38
	34.14*	34.64*	35.78*
Group 1:	70.75	71.25	74.25
	74.66*	75.16*	78.30*
Group 2:	29.51	29.51	30.01
	31.63*	31.63*	32.13*

* Applies when premium (OT) wages are paid.

Temporary Light and Power benefit rate applies for three or less workers.

Reduce benefit rate by 6.2% for any employee who has accumulated wages of $176,100 for the same employer.

OVERTIME PAY
See (A, H) on OVERTIME PAGE
See (B) for Temporary Light and Power

HOLIDAY
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages Per Hour:

	07/01/2025	04/15/2026
First Year:	$18.50	$ 19.25
Second Year:	20.50	21.25
Third Year:	22.50	23.25
Fourth Year:	25.50	26.25

Supplemental Benefits per hour:

	Regular	Overtime	Regular	Overtime
First year:	$ 18.94	$ 20.17	$ 19.84	$ 21.11
Second year:	19.99	21.35	20.89	22.30
Third year:	21.04	22.53	21.93	23.48
Fourth year:	22.61	24.30	23.51	25.25

Electrician - Highway and Street Lighting, Traffic Signals and Controls — 04/01/2026

JOB DESCRIPTION Electrician - Highway and Street Lighting, Traffic Signals and Controls **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2025	01/01/2026	04/22/2026
Electro Pole Electrician	$ 62.00	$ 62.00	$ 64.00
Electro Pole Foundation Installer	47.66	47.66	49.66
Electro Pole Maintainer	41.61	41.61	43.61

SUPPLEMENTAL BENEFITS
Per Hour:

	07/01/2025	01/01/2026	04/22/2026
Electro Pole Electrician	$ 72.85 76.77*	$ 73.35 77.27*	$ 76.43 80.09*
Electro Pole Foundation Installer	54.23 57.24*	54.73 57.74*	56.99 60.13*
Electro Pole Maintainer	48.90 51.53*	49.40 52.03*	51.66 54.42*

*Applies when premium wages are paid.
Note: Reduce benefit rate by 6.2% for any employee who has accumulated wages in $176,100 for the same employer.

OVERTIME PAY
See (A, B, E4, F, K) on OVERTIME PAGE
B - Applies to Electro Pole Foundation Installer
E4 - Applies to Electro Pole Maintainer

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

9-3J

Elevator Constructor — 04/01/2026

JOB DESCRIPTION Elevator Constructor **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

PARTIAL COUNTIES
Rockland: Entire County except for the Township of Stony Point
Westchester: Entire County except for the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES
Per hour:

	07/01/2025	03/17/2026
Elevator Constructor	$ 83.27	$ 86.43
Modernization & Service/Repair	65.54	68.06

SUPPLEMENTAL BENEFITS
Per Hour:

Elevator Constructor	$ 47.65	$ 48.96
Modernization & Service/Repairs	46.47	47.73

OVERTIME PAY
Constructor See (D, M, T) on OVERTIME PAGE.

Modern/Service See (B, E5, P) on OVERTIME PAGE.

HOLIDAY
Paid: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES PER HOUR:

6 MONTH TERMS:

1st Term*	2nd & 3rd Term*	4th & 5th Term	6th & 7th Term	8th & 9th Term
50%	50%	55%	65%	75%

* Note: 1st, 2nd, 3rd Terms are based on average of the Constructor, the Modernization and the Service/Repair wage.
Terms 4 thru 9 Based on the Journeyman's wage of classification they are working in.

SUPPLEMENTAL BENEFITS:

	07/01/2025	03/17/2026
Elevator Constructor		
1st Term	$ 0.00	$ 0.00
2nd & 3rd Term	36.90	37.66
4th & 5th Term	37.99	38.80
6th & 7th Term	39.70	40.60
8th & 9th Term	41.40	42.39
Modernization & Service/Repair		
1st Term	$ 0.00	0.00
2nd & 3rd Term	36.88	37.63
4th & 5th Term	37.58	38.37
6th & 7th Term	39.20	40.09
8th & 9th Term	40.83	41.81

Glazier — 04/01/2026

JOB DESCRIPTION Glazier **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per hour:

	07/01/2025	11/01/2025
Glazier, Glass Tinting and Window Film	$ 64.23	$ 65.23
Scaffolding, including swing scaffold	69.23	70.23
*Mechanical Equipment	65.23	66.23
**Repair & Maintenance	31.71	32.44

*Mechanical equipment, scissor jacks, man lifts, booms & buckets 30' or more, but not pipe scaffolding.
**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative Repair & Maintenance contract value is under $193,000.

SUPPLEMENTAL BENEFITS
Per hour:

Glazier, Glass Tinting Window Film, Scaffolding and Mechanical Equipment	$ 43.03	$ 43.88

Repair & Maintenance	25.12	25.37

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
For 'Repair & Maintenance' see (B, B2, I, S) on overtime page.

HOLIDAY
Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
For 'Repair & Maintenance'
Paid: See(5, 6, 16, 25)
Overtime: See(5, 6, 16, 25)

REGISTERED APPRENTICES
Wage per hour:
(1) year terms at the following wage rates:

	07/01/2025	11/01/2025
1st term	$ 22.79	$ 23.29
2nd term	31.15	31.71
3rd term	41.53	42.23
4th term	50.90	51.70

Supplemental Benefits:
(Per hour)

1st term	$ 19.56	$ 19.80
2nd term	27.85	28.31
3rd term	33.49	34.09
4th term	36.73	37.41

8-1087 (DC9 NYC)

Insulator - Heat & Frost — 04/01/2026

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2025	06/01/2026
Insulators		Additional
Heat & Frost	$ 71.76	$2.50*

* To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

Insulators $ 37.51
Heat & Frost

OVERTIME PAY
See (A, E, *Q, V) on OVERTIME PAGE
* Triple time for Labor Day (If worked)

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms at the following Wages Per Hour:

1st	2nd	3rd	4th
$ 32.30	$ 39.47	$ 46.65	$ 53.83

Supplemental Benefits:

1st	2nd	3rd	4th
$ 16.90	$ 20.64	$ 24.40	$ 28.15

4-12

Ironworker **04/01/2026**

JOB DESCRIPTION Ironworker **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2025	01/01/2026
Stone Derrickmen Rigger	$ 76.86	$ 77.82
Stone Handset Derrickman	74.38	75.67

SUPPLEMENTAL BENEFITS

Per hour:		
Stone Derrickmen Rigger	$ 47.34	$ 48.02
Stone Handset Derrickman	46.51	47.01

OVERTIME PAY
See (B, D1, *E, Q, **V) on OVERTIME PAGE
*Time and one-half shall be paid for all work on Saturday up to eight (8) hours and double time shall be paid for all work thereafter.
** Benefits same premium as wages on Holidays only

HOLIDAY
Paid: See (18) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 25) on HOLIDAY PAGE
Work stops at schedule lunch break with full day's pay.

REGISTERED APPRENTICES
Wage per hour:

Stone Derrickmen Rigger:

	1st	2nd	3rd	4th
07/01/2025	$ 38.28	$ 54.28	$ 60.39	$ 66.50
01/01/2026	$ 38.91	$ 55.02	$ 61.21	$ 67.39

Supplemental Benefits:
Per hour:

07/01/2025	23.84	35.82	35.82	35.82
01/01/2026	24.02	36.27	36.27	36.27

Stone Handset:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2025	$ 36.69	$ 52.22	$ 58.10	$ 63.99
01/01/2026	$ 37.34	$ 53.27	$ 59.24	$ 65.20

Supplemental Benefits:
Per hour:

07/01/2025	23.75	35.52	35.52	35.52
01/01/2026	24.00	35.77	35.77	35.77

9-197D/R

Ironworker **04/01/2026**

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2025	01/01/2026
Ornamental	$ 48.15	$ 48.40
Chain Link Fence	48.15	48.40
Guide Rail	48.15	48.40

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 68.17	$ 69.04

OVERTIME PAY
See (B, B1, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms at the following wages per hour:

	1st	2nd	3rd	4th
07/01/2025	$ 25.98	$ 28.45	$ 30.80	$ 34.39
01/01/2026	$ 26.40	$ 28.92	$ 31.30	$ 34.95

Supplemental Benefits per hour:

1st	2nd	3rd	4th
$ 16.29	18.29	19.29	21.29

4-580-Or

Ironworker — 04/01/2026

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
PER HOUR:

	07/01/2025	01/01/2026
Ironworker:		
Structural	$ 58.95	$ 59.20
Bridges		
Machinery		

SUPPLEMENTAL BENEFITS
Per hour paid:

Journeyman	$ 92.60	$ 94.11

OVERTIME PAY
See (B, B1, Q, *V) on OVERTIME PAGE
*NOTE: Benefits are calculated for every hour paid.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES
6 month terms at the following wages per hour:

	1st	2nd	3rd-6th
07/01/2025	$ 30.61	$ 31.21	$ 31.82
01/01/2026	$ 30.74	$ 31.34	$ 31.95

Supplemental Benefits

PER HOUR PAID: $ 64.38

4-40/361-Str

Ironworker — 04/01/2026

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES

Rockland: Southern section - south of Convent Road and east of Blue Hills Road.

WAGES

Per hour:	07/01/2025
Reinforcing & Metal Lathing	$ 57.00
"Base Wage"	55.20**

** For OVERTIME/PREMIUM CALCULATION purposes only.

SUPPLEMENTAL BENEFITS

Per hour:	
Reinforcing & Metal Lathing	$ 46.27

OVERTIME PAY

See (B, E, Q, *X) on OVERTIME PAGE
*Only $23.50 per Hour for non worked hours

** OVERTIME/PREMIUMS are calculated on Reinforcing & Metal Lathing "Base Wage" then adding: $ 1.80 per hour.

Supplemental Benefit Premiums for Overtime Hours worked:

Time & One Half	$ 52.77
Double Time	59.27

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 11, 13, *18, **19, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year terms at the following wage rates:

1st	2nd	3rd	4th
$ 22.55	$ 25.00	$ 28.00	$ 30.00

Base Wage:

$21.00*	$23.20*	$26.20*	$28.20*

* "Base Wage" are utilized for PREMIUM/OVERTIME Calculations ONLY then adding:
$ 1.55 per hour for 1st Term
$ 1.80 per hour for all other terms.

SUPPLEMENTAL BENEFITS Per Hour:

1st	2nd	3rd	4th
$ 18.17	$ 18.22	$ 17.22	$ 17.22

4-46Reinf

Laborer — 04/01/2026

JOB DESCRIPTION Laborer **DISTRICT** 9

ENTIRE COUNTIES

Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:

	07/01/2025	01/01/2026
Striper (Highway/streets):		
Striping-Machine Operator (Thermoplastic & Epoxy)	$ 42.00	$ 42.00
Striping - Lineperson (Crew Chief)	46.00	46.00
Flagger - Traffic Safety*	40.00	40.00

Note: * Includes but is not limited to: Positioning of cones and directing of traffic using handheld devices. Excludes the Driver/Operator of equipment used in protection of traffic safety.

** To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour paid:

Journeyworker	$ 21.27	$ 23.27

OVERTIME PAY
See (B, H) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 13) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 13) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:

1st Term (1-1999 hours)	$ 32.21	$ 32.21
2nd Term (2000-4000 hours)	33.85	33.85

Supplemental Benefits per hour:

All Terms	$ 21.27	23.27

9-1010-LS

Laborer 04/01/2026

JOB DESCRIPTION Laborer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour: 07/01/2025

Laborer/Excavation	
**Asbestos and Lead Abatement & Removal, Hazardous Waste Removal (including soil)	$ 45.60
Basic	45.60
Flagman	45.60
Pipelayer	45.60
*Tree Work, *Landscape	45.60

*Includes trimming, cutting, planting and/or removal of trees.
** Applies to Heavy & Highway projects

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker:	$ 55.73

Note: No payment of Supplemental Benefits is required on paid holidays, when employees do not work.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
When an observed holiday falls on a Saturday, work done shall be paid at double time.

HOLIDAY
Paid: See (2, 20) on HOLIDAY PAGE
Overtime: See (2, 5, 6, 11, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1000 hour terms at the following hourly wage rate.

		07/01/2025
1st	0 - 1000	$ 22.80
2nd	1001-2000	27.36
3rd	2001-3000	34.20
4th	3001-4000	41.04

Supplemental Benefits per hour:

All Apprentices	$ 55.73

Laborer **04/01/2026**

JOB DESCRIPTION Laborer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

GROUP 14: Blasters.

GROUP 16: Tunnel workers - including Miners, Drill Runners, Iron Men, Maintenance Men, Conveyor Men, Safety Miners, Riggers, Block Layers, Cement Finishers, Rod Men, Caulkers, Powder Carriers, Miners' Helpers, Chuck Tenders, Track Men, Nippers, Brake Men, Derail Men, Form Men, Bottom Bell, Top Bell or Signal men, Form Workers, Movers, Concrete Workers, Shaft Men, Tunnel Laborers and Caulkers' Helpers.

GROUP 17: All others including: Powder Watchmen, Top Laborers and Changehouse Attendants.

Wages: (per hour)	07/01/2025
Laborer (Tunnel)-FREE AIR:	
Group 14	$ 71.69
Group 16	68.58
Group 17	63.40
Small Bore Micro Tunnel Machines	80% of rates above
For Repairs on Existing Water Tunnels	90% of rates above
For Repairs of Sewer & Drainage Tunnels	85% of rates above
For Repair & Maintenance of all Subway & Vehicular Tunnels	80% of rates above

An additional $ 4.50 per hour for precast concrete segments.
An additional $ 6.50 per hour for liner plate & soil solidification.

Note: Employer shall pay $10.00 per day for each half mile starting at a point 500 feet from the bottom of the shaft.

SUPPLEMENTAL BENEFITS
Per hour:

GROUP 14	$ 63.84
GROUP 16	61.18
GROUP 17	56.62
Small Bore Micro Tunnel Machines	80% of rates above
For Repairs on Existing Water Tunnels	90% of rates above
For Repairs of Sewer & Drainage Tunnels	85% of rates above
For Repair & Maintenance of all Subway& Vehicular Tunnels	80% of rates above

OVERTIME PAY
OVERTIME: For Laborer (Free Air) See (D, M, R*) on OVERTIME PAGE.
For Repair Categories See (B, F, R*) on OVERTIME PAGE.
& Micro Tunneling

* Straight time first 8 hours, double time after 8 hours.

HOLIDAY
Paid: See (5, 6, 9, 11, 12, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 9, 11, 12, 15, 16, 25) on HOLIDAY PAGE
Good Friday may be exchanged for one of the holidays listed.

9-147Tnl/Free

Laborer - Building — 04/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2025	01/01/2026
Basic Laborer and Mason Tender	$ 45.25*	$ 46.05*
*Before calculating premium wage deduct:	$ 3.45	$ 3.50

SUPPLEMENTAL BENEFITS
Per hour:

Basic Laborer and Mason Tender	$ 30.69	$ 31.14

OVERTIME PAY
See (B, B2, E, E2, Q, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1000 hour terms at the following wage rate:

Term:	1st	2nd	3rd	4th
Basic Laborer and Mason Tender				
07/01/2025	$ 22.35*	$ 24.10*	$ 25.60*	$ 28.10*
01/01/2026	$ 22.87*	$ 24.62*	$ 26.12*	$ 28.62*

*Before calculating premium wage deduct $0.60.

Supplemental Benefits per hour:

All Terms	$ 11.02	$ 11.12

9-MTDC(79)

Laborer - Building — 04/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2025
Skilled Interior Demolition Laborer:	$ 40.10*
General Interior Demolition Laborer:	$ 29.29*

(General Demolition Laborer performs manual work and work incidental to demolition, such as loading and carting of debris from work site to an area where it can be loaded into trucks for removal).

* Before calculating overtime wages deduct $1.70.

SUPPLEMENTAL BENEFITS
Per Hour:

Skilled Interior Demolition Laborer:	$ 25.19
General Interior Demolition Laborer:	$ 19.51

OVERTIME PAY
See (B, B2, I, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage Per Hour:

1000 hour terms at the following wage rate:

1st	2nd	3rd	4th
$ 22.35*	$ 24.10*	$ 25.60*	$ 28.10*

* Before calculating overtime wages deduct $0.60

Supplemental Benefits Per Hour:

All Terms: $ 10.67

9-MTDC (79-ID)

Laborer - Building — 04/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour: 07/01/2025

Laborer:
Laborer-Concrete
(including flag person) $ 42.53
+ 8.25*

* This portion is not subjected to overtime premiums.

SUPPLEMENTAL BENEFITS
Per Hour
$ 21.20
+ 10.00**

** This portion subjected to overtime premiums only on codes (E,Q)

OVERTIME PAY
OVERTIME: See (A,E,Q) on OVERTIME PAGE attached.
See (B,E,Q,) for work below street level to top of foundation.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 13, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
Terms based on hours listed:

1st	2nd	3rd
0-1334	1334-2668	2669-4000
$ 18.87 + 2.49*	$ 20.49 + 7.32*	$ 26.46 + 7.80*

* This portion is not subjected to overtime premiums.

Supplemental Benefits:
Per hour:

$ 13.70	$ 17.70	$ 17.70
+ 3.18*	+ 4.14*	+ 5.10*

Journeyworker rate applies after 4000 hours
*This portion subjected to same premium as wages.

9-6A/18A/20-C

Laborer - Building **04/01/2026**

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2025	01/01/2026
Building:		
Plasterer Tender and Spray Fireproofing Tender	$ 45.25*	$ 46.05*
Before calculating overtime wages deduct:	$ 3.45	$ 3.50

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker	$ 30.69	$ 31.14

OVERTIME PAY
See (B, B2, E, E2, Q, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1000 hours terms at the following wage.

	1st	2nd	3rd	4th
07/01/2025	$22.35*	$24.10*	$25.60*	$28.10*
01/01/2026	$22.87*	$24.62*	$26.12*	$28.62*

* Before calculating overtime wages deduct $0.60.

Supplemental Benefits per hour:

All Terms:		
	$ 11.02	$ 11.12

9-30 (79)

Laborer - Building **04/01/2026**

JOB DESCRIPTION Laborer - Building **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2025	01/01/2026
Asbestos, Lead and Hazardous Material Abatement Laborer	$ 41.95	$ 42.90

NOTE: For Asbestos removal from Mechanical Systems that are NOT to be scrapped see ASBESTOS WORKER Classification

For Re-Roofing Asbestos Removal See ROOFER Classification

SUPPLEMENTAL BENEFITS
Per Hour:

Asbestos, Lead and Hazardous Material Abatement Laborer	$ 21.76	$ 23.37

OVERTIME PAY
See (B, B2, I) on OVERTIME PAGE

Asbestos, Lead and Hazardous Material Abatement Laborer	$ 61.93	$ 62.90

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 28) on HOLIDAY PAGE

REGISTERED APPRENTICES
1000 hour terms at the following wages per hour:

	1st	2nd	3rd	4th
07/01/2025	$22.12	$23.12	$26.12	$28.12
01/01/2026	$22.86	$23.91	$26.98	$29.14

OVERTIME PAY:

	1st	2nd	3rd	4th
07/01/2025	$32.50	$34.00	$38.50	$41.50
01/01/2026	$33.26	$34.83	$39.44	$42.68

SUPPLEMENTAL BENEFIT
Per Hour:

All Terms	$ 15.68	$ 16.94

4-NYDC(78)

Laborer - Building — 04/01/2026

JOB DESCRIPTION Laborer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2025	01/01/2026
Skilled Demolition Laborer:	$ 43.05*	$ 43.75*
General Demolition Laborer:	31.63**	32.33**

(General Demolition Laborer performs manual work and work incidental to demolition, such as loading and carting of debris from work site to an area where it can be loaded into trucks for removal).

*Before calculating overtime wages deduct:

	$ 3.05	$ 3.15

**Before calculating overtime wages deduct:

	$ 2.40	$ 2.50

NOTE: Total Demolition Only: Demolition shall be the complete demolition (wrecking) or dismantling of entire buildings or structures. Also may include the removal of all or any portion of a roof in which structural change is to occur. Structural change is defined as the removal of structural slabs, steel members, concrete members and penetration through the structural slab.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker:

Skilled Demolition Laborer:	$ 29.35	$ 29.65
General Demolition Laborer:	22.41	22.71

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:
(1) year terms at the following wage.

	1st	2nd	3rd	4th
07/01/2025	$ 22.35*	$ 24.10*	$ 25.60*	$ 28.10*
01/01/2026	$ 22.87*	$ 24.62*	$ 26.12*	$ 28.62*

*Before calculating overtime wages deduct $0.60.

Supplemental Benefits per hour:

All Terms:
$ 11.52 $ 11.62

9-79/95

Laborer - Concrete & Asphalt Paving 04/01/2026

JOB DESCRIPTION Laborer - Concrete & Asphalt Paving **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Group 1: Slurry Seal Coater, Maintenance Safety Surface, Small Power Tool Operator, Play Equipment Installer, Temporary Fence Installer & Repairs, Laborer.

Group 2: Production Paving Work: Shoveler, small equipment operator.

Per hour:	07/01/2025
Concrete Formsetter	$ 50.20 + $ 8.75*
Asphalt Screeperson/Micro Paver	50.80 + $ 8.75*
Asphalt Raker	50.20 + $ 8.75*
Group 1	46.33 + $ 8.75*
Group 2	46.33 + $ 8.75*

* This portion is not subjected to overtime premiums.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker: $ 46.55

Note: No payment of supplemental benefits is required on paid holidays, when employees do not work.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
Note: Saturday premium rate applies from 7:00 am on Saturday to 6:59 am Sunday
Note: Sunday premium rate applies from Sunday 7:00 am to Monday 6:59 am.

HOLIDAY
Paid: See (5, *11, 20) on HOLIDAY PAGE
HOLIDAY:
Overtime: See (21,22)** on HOLIDAY PAGE.

Note: See (5,20) Holiday pay -at the single time pay rate-shall be prorated based on 25% of a day's wages and benefits for each day worked during that calendar week.

* Columbus Day shall be an unpaid holiday. In the event work is performed on Columbus Day, wages shall be paid on a double time basis.

**New Year's Day and Christmas Day: If an employee is performing work on these (2) days the employee will receive the single rate plus 25%.

Note-When Independence day falls on Saturday, it will be observed on that Saturday, however, when it occurs on a Sunday, it will be observed on the Monday.

REGISTERED APPRENTICES
Wage per hour:

2000 hours term:

1st term	2nd term
1-1999	2000-4000
$ 32.21 + $ 8.75*	$ 33.85 + $ 8.75*

* This portion is not subjected to overtime premiums.

Supplemental Benefits per hour:
2000 hours term:

1st term	2nd term
1-1999	2000-4000
$ 19.07	$ 19.07

9-1010H/H

Laborer - Trac Drill — 04/01/2026

JOB DESCRIPTION Laborer - Trac Drill **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Group 1:Chipper/Jackhammer, Powder Carrier, Hydraulic Chuck tender, Chuck Tender and Nipper, Magazine Keeper

Group 2: Hydraulic Trac Drill

Group 3: Air Trac, Wagon and Quarry bar

Group 4: Blaster

Per Hour:	07/01/2025
Group 1	$ 45.60
Group 2	52.95
Group 3	52.12
Group 4	58.81

SUPPLEMENTAL BENEFITS
Per Hour:

All Classifications:	55.73

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
When an observed holiday falls on a Saturday, work done shall be paid at double time.

HOLIDAY

Paid:	See (2, 20) on HOLIDAY PAGE
Overtime:	See (2, 5, 6, 11, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1000 hour terms at the following hourly wage rate.

		07/01/2025
1st	0 - 1000	$ 22.80
2nd	1001-2000	27.36
3rd	2001-3000	34.20
4th	3001-4000	41.04

Supplemental Benefits per hour:

All Apprentices	55.73

9-731/29

Laborer - Tunnel 04/01/2026

JOB DESCRIPTION Laborer - Tunnel **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
GROUP 5: Blasters and Mucking Machine Operators

GROUP 6: Tunnel Workers*(including Miners, Drill Runners, Iron Men, Maintenance Men, Inside Muck Lock Tender, Pumpmen, Electricians, Cement Finishers, Rod Men, Caulkers, Carpenters, Hydraulic Men, Shield Drivers, Monorail Operators, Motor Men, Conveyor Men, Safety Miners, Powder Carriers, Pan Men, Riggers, Miner's Helpers, Chuck Tenders, Track Men, Nippers, Brake Men, Form Workers, Concrete Workers, Tunnel Laborers, Caulker's Helpers), Hose Men, Grout Men, Gravel Men, Derail Men and Cable Men.

GROUP 7: Top Nipper

GROUP 8,9: Outside Man Lock Tender, Outside Muck Lock Tender, Shaft Men, Gauge Tender and Signal Men.

GROUP 10: Powder Watchmen, Top Laborers and Changehouse Attendants.

WAGES: (per hour)

	07/01/2025
Laborer (Compressed Air):	
GROUP 5	$ 75.14
GROUP 6	72.46
GROUP 7	71.24
GROUP 8,9	69.83
GROUP 10	61.57

An additional $3.00 per day when using an air spade, jack hammer or pavement breaker.

Note: Employer shall pay $10.00 per day for each one half (1/2) mile or fraction starting from a point 500 feet from the shaft.

SUPPLEMENTAL BENEFITS
SUPPLEMENTAL BENEFITS:
per hour:

GROUP 5	$ 66.51
GROUP 6	64.41
GROUP 7	63.14
GROUP 8,9	62.11
GROUP 10	58.18

OVERTIME PAY
See (D, M, *R) on OVERTIME PAGE
NOTE: Time and one-half to be paid for all overtime repair-maintenance work on existing equipment and facilities.

* Straight time first 8 hours, double time after 8 hours.

HOLIDAY
Paid: See (5, 6, 9, 11, 12, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 9, 11, 12, 15, 16, 25) on HOLIDAY PAGE
Good Friday may be exchanged for one of the holidays listed.

9-147Tnl/Comp Air

Mason 04/01/2026

JOB DESCRIPTION Mason **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2025
Brick/Block Layer	$ 68.84
"Base Wage"	57.30*

* For OVERTIME/PREMIUM CALCULATIONS purposes only.

SUPPLEMENTAL BENEFITS

Per Hour:

Brick/Block Layer	$ 36.70

OVERTIME PAY
See (A, E, E2, Q) on OVERTIME PAGE
* OVERTIME/PREMIUMS are calculated on Brick/Block Layer "Base Wage" then adding: $11.29 per hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Terms at the following Percentage of Brick/Block Layer "Base Wage" then adding $ 6.04 per hour.:

1st	2nd	3rd	4th	5th	6th
40%	50%	60%	70%	80%	90%

Supplemental Benefits per hour:

All Apprentices	$ 26.25

4-1Brk

Mason - Building — 04/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Building

	07/01/2025	01/01/2026
Wages per hour:		
Mosaic & Terrazzo Mechanic	$ 61.77	$ 62.27
Mosaic & Terrazzo Finisher	60.17	60.67

SUPPLEMENTAL BENEFITS
Per hour:

Mosaic & Terrazzo Mechanic	$ 31.56* + $10.91	$ 31.66* + $11.37
Mosaic & Terrazzo Finisher	$ 31.56* + 10.89	$ 31.66* + 11.35

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (A, E, Q) on OVERTIME PAGE
Deduct $7.00 from hourly wages before calculating overtime.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
Easter Sunday is an observed holiday.Holidays falling on a Saturday will be observed on that Saturday. Holidays falling on a Sunday will be celebrated on the Monday.

REGISTERED APPRENTICES
Wages Per hour:

	1st 0- 1500	2nd 1501- 3000	3rd 3001- 3750	4th 3751- 4500	5th 4501- 5250	6th 5251- 6000
07/01/2025	$25.50	$32.80	$40.21	$41.37	$49.69	$56.54
01/01/2026	$25.72	$33.06	$40.57	$41.80	$50.18	$56.58
Supplemental Benefits per hour:						
07/01/2025	$7.16*	$9.20*	$15.78*	$23.96*	$24.96*	$27.46*

	+ 3.83	+ 4.91	+ 6.55	+ 7.63	+ 8.74	+ 9.81
01/01/2026	$7.16*	$9.20*	$15.78*	$24.96*	$24.96*	$27.96*
	+ 3.98	+ 5.12	+ 7.95	+ 7.95	+ 9.10	+ 11.37

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/3

Mason - Building — 04/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2025	12/01/2025	06/01/2026 Additional
Tile Setters	$ 65.03	$ 65.54	$ 1.28

SUPPLEMENTAL BENEFITS
Per Hour:

	$ 29.61*	$ 30.11*
	+8.53	+8.54

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
Work beyond 10 hours on Saturday shall be paid at double the hourly wage rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

750 hour terms at the following wage rate:

	1st 1-750	2nd 751-1500	3rd 1501-2250	4th 2251-3000	5th 3001-3750	6th 3751-4500	7th 4501-5250	8th 5251-6000	9th 6001-6750	10th 6501-7000
07/01/2025	$22.34	$27.46	$34.56	$39.66	$43.35	$46.96	$50.23	$55.79	$58.36	$65.03
12/01/2025	$22.70	$27.86	$35.07	$40.22	$43.96	$47.61	$51.39	$56.55	$59.16	$65.54

Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2025	$13.00* + $.76	$13.00* + $.81	$16.11* + $.92	$16.11* + $.97	$17.11* +$1.44	$18.61* +$1.49	$19.61* +$1.92	$19.61* +$1.97	$19.61* +$4.57	$29.61* +$8.53
12/01/2025	$13.00* + $.76	$13.00* + $.82	$16.11* + $.92	$16.11* + $.97	$17.11* +$1.44	$18.61* +$1.50	$19.61* +$1.93	$19.61* +$1.98	$19.61* +$4.58	$30.11* +$8.54

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52

Mason - Building — 04/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2025	07/07/2025	01/05/2026

Building-Marble Restoration:			
Marble, Stone & Terrazzo Polisher	$ 47.93	$ 48.20	$ 48.36

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker:

Building-Marble Restoration:			
Marble, Stone & Polisher	$ 31.86	$ 32.16	$ 32.57

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
* On Saturdays, 8th hour and successive hours paid at double hourly rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES per hour:

900 hour term at the following wage:

	1st 1-900	2nd 901-1800	3rd 1801-2700	4th 2701
07/01/2025	33.54	38.34	43.13	47.93
07/07/2025	33.73	38.56	43.37	48.20
01/05/2026	33.84	38.68	43.51	48.36

Supplemental Benefits Per Hour:

07/01/2025	29.59	30.34	31.11	31.86
07/07/2025	30.19	30.84	31.51	32.16
01/05/2026	31.14	31.61	32.10	32.57

9-7/24-MP

Mason - Building — 04/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per Hour:

	07/01/2025	07/07/2025	01/05/2026
Marble Cutters & Setters	$ 64.21	$ 64.66	$ 65.21

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 40.51	$ 40.82	$ 41.02

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage Per Hour:

750 hour terms at the following wage

1st	2nd	3rd	4th	5th	6th	7th	8th
0-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500	7500+
07/01/2025							

$27.24	$40.84	$44.25	$47.63	$51.05	$54.58	$60.99	$64.21
07/07/2025							
$27.60	$41.50	$44.98	$48.45	$51.94	$54.81	$64.66	$64.66
01/05/2026							
$27.39	$41.07	$44.49	$47.91	$51.33	$53.73	$65.21	$65.21

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2025							
$26.88	$30.14	$30.95	$31.78	$32.59	$38.07	$39.71	$40.51
07/07/2025							
$26.95	$30.02	$30.78	$31.55	$32.32	$38.53	$40.82	$40.82
01/05/2026							
$28.60	$31.67	$32.43	$33.20	$33.97	$40.73	$41.02	$41.02

9-7/4

Mason - Building — 04/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

Per hour:	07/01/2025	12/01/2025	06/01/2026 Additional
Tile Finisher	$ 50.11	$ 50.44	$ 1.05*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

	$ 26.11*	$ 26.61*
	+ $8.35	+ $8.36

* This portion of benefits is subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (A, *E, Q) on OVERTIME PAGE
Double time rate after 10 hours on Saturdays

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88-tf

Mason - Building — 04/01/2026

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2025	07/07/2025	01/05/2026
Marble, Stone, Maintenance Finishers:	$ 27.99	$ 28.15	$ 28.30

Note 1: An additional $2.00 per hour for time spent grinding floor using "60 grit" and below.
Note 2: Flaming equipment operator shall be paid an additional $25.00 per day.

SUPPLEMENTAL BENEFITS
Per Hour:

Marble, Stone Maintenance Finishers:	$ 15.88	$ 16.13	$ 16.39

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
*Double hourly rate after 8 hours on Saturday

HOLIDAY
Paid: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
1st term apprentice gets paid for all observed holidays.

REGISTERED APPRENTICES
WAGES per hour:

	07/01/2025	07/07/2025	01/05/2025
0-750	$ 22.91	$ 23.39	$ 23.56
751-1500	23.59	24.02	24.20
1501-2250	24.26	24.67	24.83
2251-3000	24.95	25.29	25.46
3001-3750	25.96	26.25	26.41
3751-4500	27.32	27.52	27.68
4501+	27.99	28.15	28.30

Supplemental Benefits:
Per hour:

0-750	$ 12.43	$ 12.31	$ 12.50
751-1500	12.89	12.82	13.01
1501-2250	13.35	13.32	13.51
2251-3000	13.80	13.84	14.05
3001-3750	14.50	14.60	14.83
3751-4500	15.41	15.62	15.86
4501+	15.88	16.13	16.39

9-7/24M-MF

Mason - Building / Heavy&Highway — 04/01/2026

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per hour:

	07/01/2025	07/07/2025	01/05/2026 Additional
Marble-Finisher	$ 50.22	$ 50.44	$ 0.53

SUPPLEMENTAL BENEFITS
Journeyworker:
Per hour

Marble- Finisher	$ 37.69	$ 38.00

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
Work beyond 8 hours on a Saturday shall be paid at double the rate.

HOLIDAY
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
When an observed holiday falls on a Sunday, it will be observed the next day.

9-7/20-MF

Mason - Building / Heavy&Highway — 04/01/2026

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2025
Cement Mason	$ 59.87

SUPPLEMENTAL BENEFITS
Per Hour:

Cement Mason	$ 34.81
1.5x OVERTIME	$ 63.30
2X OVERTIME	$ 69.62

OVERTIME PAY
See (B1, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 13, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following wage:

1st	2nd	3rd
$ 23.77	$ 28.74	$ 34.27

Supplement Benefits per hour paid:

	1st	2nd	3rd
Straight Time	$ 14.86	$ 15.16	$ 15.27
1.5x OVERTIME	14.89	15.34	15.50
2X OVERTIME	14.91	15.51	15.73

4-780

Mason - Building / Heavy&Highway **04/01/2026**

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
NOTE: Shall include but not limited to Precast concrete slabs (London Walks) Marble and Granite pavers 2'x 2' or larger.
Per Hour:

	07/01/2025
Stone Setter	$ 71.77
"Base Wage"	55.87*

* For OVERTIME/PREMIUM CALCULATIONS purposes only.

SUPPLEMENTAL BENEFITS
Per Hour:

Stone Setter	$ 44.10

OVERTIME PAY
See (*C, **E, Q) on OVERTIME PAGE
* OVERTIME/PREMIUMS are calculated on Stone Setter "Base Wage" then adding: $15.90 per hour worked.

**On weekdays the eighth (8th) and ninth (9th) hours are time and one-half and all work thereafter is paid at double the hourly rate. On Saturday, the first nine (9) hours are paid at time and one-half and all work thereafter is paid at double the hourly rate.

HOLIDAY
Paid: See (*18) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 10) on HOLIDAY PAGE
Paid: * Must work first 1/2 of day.

REGISTERED APPRENTICES
Per Hour:

Terms at the following Percentage of Stone Setter "Base Wage" then adding:
$ 4.06 per hour worked for 1st Term
$ 7.32 per hour worked for all other terms

1st	2nd	3rd	4th	5th	6th
40%	50%	60%	70%	80%	90%

Supplemental Benefits:

1st Term	$20.76
All Other Terms	26.76

4-1Stn

Mason - Heavy&Highway — 04/01/2026

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour: 07/01/2025

Pointer, Caulkers & Cleaners	$ 65.59

SUPPLEMENTAL BENEFITS
Per Hour:

Pointer, Cleaners & Caulkers	$ 32.75

OVERTIME PAY
See (B, E2, H) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rates per hour.

1st	2nd	3rd	4th
$ 33.58	$ 38.04	$ 44.19	$ 53.10

Supplemental Benefits per hour paid:

1st	2nd	3rd	4th
$ 15.95	$ 20.05	$ 23.80	$ 24.80

4-1PCC

Operating Engineer - Building — 04/01/2026

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

PARTIAL COUNTIES
Dutchess: that part of Dutchess County lying south of the North City Line of the City of Poughkeepsie.

WAGES
NOTE: Construction surveying
Party Chief--One who directs a survey party
Instrument Man--One who runs the instrument and assists Party Chief.
Rodman--One who holds the rod and assists the Survey Crew

Wages:(Per Hour) 07/01/2025

Building Construction:

Party Chief	$ 81.94
Instrument Man	60.49
Rodman	40.63

Steel Erection:

Party Chief	$ 84.04
Instrument Man	63.19
Rodman	43.31

Heavy Construction-NYC counties only:
(Foundation, Excavation.)

Party Chief	$ 88.97
Instrument man	66.04
Rodman	55.85

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2025
Building Construction	$ 29.45* + 7.65
Steel Erection	31.25* + 7.65
Heavy Construction	32.06* + 7.64

* This portion subject to SAME premium as wages

Non-Worked Holiday Supplemental Benefit:
$ 22.48

OVERTIME PAY
See (A, B, E, Q) on OVERTIME PAGE
Code "A" applies to Building Construction and has double the rate after 7 hours on Saturdays.
Code "B" applies to Heavy Construction and Steel Erection and has double the rate after 8 hours on Saturdays.

HOLIDAY

Paid:	See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime:	See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

9-15Db

Operating Engineer - Building, Maintenance, Steel Erection & Heavy Construction — 04/01/2026

JOB DESCRIPTION Operating Engineer - Building, Maintenance, Steel Erection & Heavy Construction **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
STEEL ERECTION:

Group 1: Derrick, travelers, tower, crawler tower & climbing cranes

Group 2: Oiler (Truck Crane)

Group 3: Oiler (Crawler Crane)

BUILDING CONSTRUCTION:

Group 1: Installing, repairing, maintaining, dismantling of all equipment including Steel cutting& bending machines, mechanical heaters, mine hoists, climbing cranes, tower cranes, Linden Peine, Lorain, Liebherr, Mannes and machines of a similar nature; Well Point system, Deep Well pumps, Concrete mixers with loading devices, Concrete plants, motor generators (When used for temporary power and lights(Driving maintenance trucks and mounted-welded machines)-All Pumps(excluding River Cofferdam Pumps and Well Point Pumps), Motorized Concrete Buggies(When three or more are on job site), Skid-Steer and similar machines

Group 2:Maintenance of: Pumps, Generators, Mixers, Heaters

Group 3: Oilers of all gasoline, electric, diesel or air operated Gradalls; Concrete Pumps, Overhead Cranes in Power Houses, Assist in oiling, greasing and repairing of all machines, including: Driving Truck Cranes, Driving and operating Fuel and Grease Trucks, Cherry Pickers(Hydraulic Cranes) over 70,000 GVW and machines of a similar nature

Group 4: Oiler on Crawler Cranes, Backhoes, Trenching Machines, Gunite Machines, Compressors(3 or more in battery)

Group 5: Maintenance on Radiant Mechanical Heaters

HEAVY CONSTRUCTION (Excavation, Foundations, etc)

Group 1:Maintenance of: Generators, Light Towers

Group 2:Maintenance of: Pumps, Mixers including mudsucking

Group 3: Base Mounted Tower Cranes

Group 4: Installing, repairing, maintaining, dismantling(of all equipment including Steel cutting & Bending machines, Fusion Coupling Machines, Vermeer Trenching machines, on-site crushing plant, mechanical heaters(1 through 7),Mine hoists, Tower Cranes, Linden Peine, Lorrain, Lebherr, Mannes or machines of a similar nature, Wellpoints)-Driving maintenance trucks and truck mounted welding machines, burning, welding-operating of accumilator for shield-driven tunnels, in addition to the performance of other duties: Handling, installation, jointing, coupling of all permanent steel and plastic pipe. RIDE UPON MOLES-tunnel boring machines-MICRO TUNNELING SYSTEMS, All temporary pipefitting;When three or more motorized concrete buggies(Ride type)are utilized on the jobsite they shall be serviced, maintained and repaired by the maintenance engineer. The Operating Engineer on autogrades(C.M.I.)is to be assisted by the maintenance engineer who shall in addition perform other duties.

WAGES:

Per hour:	07/01/2025
Steel Erection:	
Group 1	$ 83.44
Group 2	78.48
Group 3	58.31
Building Construction:	
Group 1	$ 72.50
Group 2	57.45
Group 3	69.18
Group 4	52.71
Group 5	46.16
Heavy Construction:	
Group 1	$ 58.75
Group 2	60.12
Group 3	111.47
Group 4	86.18

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2025
Building Construction:	$ 31.43* + $7.40
Steel Erection & Heavy	31.93* + $7.40

* This portion of benefits is subject to same OT premium as wages.

Non-Worked Holiday Supplemental Benefits:

Building Construction:	$ 22.28
Steel Erection & Heavy:	22.53

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY

Paid:	See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime:	See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages Per Hour:
(1) year terms at the following wage rates:

1st	2nd	3rd	4th.
$ 39.41	$ 46.58	$ 50.17	$ 53.75

Supplemental Benefits:
Per Hour:
All Terms $ 17.18* + 7.40

* This portion of benefits is subject to same OT premium as wages.

9-15Ab

Operating Engineer - Building / Heavy&Highway **04/01/2026**

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES

EQUIPMENT COVERED: Jet-Rodder/Vacuum Truck, Flusher, Sewer Rodder, Stetco Hoist and similar, Sewer Winch/Tugger Hoist and similar, Vacall/Vactor, Closed Circuit Television Inspection Equipment, Chemical Grouting Equipment and similar, John Beame, Meyers and similar.

Per Hour:	07/01/2025
Maintenance Engineer (Sewer Systems)	$ 86.18

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyman	$ 31.93*
	+ $ 7.40

*This portion of benefits subject to SAME premium as OT wages.

Non-Worked Holiday Supplemental Benefits:
$ 22.53

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour:
(1) year terms at the following wage rates.

1st	2nd	3rd	4th
$39.41	$46.58	$50.17	$53.75

Supplemental Benefits:
Per Hour:

All Apprentices:	$ 17.18*
	+ $ 7.40

* This portion of benefits subject to the SAME premium as OT wages

9-15Sewer

Operating Engineer - Building / Heavy&Highway — 04/01/2026

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2025	08/01/2025
Well Driller	$ 43.11	$ 44.37
Well Driller Helper	37.35	38.44

Hazardous Waste Differential Added to Hourly Wage:

Level A	$ 3.00
Level B	$ 2.00
Level C	$ 1.00

Monitoring Well Work Add to Hourly Wage:

Level A	$ 3.00
Level B	$ 2.00

SUPPLEMENTAL BENEFITS
Per Hour:

Well Driller	10% of Total Wage at

& Helper Straight time rate plus $ 13.50*

*Additional $ 4.25/Hr. for Premium Time Hours Worked

OVERTIME PAY
See (B2, P, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 16, 23) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES
Apprentices at 12 Month Terms

Wages Per Hour:

	1st	2nd	3rd
07/01/2025	$ 28.00	$ 29.00	$ 30.00
08/01/2025	$ 29.40	$ 30.43	$ 31.46

SUPPLEMENTAL BENEFITS
Per Hour:
All Terms 10% of Total Straight time wage plus $ 13.50*

*Additional $ 4.25/Hr. for Premium Time Hours Worked

4-138well

Operating Engineer - Building & Steel Erection 04/01/2026

JOB DESCRIPTION Operating Engineer - Building & Steel Erection **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per Hour: 07/01/2025
STEEL ERECTION:

Three Drum Derricks	$ 108.57
Cranes, Two Drum Derricks, Hydraulic Cranes & Fork Lifts, Boom Trucks	104.60
Compressors, Welding Machines	62.36
Compressors (not combined with welding machines)	59.71

BUILDING CONSTRUCTION:

Cranes, Stone Derrick, Boom Trucks, Hydraulic Cranes, Double Drum	104.87
4 Pole Hoists and Single Drum Hoists	99.40
Fork Lifts, Plaster(Platform Machine)Plaster Bucket, Concrete Pumps and all other equipment used for hoisting	86.78
House Cars and Rack & Pinion	79.54
House Cars (New Projects)	70.35
Erecting and dismantling Cranes	57.47
Compressors, Welding Machines(Cutting Concrete-Tank Work), Paint Spraying, Sand Blasting, Pumps(With the exclusion of concrete pumps), House Car (Settlement basis only), All Engines irrespective of power(Power-Vac)used to drive auxiliary equipment Air, Hydraulic, etc., Boilers, Jacking System	87.64
	61.20

APPLICABLE TO BUILDING CATEGORY:
CRANES: Crawler Or Truck

	In Addition To Above Crane Rates
100' to 149' Boom	$ 1.75/hr

150' to 249' "	$ 2.00/hr
250' to 349' "	$ 2.25/hr
350' to 450' "	$ 2.75/hr
Tower Crane	$ 2.00/hr

APPLICABLE TO STEEL CATEGORY:
CRANES: Crawler Or Truck

	In Addition To Above Crane Rates
100' to 149' Boom	$ 2.25/hr
150' to 249' "	$ 2.50/hr
250' to 349' "	$ 2.75/hr
350' to 450' "	$ 3.25/hr
Tower Crane	$ 2.50/hr

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2025
All Operator Classes	$ 28.15* plus $ 6.30

* This portion of the benefits is subject to the same premium as shown for overtime wages.

OVERTIME PAY
See (*B, **C, ***D, O) on OVERTIME PAGE
*Applies to House Cars and Rack & Pinion after 8 hours worked in a day, Saturday, Sunday and Holidays
**Applies to Building Construction category
***Applies to Steel Erection

HOLIDAY
Paid: See (5, 6, 8, 11, 12, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 12, 15, 16, 25, 26) on HOLIDAY PAGE
Codes 8 and 12 apply ONLY to Steel Erection
Code 16 applies ONLY to Building Construction

REGISTERED APPRENTICES
Wage Per Hour:

Apprentices (1) year terms at the following rates:

	1st	2nd	3rd
07/01/2025	$ 45.41	$ 55.00	$ 64.58

Supplemental Benefits Per Hour:

	07/01/2025
Straight Time	$ 17.65* plus $ 6.30

* This portion of benefits subject to the same premium as shown for overtime wages.

9-14 B&S

Operating Engineer - Heavy Construction 1 — 04/01/2026

JOB DESCRIPTION Operating Engineer - Heavy Construction 1 **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
(For Groups 23 - 28, see Operating Engineer - Heavy Construction 2)

Group 1: Tower Crane/Climbing Crane
Group 2: Backhoes (Including all track and rubber tire backhoes over 37,000 lbs), Power Shovels, Steel Erection: Hydraulic Clam Shells, Moles and machines of a similar nature
Group 3: Mine Hoists, Cranes, etc, used as Mine Hoists
Group 4: Gradalls, Keystones, Cranes (With digging buckets), Bridge Cranes, Trenching Machines, Vermeer Cutter and machines of a similar nature
Group 5: Pile Drivers and Rigs (Employing Dock-Builders Foreman), Derrick Boats, Tunnel Shovels,
Group 6: All Drills and machines of a similar nature
Group 7: Back-Filling Machines and Cranes, Mucking Machines, Dual Drum Pavers
Group 8: Mixers (Concrete with loading attachment), Concrete Pavers, Cableways, Land Derricks, Power House (Low pressure units)
Group 9: Concrete Pumps, Concrete Plant, Stone Crushers, Double Drum Hoists, Power Houses (Other than above)
Group 10: Concrete Mixer

Group 11: Elevators
Group 12: Concrete Breaking Machines, Single Drum Hoists, Load Masters, Locomotives and Dinkies (Over 10 tons), Hydraulic Crane-Second Engineer
Group 13: On-Site Concrete Plant Engineers, On-Site Asphalt Plant Engineer and Vibratory Console
Group 14: Barrier Mover, Barrier Transport and machines of a similar nature
Group 15: Compressors (Portable, 3 or more), Truck Compressor (Engineer Driver), Tugger Machines, Well Point Pumps, Chum Drill
Group 16: Boilers(High pressure),Compressors, Pumps(River Cofferdam) and Welding Machines(except where arc is operated by another Operating Engineer) Push Button Machines, All Engines, irrespective of power(Power Pac) used to drive auxiliary equipment, Air, Hydraulic, etc.
Group 17: Utility-Horizontal Boring Rig
Group 18: Utility Compressors
Group 19: Paving-Asphalt Spreader, Autogrades (C.M.I.), Roto-Mill
Group 20: Paving-Asphalt Roller
Group 21 Paving-Asphalt Plant
Group 22: Roller (non paving, all sizes)

WAGES:(per hour)	07/01/2025
Group 1	$ 124.68
Group 2	104.14
Group 3	107.26
Group 4	104.83
Group 5	102.91
Group 6	99.09
Group 7	100.82
Group 8	98.12
Group 9	96.22
Group 10	92.29
Group 11	86.70
Group 12	88.46
Group 13	89.05
Group 14	80.64
Group 15	68.95
Group 16	64.60
Group 17	93.69
Group 18	64.22
Group 19	98.12
Group 20	95.80
Group 21	82.09
Group 22	95.80

Cranes: Crawler or Truck

100' to 149'	$0.50 per hour additional to above Crane Rates
150' to 249'	$0.75 per hour additional to above Crane Rates
250' to 349'	$1.00 per hour additional to above crane Rates
350' to 450'	$1.50 per hour additional to above crane Rates

SUPPLEMENTAL BENEFITS
Per Hour:
Groups 1-22
Regular Time $ 28.15* plus $ 6.30

* This portion of benefits subject to the same premium as shown for wages.

Non-Worked Holiday Supplemental Benefits:
$ 22.80

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour:
(1) year terms at the following wage rates:

Groups 1-22	1st	2nd	3rd
	$ 45.41	$ 55.00	$ 64.58

Supplemental Benefits:

Groups 1-22
Regular Time $ 17.65*
plus $ 6.30

* This portion of benefits is subject to the SAME PREMIUM as shown for overtime wages

9-14 HC

Operating Engineer - Heavy Construction 2 **04/01/2026**

JOB DESCRIPTION Operating Engineer - Heavy Construction 2 **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
(For Groups 1 - 22, see Operating Engineer - Heavy Construction 1)

Group 23: Cherry Picker (Over 20 tons), Loader (Over 6 yards)

Group 24: Backhoes and Loaders (Up to 37,000lbs), Bulldozers, Scrapers, Turn-A-Pulls, Tugger Hoists, Tractors, Hysters, Roustabout Cranes, Conveyors, Ballast Regulators (Ride On), Track Removal Machine or similar, Motor Graders, Locomotives (10 tons and under),Curb & Gutter Pavers and machines of a similar nature

Group 25: Post Hole Digger, Ditch Winch, Road Finishing Machines, Rollers (5 tons and under, Dual Purpose Trucks, Forklifts, Dempsey Dumpsters, Fireman

Group 26: Service Engineer (Gradalls, Concrete Pumps, Cold Planers Grader)

Group 27: Service Mechanic (Shovels, Draglines, Crawler Cranes, Backhoes, Trenching Machines, Compressors (3 or more in battery)

Group 28: Steam Equipment Operator (Water rigs, steam shovels, power boilers, derrick boats)

WAGES:(per hour)	07/01/2025
Group 23	$ 89.06
Group 24	86.57
Group 25	82.43
Group 26	78.23
Group 27	55.82
Group 28	82.43

Cranes: Crawler or Truck

100' to 149'	$0.50 per hour additional to above Crane Rates
150' to 249'	$0.75 per hour additional to above Crane Rates
250' to 349'	$1.00 per hour additional to above crane Rates
350' to 450'	$1.50 per hour additional to above crane Rates

SUPPLEMENTAL BENEFITS
Per Hour:
Groups 23-28
Regular Time $ 31.93*
+ $7.40

* This portion of benefits subject to the same OT premium as wages.

Non-Worked Holiday Supplemental Benefits:
$ 22.53

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour:
(1) year terms at the following wage rates:

1st	2nd	3rd	4th

Groups 23-28	$ 39.41	$ 46.58	$ 50.17	$ 53.75

Supplemental Benefits:

Regular Time $ 17.18*
+ $ 7.40

* This portion of benefits subject to same OT premium as wages.

9-15 HC

Operating Engineer - Marine Dredging 04/01/2026

JOB DESCRIPTION Operating Engineer - Marine Dredging **DISTRICT** 4

ENTIRE COUNTIES
Albany, Bronx, Cayuga, Clinton, Columbia, Dutchess, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Orange, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES
These wage rates do not apply to Operating Engineers on land-based construction projects. For those projects, refer to the Operating Engineers Heavy/Highway rates. The wage rates listed below apply specifically to all equipment and operators involved in marine dredging work within navigable waters located in the counties listed above.

Per Hour:	07/01/2025	10/01/2025
CLASS A1 Deck Captain, Leverman, Mechanical Dredge Operator, Licensed Tug Operator with MOTV	$ 47.07	$ 48.48
CLASS A2 Crane Operator (360 swing)	41.94	43.20
CLASS B Dozer, Front Loader Operator (On Land)	To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits.	
CLASS B1 Derrick Operator (180 swing), Spider/Spill Barge Operator I/II, Fill Placer, Engineer, Chief Mate, Electrician,Chief Welder,Maintenance Engineer, Licensed Boat, Crew Boat Operator	40.71	41.93
CLASS B2 Certified Welder	38.31	39.46
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	37.26	38.38
CLASS C2 Boat Operator	36.07	37.15
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	29.96	30.86

SUPPLEMENTAL BENEFITS
Per Hour:
THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes: 7% of Hourly Straight time wage + $12.00.

Additional $0.63 per hour for Overtime hours

OVERTIME PAY
See (B2, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

Operating Engineer - Survey Crew - Consulting Engineer — 04/01/2026

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
Dutchess: That part in Duchess County lying South of the North City line of Poughkeepsie.

WAGES
Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour:	07/01/2025
Survey Classifications	
Party Chief	$ 51.16
Instrument Man	42.44
Rodman	36.92

SUPPLEMENTAL BENEFITS
Per Hour:

All Crew Members:	$ 24.53

OVERTIME PAY
OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.
*Double-time paid on the 9th hour on Saturday.

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

9-15dconsult

Painter — 04/01/2026

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2025	05/01/2026
Brush	$ 54.56	Additional $2.69*
Abatement/Removal of lead based or lead containing paint on materials to be repainted.	54.56	
Spray & Scaffold	$ 57.56	
Fire Escape	57.56	
Decorator	57.56	
Paperhanger/Wall Coverer	55.62	

*To be allocated at a later date.

SHIFT WORK
Counties of Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, and Westchester; Agency/Government mandated off-shift work to be paid at time and one-half the hourly wage.

SUPPLEMENTAL BENEFITS
Per hour:

Paperhanger	$ 38.82
All others	35.23
Premium	39.36**

**Applies only to "All others" category, not paperhanger journeyworker.

OVERTIME PAY
See (A, E, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rate.

Per hour:	07/01/2025
Appr 1st term...	$ 20.76
Appr 2nd term...	26.72
Appr 3rd term...	32.51
Appr 4th term...	43.64

Supplemental benefits:

Per Hour:	
Appr 1st term...	$ 17.40
Appr 2nd term...	21.47
Appr 3rd term...	24.77
Appr 4th term...	31.43

8-NYDC9-B/S

Painter 04/01/2026

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

PARTIAL COUNTIES
Nassau: Atlantic Beach, Ceaderhurst, East Rockaway,Hewlett, Hewlett Bay, Hewlett Neck, Hewlett Park, Inwood, Lawrence, Lido Beach, Long Beach, parts of Lynbrook, parts of Oceanside, parts of Valley Stream, and Woodmere. Starting on South side of Sunrise Hwy in Valley Stream running east to Windsor and Rockaway Ave, Rockville is the boundary line up to Lawson Blvd, turning right going west all the above territory. Starting at Union Turnpike &Lakeville Rd going north to northern Blvd. the west side of Lakeville Rd to Northern Blvd. At Northern Blvd doing east the district north of Northern blvd to Port Washington blvd. West of Port Washington blvd to St.Francis Hospital then north of first traffic light to Port Washington & Sands Point, Manor Haven, & Harbour Acres.

WAGES

Per hour:	07/01/2025
Drywall Taper	$ 58.94

SHIFT WORK
When directly specified in public agency or authority contract documents for an employer to work an irregular or off-shift, all employees who work any shifts between 3pm-11pm or 11pm-7am will be paid wage rate as followed:

$ 67.37

SUPPLEMENTAL BENEFITS

Per Hour:	
Journeyworker:	$ 26.29

OVERTIME PAY
See (A, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (4, 6, 8, 11, 18, 19, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

1st term	$ 23.18
2nd term	29.81
3rd term	35.63
4th term	47.29

Supplemental Benefits per hour:

1st term	$ 14.83
2nd term	20.56
3rd term	21.71
4th term	24.00

8-NYC9-1974-DWT

Painter - Bridge & Structural Steel **04/01/2026**

JOB DESCRIPTION Painter - Bridge & Structural Steel **DISTRICT** 8

ENTIRE COUNTIES
Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES
Per Hour:
STEEL:

Bridge Painting:	07/01/2025	10/01/2025
	$ 56.25	$ 57.00
	+ 11.10*	+ 12.10*

ADDITIONAL $7.00 per hour for POWER TOOL/SPRAY, whether straight time or overtime.

NOTE: All premium wages are to be calculated on base rate per hour only.

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

** To be allocated a later date

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SHIFT WORK
When directly specified in public agency or authority contract documents for an employer to work a second shift and works the second shift with employees other than from the first shift, all employees who work the second shift will be paid 10% of the base wage shift differential in lieu of overtime for the first eight (8) hours worked after which the employees shall be paid at time and one half of the regular wage rate. When a single irregular work shift is mandated in the job specifications or by the contracting agency, wages shall be paid at time and one half for single shifts between the hours of 3pm-11pm or 11pm-7am.

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker:		
	$ 13.33	$ 13.49
	+ 30.76*	+ 31.27*

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage - Per hour:
Apprentices: (1) year terms.

	07/01/2025	10/01/2025
1st year	$ 22.50	$ 22.80
	+ 4.44	+ 4.54*
2nd year	$ 33.75	$ 34.20
	+ 6.63	+ 7.26*
3rd year	$ 45.00	$ 45.60
	+ 8.88	+ 10.60*
Supplemental Benefits - Per hour:		
1st year	$ 1.52	$ 18.63*
	+ 12.51	
2nd year	$ 8.00	$ 8.09
	+ 18.47	+ 19.04*

3rd year	$ 10.66	$ 10.79
	+ 24.62	+ 25.39*

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Metal Polisher — 04/01/2026

JOB DESCRIPTION Painter - Metal Polisher **DISTRICT** 8

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2025
Metal Polisher	$ 40.33
Metal Polisher*	41.43
Metal Polisher**	44.33

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS
Per Hour: 07/01/2025

Journeyworker:
All classification $ 13.44

OVERTIME PAY
See (B, E, P, T) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year term at the following wage rates:

	07/01/2025
1st year	$ 20.17
2nd year	22.18
3rd year	24.20
1st year*	$ 20.56
2nd year*	22.62
3rd year*	24.74
1st year**	$ 22.67
2nd year**	24.68
3rd year**	26.70

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
Per hour:

1st year	$ 8.94
2nd year	8.94
3rd year	8.94

8-8A/28A-MP

Plasterer — 04/01/2026

JOB DESCRIPTION Plasterer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per hour:

	07/01/2025	08/01/2025
Building:		
Plasterer/Traditional &	$ 47.99	$ 49.18
Spraying Fireproofing	+ $5.62*	+ $6.00*

*This portion is not subjected to OT premiums.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 26.10

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages:	07/01/2025
(Per hour)	
800 hours term:	
1st term	$ 19.44 + 0.68*
2nd term	22.69 + 0.81*
3rd term	25.98 + 0.95*

*This portion is not subjected to OT premiums.

Supplemental Benefits:	
(Per hour):	
(800) hours term:	
1st term	$ 11.95
2nd term	12.44
3rd term	13.08

9-262

Plumber — 04/01/2026

JOB DESCRIPTION Plumber **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2025
Plumber	$ 76.30
Temporary Service**	$ 61.12

** Temporary Service- Includes Maintenance of cooling & heating apparatus, maintenance work on pneumatic systems during the construction period, and work on temporary heat. All hours paid at straight time, including holidays.

**THERE ARE NO HELPERS UNDER THIS CLASSIFICATION.

On tower work, bridges, elevated highway, or buildings, where pipe is being installed, fifty (50) or more feet vertically in a free drop from its base, an additional $1.00 per hour.

SHIFT WORK
Shift work, when directly specified in public agency or authority contract documents, and continues for a period of not less than ten (10) consecutive work days. A shift shall consist of seven(7) hours with one-half (1/2) hour for lunch after the first four (4) hours of each shift. A premium of thirty percent (30%) for wages and supplemental benefits on shift work performed Monday through Friday on the 4 P.M. and midnight shifts.
For shift work performed on weekends the shift premium shall be fifty percent (50%) of wages and supplemental benefits.

For shift work performed on holidays designated below, double time wages and supplemental benefits shall be paid. Also noted that the normal workday Monday through Friday 8:00 A.M. to 3:00 P.M. is not considered shift work, and therefore not subject to shift premium.

SUPPLEMENTAL BENEFITS
Per hour:

Plumber	$ 45.15
Temporary Service	$ 36.04

OVERTIME PAY
See (C, *D, O, V) on OVERTIME PAGE
*Where the plumbing contract price is one and one half million dollars ($1,500,000.00) or less, code D applies.

HOLIDAY

Plumber	
Overtime:	See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE.
Repairs & Maintenance	
Paid:	See (1) on HOLIDAY PAGE.
Overtime:	See (5, 6, 25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:

(1/2) year terms at the following wage:

1st	2nd	3rd&4th	5th&6th	7th&8th	9th	10th
$ 19.00	$ 21.00	$ 30.90	$ 33.00	$ 35.85	$ 37.25	$ 49.32

Supplemental Benefits:
(1/2) year term at the following dollar amount:

1st	2nd	3rd-10th
$ 5.43	$ 6.43	$ 23.81

9-1 Const

Plumber - Pump & Tank: Oil Trades Installation & Maintenance — 04/01/2026

JOB DESCRIPTION Plumber - Pump & Tank: Oil Trades Installation & Maintenance **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2025
Pump & Tank	$ 74.00

SUPPLEMENTAL BENEFITS
Per hour:

Plumber	$ 34.31

OVERTIME PAY
Pump & Tank See (B, F, H) on OVERTIME PAGE.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE.
Overtime:	See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE.

9-1-P&T

Plumber - Repairs & Maintenance — 04/01/2026

JOB DESCRIPTION Plumber - Repairs & Maintenance **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per hour:

	07/01/2025
Repairs & Maintenance	$ 48.90

Repair & Maintenance work is any repair and/or replacement of present plumbing system that does not change existing roughing or water supply lines. Projects regardless of work type which have approved plans and specifications wherein the plumbing exceeds $725,000 are excluded.

SUPPLEMENTAL BENEFITS
Per hour:

Repair Maintenance	$ 22.26

OVERTIME PAY

Repairs & Maintenance	See (B, H) on OVERTIME PAGE.

HOLIDAY

Repairs & Maintenance	
Paid:	See (1) on HOLIDAY PAGE.
Overtime:	See (5, 6, 25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Note: The Repairs & Maintenance Category has NO Apprentices.

9-1 R&M

Roofer — 04/01/2026

JOB DESCRIPTION Roofer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2025	05/01/2026
		Additional
Roofer/Waterproofer	$ 50.25 + $7.00*	+ $ 2.75

* This portion is not subjected to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS
Per Hour: $ 32.62

OVERTIME PAY
See (B, H) on OVERTIME PAGE
Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year term apprentices indentured prior to 01/01/2023

1st	2nd	3rd	4th
$ 17.59	$ 25.13 + 3.50*	$ 30.15 + 4.20*	$ 37.69 + 5.26*

Supplements:

1st	2nd	3rd	4th
$ 4.22	$ 16.69	$ 19.87	$ 24.65

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

1st	2nd	3rd	4th	5th
$ 19.10	$ 22.61 + 3.16*	$ 25.13 + 3.50*	$ 30.15 + 4.20*	$ 37.69 + 5.26*

Supplements:

1st	2nd	3rd	4th	5th
$ 7.95	$ 15.09	$ 16.69	$ 19.87	$ 24.65

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker — 04/01/2026

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour:

	07/01/2025
Sign Erector	$ 60.00

NOTE: For Structurally Supported Overhead Highway Signs (See STRUCTURAL IRON WORKER CLASSIFICATION)

SUPPLEMENTAL BENEFITS
Per Hour:

	07/01/2025
Sign Erector	$ 58.31

OVERTIME PAY
See (B, F, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour:
6 month Terms at the following percentage of Sign Erectors wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	40%	45%	50%	55%	60%	65%	70%	75%	80%

SUPPLEMENTAL BENEFITS Per Hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 18.65	$ 21.16	$ 23.69	$ 26.22	$35.39	$ 38.52	$ 42.55	$ 45.75	$ 48.96	$ 52.15

4-137-SE

Sheetmetal Worker **04/01/2026**

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES

Per Hour:	07/01/2025
Sheetmetal Worker	$ 62.34
Maintenance of Fans Temporary Operation	$ 51.42

SUPPLEMENTAL BENEFITS
Per Hour:

All Classifications:	$ 55.00
Premium*:	$ 80.81
Premium**:	$ 106.62

* Applies to instances where 1-1/2 regular rate are paid
**Applies to instances where 2 times the rate are paid.

OVERTIME PAY
See (B, *E, E2, Q) on OVERTIME PAGE
* Double the hourly rate on Saturday after 10 Hours

Maintenance of Fans
Temporary Operation: B,E, & Q

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Six(6) Month Terms As Follows:
Wages per hour:

1st & 2nd Term	3rd & 4th Term	5th & 6th Term	7th & 8th Term	9th Term
$ 21.70	$ 27.95	$ 34.21	$ 43.63	$ 49.85

Supplemental Benefits Per Hour:

	1st & 2nd Term	3rd & 4th Term	5th & 6th Term	7th & 8th Term	9th Term
Straight Time:	$ 20.27	$ 27.52	$ 32.53	$ 40.00	$ 45.02
Premium*:	$ 29.77	$ 40.45	$ 47.87	$ 58.78	$ 66.15
Premium**:	$ 39.26	$ 53.38	$ 63.08	$ 77.56	$ 87.28

* Applies to instances where 1-1/2 regular rate are paid
**Applies to instances where 2 times the rate are paid.

4-28

Steamfitter **04/01/2026**

JOB DESCRIPTION Steamfitter **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2025
AC Service/Heat Service & Refrigeration	$ 46.60

Includes installation, service, maintenance, repair and replacement, of refrigeration, A/C, Oil Burner and Stoker.

NOTE: Refrigeration Compressor installation. (Not to exceed 5 Hp combined on any one project).

NOTE: Air / Heating Compressor installation.(Not to exceed 15 tons combined on any one project).

SUPPLEMENTAL BENEFITS
Per Hour Worked:

AC Service/Heat Service & Refrigeration	$ 22.71
Per hour Paid:	$ 19.65

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms at the following wages per hour:

1st	2nd	3rd	4th
$ 22.55	$ 27.23	$ 31.72	$ 38.31

Supplemental Benefits per hour worked:

1st	2nd	3rd	4th
$ 14.93	$ 16.43	$ 17.99	$ 20.10

Supplemental Benefits for hours paid:

1st	2nd	3rd	4th
$ 11.87	$ 13.37	$ 14.93	$ 17.04

4-638B-StmFtrRef

Steamfitter 04/01/2026

JOB DESCRIPTION Steamfitter **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

WAGES
Per Hour:

	07/01/2025	10/01/2025	04/01/2026
Sprinkler/Steam AC & Heat Fitter	$ 70.36	$ 70.36	$ 70.36
Temporary Heat & AC Fitter	53.49	53.49	53.49

SHIFT WORK
Add 15% to Hourly Wage and Hourly Supplemental Benefit for "Contracting Agency" Mandated Off Shift Work.

SUPPLEMENTAL BENEFITS
Per Hour:

Sprinkler/Steam Fitter	$ 54.24	$ 54.99	$ 56.49
Temporary Heat & AC Fitter	44.43	45.00	46.14

OVERTIME PAY
Note: The posted overtime rates are applicable after 8 hours plus Saturday, Sunday and Holidays:

Per Hour:

Wages	07/01/2025	10/01/2025	04/01/2026
Sprinkler/Steam	$ 140.66	$ 140.66	$ 140.66
Temp Heat/AC	106.92	106.92	106.92

Supplemental Benefits per hour:

Sprinkler/Steam	$ 107.64	$ 109.14	$ 112.14
Temp Heat/AC	88.02	89.16	91.44

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms at the following wages Per hour:

	1st	2nd	3rd	4th	5th
07/01/2025	$ 28.18	$ 35.21	$ 42.24	$ 49.27	$ 56.30
10/1/2025	28.18	35.21	42.24	49.27	56.30
04/01/2026	28.18	35.21	42.24	49.27	56.30

PREMIUM TIME Wages per hour:

	1st	2nd	3rd	4th	5th
07/01/2025	$ 56.30	$ 70.36	$ 84.42	$ 98.48	$ 112.54
10/01/2025	56.30	70.26	84.42	98.48	112.54
04/01/2026	56.30	70.26	84.42	98.48	112.54

Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th
07/01/2025	$ 22.20	$ 27.55	$ 32.88	$ 38.23	$ 43.56
10/01/2025	22.50	27.92	33.33	38.75	44.16
04/01/2026	23.10	28.67	34.23	39.80	45.36

PREMIUM TIME Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th
07/01/2025	$ 43.56	$ 54.26	$ 64.92	$ 75.62	$ 86.28
10/01/2025	44.16	55.00	65.82	76.66	87.48
04/01/2026	45.36	56.50	67.62	78.76	89.88

4-638A-StmSpFtr

Teamster - Asphalt Delivery 04/01/2026

JOB DESCRIPTION Teamster - Asphalt Delivery **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES
Per Hour:

	07/01/2025
Truck Driver Heavy Construction Asphalt Delivery	$ 45.645

Heavy Construction Work:
Shall include the supply of Asphalt for construction, improvement and modification of all or any part of Streets, Highways, Bridges, Tunnels, Railroads, Canals, Dams, Airports, Schools, Power Generation Plants, where distance between project and asphalt plant is not more than 50 miles.

Truck Driver Light Construction Asphalt Delivery	$ 44.90

Light Construction Work:
Shall include the supply of Asphalt for construction of Single & Multi Family Homes, Town Houses, Apartment Buildings, including Driveways, Streets and Curbs within those projects. Parking Lots, Office Buildings, where distance between project and asphalt plant is not more than 50 miles.

SHIFT WORK
PREMIUM PAY of 25% on straight time hours for New York State D.O.T. and or other GOVERNMENTAL MANDATED off shift work.

SUPPLEMENTAL BENEFITS
Per Hour:

Truck Driver Heavy Construction Asphalt Delivery	$ 56.2025
Truck Driver Light Construction Asphalt Delivery	$ 13.25

OVERTIME PAY
See (B, B2, E, I, P, R, T, U) on OVERTIME PAGE
Note: (B,E,P,T,&U) Apply to Heavy Construction Driver.
Note: (B2,I,T,&U) Apply to Light Construction Driver.
Note: (U) Only applies after 8 hours worked on holiday.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, *16, **25) on HOLIDAY PAGE
*Paid at Double if Worked
**Paid at Double if Worked.

4-282

Teamster - Delivery of Concrete 04/01/2026

JOB DESCRIPTION Teamster - Delivery of Concrete **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

WAGES
Per Hour:

Effective 01/01/2026

	01/01/2026
Concrete Delivery	$ 43.29
	+ 2.66

SUPPLEMENTAL BENEFITS
Per Hour:

Asphalt & Concrete Delivery Driver	$ 46.85

OVERTIME PAY
See (B, E, P, *R, **U, ***V) on OVERTIME PAGE
Note: R* for Holidays 2, 11, & 15 ONLY
U** for Holidays 5 & 6 ONLY
V*** paid at $13.25 per hour worked ONLY

HOLIDAY
Paid: See (5, 6, 11, 25) on HOLIDAY PAGE
Overtime: See (2, 5, 6, 11, 15) on HOLIDAY PAGE

9-282nyc

Teamster - Heavy Construction 04/01/2026

JOB DESCRIPTION Teamster - Heavy Construction **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond

WAGES
Per Hour:
Drivers (Debris Removal Street Level and below)

	07/01/2025
Dump Trucks	$ 46.115
Tractor Trailers	48.815
Euclid/Turnapull	49.38

SUPPLEMENTAL BENEFITS
Per Hour:

Dump Trucks	$ 59.6525
All Others Up to 40 Hours Worked	57.6525

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE
Note: Employees receive 2 hours of Holiday Pay for each day worked in holiday week (not to exceed 8 hours)
Note: Employees receive 5 1/3 hours of Holiday Pay for each day worked in Thanksgiving Holiday Week.

4-282

Welder 04/01/2026

JOB DESCRIPTION Welder **DISTRICT** 1

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour 07/01/2025

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY

HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

(AA)	Time and one half of the hourly rate after 7 and one half hours per day
(A)	Time and one half of the hourly rate after 7 hours per day
(B)	Time and one half of the hourly rate after 8 hours per day
(B1)	Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday. Double the hourly rate for all additional hours
(B2)	Time and one half of the hourly rate after 40 hours per week
(B3)	Time and one half of the hourly rate after 40 straight hours per week
(C)	Double the hourly rate after 7 hours per day
(C1)	Double the hourly rate after 7 and one half hours per day
(D)	Double the hourly rate after 8 hours per day
(D1)	Double the hourly rate after 9 hours per day
(E)	Time and one half of the hourly rate on Saturday
(E1)	Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
(E2)	Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E3)	Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
(E4)	Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E5)	Double time after 8 hours on Saturdays
(F)	Time and one half of the hourly rate on Saturday and Sunday
(G)	Time and one half of the hourly rate on Saturday and Holidays
(H)	Time and one half of the hourly rate on Saturday, Sunday, and Holidays
(I)	Time and one half of the hourly rate on Sunday
(J)	Time and one half of the hourly rate on Sunday and Holidays
(K)	Time and one half of the hourly rate on Holidays
(L)	Double the hourly rate on Saturday
(M)	Double the hourly rate on Saturday and Sunday
(N)	Double the hourly rate on Saturday and Holidays
(O)	Double the hourly rate on Saturday, Sunday, and Holidays
(P)	Double the hourly rate on Sunday
(Q)	Double the hourly rate on Sunday and Holidays
(R)	Double the hourly rate on Holidays

(S)	Two and one half times the hourly rate for Holidays
(S1)	Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
(T)	Triple the hourly rate for Holidays
(U)	Four times the hourly rate for Holidays
(V)	Including benefits at SAME PREMIUM as shown for overtime
(W)	Time and one half for benefits on all overtime hours.
(X)	Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

(1)	None
(2)	Labor Day
(3)	Memorial Day and Labor Day
(4)	Memorial Day and July 4th
(5)	Memorial Day, July 4th, and Labor Day
(6)	New Year's, Thanksgiving, and Christmas
(7)	Lincoln's Birthday, Washington's Birthday, and Veterans Day
(8)	Good Friday
(9)	Lincoln's Birthday
(10)	Washington's Birthday
(11)	Columbus Day
(12)	Election Day
(13)	Presidential Election Day
(14)	1/2 Day on Presidential Election Day
(15)	Veterans Day
(16)	Day after Thanksgiving
(17)	July 4th
(18)	1/2 Day before Christmas
(19)	1/2 Day before New Years
(20)	Thanksgiving
(21)	New Year's Day
(22)	Christmas
(23)	Day before Christmas
(24)	Day before New Year's
(25)	Presidents' Day
(26)	Martin Luther King, Jr. Day
(27)	Memorial Day
(28)	Easter Sunday

(29) Juneteenth

New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12226

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By: (Check Only One) ☐ Contracting Agency ☐ Architect or Engineering Firm ☐ Public Work District Office Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address ☐ (Check if new or change)

Telephone Fax

E-Mail:

2. NY State Units (see Item 5).

- ☐ 01 DOT
- ☐ 02 OGS
- ☐ 03 Dormitory Authority
- ☐ 04 State University Construction Fund
- ☐ 05 Mental Hygiene Facilities Corp.
- ☐ 06 OTHER N.Y. STATE UNIT
- ☐ 07 City
- ☐ 08 Local School District
- ☐ 09 Special Local District, i.e., Fire, Sewer, Water District
- ☐ 1O Village
- ☐ 11 Town
- ☐ 12 County
- ☐ 13 Other Non-N.Y. State (Describe)

3. SEND REPLY TO ☐ (check if new or change)
Name and complete address:

Telephone Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

☐ New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

☐ Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

_____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

- ☐ 1. New Building
- ☐ 2. Addition to Existing Structure
- ☐ 3. Heavy and Highway Construction (New and Repair)
- ☐ 4. New Sewer or Waterline
- ☐ 5. Other New Construction (Explain)
- ☐ 6. Other Reconstruction, Maintenance, Repair or Alteration
- ☐ 7. Demolition
- ☐ 8. Building Service Contract

8. OCCUPATION FOR PROJECT :

- ☐ Construction (Building, Heavy Highway/Sewer/Water)
- ☐ Tunnel
- ☐ Residential
- ☐ Landscape Maintenance
- ☐ Elevator maintenance
- ☐ Exterminators, Fumigators
- ☐ Fire Safety Director, NYC Only
- ☐ Fuel Delivery
- ☐ Guards, Watchmen
- ☐ Janitors, Porters, Cleaners, Elevator Operators
- ☐ Moving furniture and equipment
- ☐ Trash and refuse removal
- ☐ Window cleaners
- ☐ Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES ☐ NO ☐

10. Name and Title of Requester

Signature

SEE PAGE TWO FOR LAWS RELATING TO PUBLIC WORK CONTRACTS

NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED ANY PUBLIC WORK CONTRACT

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: https://apps.labor.ny.gov/EDList/searchPage.do

For inquiries please call 518-457-5589.

NYSDOL Bureau of Public Work Debarment List 03/27/2026

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5754	0369 CONTRACTORS, LLC		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL	*****5784	A.J.M. TRUCKING, INC.		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL		AKHLAQ OULAKH		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		ALEXANDER DELISA		411 THEODORE FREMND SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	NYC		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL	*****8387	AMERICAN PAVING & MASONRY, CORP.		8 FOREST AVE GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL	*****8654	AMERICAN PAVING, INC.		8 FORREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL		ANGELO GARCIA		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL		ANGELO STANCO		8 FOREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL		ANTHONY CASALE		20 HEATHER RIDGE ROAD TROY NY 12180	05/20/2025	05/20/2030
DOL	DOL		ANTHONY MONGELLI		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	DA	*****2404	BJA RENOVATION, CORP		33 DOLLARD DR NORTH BABYLON NY 11703	03/19/2025	03/19/2030
DOL	DOL	*****5078	BLACK RIVER TREE REMOVAL, LLC		29807 ANDREWS ROAD BLACK RIVER NY 13032	10/17/2023	10/17/2028
DOL	DOL		C.M.C CONTRACTORS, INC.		500 WEST PUTNAM AVE SUITE 400GREENWICH CT 06830	09/03/2025	09/03/2030
DOL	DOL	*****5161	CALADRI DEVELOPMENT CORP.		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****3391	CALI ENTERPRISES, INC.		1223 PARK STREET PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL		CARLOS F. ESCOBAR		411 THEODORE FREMD AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		CARLOS FIGUEROA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL		CESAREO TULA		120 SEARS AVE ELMSFORD NY 10523	09/26/2025	09/26/2030
DOL	DOL	*****2292	CHAMPION MAINTENANCE CONTRACTORS, INC.		211 SOUTH RIDGE STREET RYE BROOK NY 10573	09/03/2025	09/03/2030
DOL	NYC	*****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DOL		CHARLES CASALE		55 MAIN AVENUE WYNANTSKILL NY 12198	05/20/2025	05/20/2030
DOL	DOL		CHARLES CASALE		55 MAIN AVENUE WYNANTSKILL NY 12198	05/20/2025	05/20/2030
DOL	DOL		CHRISTOPHER PEROSI		5507 NESCONSET HIGHWAY MT. SINAI NY 11766	07/17/2025	07/17/2030
DOL	DOL	*****2281	CORRAO TRUCKING, INC.		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL DELISA		211 SOUTH RIDGE STREET RYE BROOK NY 10573	09/03/2025	09/03/2030
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027

DOL	DOL		DARWIN PEGUESE		6400 BALTIMORE NATIONAL SUITE 602CANTONSVILLE NY 21228	10/24/2024	10/24/2029
DOL	DOL		DAVID FRIEDLANDER		64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL		DENISE NAGLE		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG		EDWIN HUTZLER		23 NORTH HOWELLS RD BELLPORT NY 11713	08/04/2021	08/04/2026
DOL	DA		EDWIN HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****2337	EGL DRAINAGE SOLUTION & REPAIRS LLC		5507 NESCONSET HIGHWAY MT. SINAI NY 11766	07/17/2025	07/17/2030
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL		EMIL KISZKO		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION CORP.		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION LLC		4192 SIR ANDREW CIRCLE DOYLESTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		FREDERICK HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****2998	G.E.M. AMERICAN CONSTRUCTION CORP.		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		GIOVANNI NAPOLITANO		2501 BAYVIEW AVENUE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DA	*****0213	GORILLA CONTRACTING GROUP, LLC		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DA	*****4760	GTX CONSTRUCTION ASSOCIATES, CORP		2501 BAYVIEW AVE WANTAGH NY 11793	02/21/2024	02/21/2029
DOL	DOL		HENRY WICKE A/K/A HENRY WICKE, JR.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****6961	HUNTER ELEVATOR COMPANY, INC.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL	*****2397	ISLAND BREEZE MARINE, INC.		6400 BALTIMORE NATIONAL CANTONSVILLE MD 21228	10/24/2024	10/24/2029
DOL	DOL	*****5010	J. LINDSLEY ENTERPRISE, LLC		1002 STATE ROUTE 176 FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL	*****0241	J. LINDSLEY ROOFING, LLC		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		J.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028

DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JAMES LINDSLEY		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****7993	JBS DIRT, INC.		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	*****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JENNIFER LINDSLEY		211 NORTH 2ND STREET FULTON NY 13069	07/30/2025	07/30/2030
DOL	DOL		JERRY DASTON		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		JIM PLAUGHER		17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN MARKOVIC		47 MANDON TERRACE HAWTHORN NJ 07506	03/29/2021	03/29/2026
DOL	DOL		JOHN NAGLE A/K/A JOHN NAGLE, JR.		36 OAKWOOD TRAIL S AL MONROE NY 10950	10/29/2025	10/29/2030
DOL	DOL		JONATHAN DELISA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		JORGE FIGUEROA		411 THEODORE FRMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		JORGE RAMOS		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	DA		JOSEPH DEMASCO		33 DOLLARD DRIVE NORTH BABYLON NY 11703	01/30/2026	01/30/2031
DOL	DA		JOSEPH DEMASCO		33 DOLLARD DRIVE NORTH BABYLON NY 11703	03/19/2025	03/19/2030
DOL	DOL		JOSEPH HALL		937 US ROUTE 11 CENTRAL SQUARE NY 13036	10/21/2024	10/21/2029
DOL	DOL	*****2271	JOSEPH HALL COMPANIES LLC		937 US ROUTE 11 CENTRAL SQUARE NY 13036	10/21/2024	10/21/2029
DOL	DOL		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		JRN CONSTRUCTION CO, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028

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DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL		KATE E. CONNOR		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL	*****2959	KELC DEVELOPMENT, INC		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KEVIN FUNEZ URBINA A/K/A KEVIN FUNEZ		1009 LYNDALE AVE TRENTON NJ 08629	12/16/2024	12/16/2029
DOL	DOL		KIMBERLY F. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****8760	KJ&J CONSTRUCTION, LLC		1009 LYNDALE AVE TRENTON NJ 08629	12/16/2024	12/16/2029
DOL	DOL		KMA GROUP II, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL	*****1833	KMA GROUP INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KMA INSULATION, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KRIN HEINEMANN		2345 ROUTE 52, SUITE 2N HOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	NYC		KULWANT S. DEOL		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****3716	LIGHTNIN ELECTRIC INC.		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029
DOL	AG	*****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DOL		LIZETTE PONCE		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		LOUIS A. CALICCHIA		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		MOHAMMAD MIAN		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	NYC		NASEER CHAUDHRY		2349 BRAGG STREET BROOKLYN NY 11229	04/22/2025	04/22/2030
DOL	DOL	*****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****1797	NATIONAL CONSTRUCTION SERVICES, INC		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027

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DOL	DOL		NELCO CONTRACTING, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DA		NICHOLAS BARNETT		33 DOLLARD DR BABYLON NY 11703	03/04/2025	03/04/2030
DOL	DOL		NICHOLAS RAO		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DA		NICHOLAS T. ANALITIS		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		NIKOLA NTONI		3418 NORTHERN BLVD SUITE 5-27LONG ISLAND CITY NY 11101	12/13/2024	12/13/2029
DOL	NYC	*****6971	NN CONSTRUCTION, INC.		2349 BRAGG STREET BROOKLYN NY 11229	04/22/2025	04/22/2030
DOL	NYC	*****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL	*****4772	R.W. LOBDELL CONSTRUCTION LLC		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DOL		ROBBYE BISSESAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL		ROSA GARCIA		411 THEODORE FRMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DOL		SAL FRESINA MASONRY CONTRACTORS, INC.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		SAL MASONRY CONTRACTORS, INC.		(SEE COMMENTS) SYRACUSE NY 13202	07/16/2021	07/16/2026
DOL	DOL	*****9874	SALFREE ENTERPRISES INC		P.O BOX 14 2821 GARDNER RDPOMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		SALVATORE A FRESINA A/K/A SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DOL		SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DA	*****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA		SILVANO TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DOL	*****0440	SOLAR GUYS INC.		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	NYC	*****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	*****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL	*****9528	STEEL-IT, LLC.		17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		STEVEN DELISA		411 THEODORE FREMND AVE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL	*****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026

NYSDOL Bureau of Public Work Debarment List 03/27/2026

Article 8

DOL	DOL	*****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED MUHAMMAD S. JAFRI A/K/A SHARRUKH JAFRI		4307 28TH AVE ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4855	TECH INDUSTRIES LLC		20 HEATHER RIDGE ROAD TROY NY 12180	05/20/2025	05/20/2030
DOL	DOL	*****9733	TERSAL CONSTRUCTION SERVICES INC		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13208	07/16/2021	07/16/2026
DOL	DOL		TERSAL CONTRACTORS, INC.		221 GARDNER RD P.O BOX 14POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		TERSAL DEVELOPMENT CORP.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL	*****2426	THE MATRUKH GROUP, INC.		4307 28TH AVE PO BOX 9082ASTORIA NY 11103	10/11/2024	10/11/2029
DOL	DOL		THOMAS LOBDELL		635 WEST DRYDEN ROAD FREEVILLE NY 13068	01/31/2025	01/31/2030
DOL	DOL		TIMOTHY PERCY		29807 ANDREWS ROAD BLACK RIVER NY 13612	10/17/2023	10/17/2028
DOL	DA	*****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DA	*****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****8485	TULA PLUMBING AND HEATING LLC		120 SEARS AVE ELMSFORD NY 10523	09/26/2025	09/26/2030
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL		VINCENT CORRAO		PO BOX 393 NANUET NY 10954	09/17/2024	09/17/2029
DOL	DOL	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL	*****9494	WND CONSTRUCTION LLC		411 THEODORE FREMD AVENUE SUITE 206RYE NY 10580	09/03/2025	09/03/2030
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

EXHIBIT C: SPECIFICATIONS

HISTORY GALLERY RENOVATION
FASHION INSTITUTE OF TECHNOLOGY

BID SET SPECIFICATIONS VOLUME I
April 28, 2026

SAMUEL ANDERSON ARCHITECTS
307 WEST 38TH ST SUITE 1901 NEW YORK NY 10018 | 212.564.7002 | SAMUELANDERSON.COM

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SECTION 011100

SUMMARY OF WORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SUMMARY

A. All work as necessary for the demolition and renovation of a portion of the FIT Museum Ground Floor, Basement, and Sub-basement floors of the building at 227 West 27th Street, New York, NY, as shown on the drawings and within these specifications, to a new fully functioning Historical Gallery fit out.

B. The Scope of Work includes scope by mechanical, electrical and plumbing trades, as well as interior architectural fit out. Exterior work includes but is not limited to the installation of new doors and curtain walls (see Division 8, below).

C. Work is to be accomplished while the remainder of the building is in operation and continues to be occupied. Care should be taken in setting up staging areas, access, and daily activities so as to prevent any inconvenience to tenants and visitors to the building.

D. Work is to be done during normal construction hours except if otherwise required for shut- downs, tests and new connections, which shall be scheduled and executed – with prior approval by the Landlord - so as to minimize disruptions to the facility, staff and visitors. Special consideration shall be given to the fact that the rest of the building will remain open and in operation throughout the project. All due care must be taken to prevent the spread of dust, chemical vapors, noise and/or vibrations from the construction area into the occupied portions of the building, and to ensure the maintenance of the Landlord's security standards and requirements.

E. Special consideration shall be given to provide materials containing the minimum possible quantities of urea formaldehyde, sulfur ammonia and/or chlorine, including in particular all ply- woods, sealants, adhesives, and rubber products.

F. All MEP/FP trades shall participate in a coordination modeling process – immediately upon commencement of the contract and prior to submission of trade shop drawings – to ensure that all elements of MEP work are fully coordinated with each other and with related construction. The construction manager shall lead this process wherein all MEP trades and the ceiling and drywall subcontractors meet, draw coordinated scopes of their trades into a computer model (eg Revit), and present same to NEDCC and the Design Team for review and approval. No shop drawings for individual trades will be accepted for review until the coordination drawing process has been reviewed, approved, ***and signed off by all relevant parties.***

1.3 SECTION INCLUDES

A. Work of this Section includes the following descriptions:

1. Contractor's duties and responsibilities.

2. Codes.

3. Abbreviations and symbols.

1.4 CONTRACTOR'S DUTIES

A. Except as specifically noted, provide, and pay for:

1. Labor, materials, and equipment.

2. Tools, construction equipment and machinery.

3. Other facilities and services necessary for proper execution and completion of the work.

B. Pay required sales, consumer and use taxes, except as specifically excluded by the Supplementary Conditions.

C. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of Contract Award.

1. Permits.

2. Government fees.

3. Licenses.

D. Give required notices for work under this Contract.

E. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities, including State, and Federal Building Codes which bear on performance of work.

F. Promptly submit written notice to the Architect of observed variance of Contract Documents from the Building Code and other requirements of Public Authorities having jurisdiction.

1.5 APPLICABLE CODES

A. All references to codes and specifications, and all standards referred to in the Specification Sections and on the Drawings shall mean, and are intended to mean, the latest edition, amendment, and/or revision of such reference standard in effect as of the date of these Contract Documents.

1.6 ABBREVIATIONS AND SYMBOLS

A. Reference to a technical society, institution, association, or governmental authority is made in the Specifications in accordance with the following abbreviations.

1. AA Aluminum Association

2. AAMA Architectural Aluminum Manufacturers Association

3. AASHTO American Association of State Highway and Transportation Officials

4. ABMA American Boiler Manufacturers Association

5.	ACI	American Concrete Institute
6.	ACRI	Air Conditioning and Refrigeration Institute
7.	ADC	Air Diffusion Council
8.	AFI	Air Filter Institute
9.	AGI	American Gas Institute
10.	AGCA	Associated General Contractors of America, Inc.
11.	AGMA	American Gear Manufacturers Association
12.	AIA	American Institute of Architects
13.	AIA	American Insurance Association
14.	AIMA	Acoustical and Insulating Materials Association
15.	AISC	American Institute of Steel Construction
16.	AISI	American Iron and Steel Institute
17.	AITC	American Institute of Timber Construction
18.	ALS	American Lumber Standards
19.	AMCA	Air Moving and Conditioning Association
20.	ANSI	American National Standards Institute, Inc.
21.	APA	American Plywood Association
22.	API	American Petroleum Institute
23.	AREA	American Railway Engineering Association
24.	ARI	Air Conditioning and Refrigeration Institute
25.	ASAHC	American Society of Architectural Hardware Consultants
26.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
27.	ASME	American Society of Mechanical Engineers
28.	ASTM	American Society for Testing and Materials
29.	ATI	Asphalt Tile Institute
30.	AWI	Architectural Woodwork Institute
31.	AWPA	American Wood Preservers Association
32.	AWPI	American Wood Preservers Institute

33. AWS American Welding Society
34. AWWA American Waterworks Association
35. BHMA Builders Hardware Manufacturers Association
36. BIA Brick Institute of America
37. BRI Building Research Institute
38. CABRA Copper and Brass Research Association
39. CAGI Compressed Air and Gas Institute
40. CE Corps of Engineers (Army)
41. CRSI Concrete Reinforcing Steel Institute
42. CS U.S. Commercial Standard
43. CSI Construction Specification Institute
44. CTI Cooling Tower Institute
45. DFPA Douglas Fir Plywood Association
46. ETL Electrical Testing Laboratories
47. FGMA Flat Glass Marketing Association
48. FHA Federal Housing Administration
49. FIA Factory Insurance Association
50. FM Factory Mutual Engineering Division Association of Factory Mutual Fire Insurance Companies
51. FPL Forest Products Laboratories
52. FS Federal Specifications
53. FSIWA Federation of Sewage and Industrial Waste Association
54. FTI Facing Tile Institute
55. GA Gypsum Association
56. GTA Glass Tempering Association
57. HPMA Hardwood Plywood Manufacturers Association
58. IBRM Institute of Boiler and Radiator Manufacturers
59. IEEE Institute of Electrical and Electronics Engineering
60. IES Illuminating Engineering Society

61. IPCEA Insulated Power Cable Engineers Association
62. JAN Joint Army-Navy Specifications
63. MAC Masonry Advisory Council
64. MIA Marble Institute of America
65. MLMA Metal Lath Manufacturers Association
66. MS Military Specifications
67. MSS Manufacturers Standardization Society of the Valves and Fittings Industries
68. MSTD Military Standard
69. NAAMM National Association of Architectural Metal Manufacturers
70. NAFM National Association of Fan Manufacturers
71. NAPM National Association of Plastic Manufacturers
72. NBHA National Builders Hardware Association
73. NBS National Bureau of Standards
74. NCMA National Concrete Masonry Association
75. NEC National Electric Code (NFPA Pamphlet No. 70)
76. NELMA Northeastern Lumber Manufacturers Association, Inc.
77. NEMA National Electric Manufacturers Association
78. NEMI National Elevator Manufacturing Industry, Inc.
79. NFC National Fire Code
80. NFPA National Fire Protection Association
81. NFPA National Forest Products Association
82. NHLA National Hardwood Lumber Association
83. NHPMA Northern Hardwood and Pine Manufacturers Association
84. NPA National Particleboard Association
85. NPCA National Paint and Coatings Association
86. NRMCA National Ready Mixed Concrete Association
87. NSC National Safety Council
88. NSF National Sanitation Foundation

89. NSSEA National School Supplies and Equipment Association
90. NTMA The National Terrazzo and Mosaic Association, Inc.
91. NWMA National Woodwork Manufacturers Association
92. OSHA Occupational Safety and Health Administration
93. PCA Portland Cement Association
94. PCI Prestressed Concrete Institute
95. PEI Porcelain Enamel Institute, Inc.
96. PS Product Standard, U.S. Department of Commerce
97. RIS Redwood Inspection Service
98. RTI Resilient Tile Institute
99. SAE Society of Automotive Engineers
100. SBI Steel Boiler Institute
101. SCMA Southern Cypress Manufacturers Association
102. SDI Steel Deck Institute
103. SDI Steel Door Institute
104. SJI Steel Joist Institute
105. SMACNA Sheet Metal and Air Conditioning Contractors National Association
106. SMFMA Sprayed Mineral Fiber Manufacturers Association, Inc.
107. SPIB Southern Pine Inspection Bureau
108. SPR Simplified Practice Recommendations, U.S. Department of Commerce
109. SSPC Steel Structures Painting Council
110. SWFPA Structural Wood Fiber Products Association
111. TCA Tile Council of America
112. TEMA Tubular Exchange Manufacturing Association
113. TIMA Thermal Insulation Manufacturers Association
114. TPI Truss Plate Institute
115. UL Underwriter's Laboratories, Inc.
116. UPC Uniform Plumbing Code

117. USCGS U.S. Coast and Geodesic Survey
118. WCLIB West Coast Lumber Inspection Bureau
119. WRI Wire Reinforcement Institute
120. WWPA Western Wood Products Association

END OF SECTION

SECTION 012020

PROGRESS MEETINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. To enable orderly review of progress during construction and to provide for systematic discussions of problems, the Architect will conduct project meetings throughout the construction period.

B. In general, project meetings will be held weekly at the job site in accordance with a mutually acceptable schedule.

C. The purpose of the project meetings is analysis of problems that might arise between the Owner and the Contractor relative to execution of the work, and review of projected schedules.

1.3 RELATED SECTIONS

A. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility as described in the General Conditions, and are not part of the agenda of project meetings.

1.4 QUALITY ASSURANCE

A. Persons designated by the Contractor to attend and participate in project meetings shall have all required authority to commit the Contractor to solutions as agreed upon in the project meetings.

B. Pre-Installation Conferences: General contractor shall arrange pre-installation conference not less than thirty days prior to starting work.

1. Attendance

a. General Contractor.
b. Architect/Owner's Representative.
c. Manufacturer/Installer's Representative.
d. Other trades as directed by the Architect.

2. Pre-installation conference is required for the following:

a. Miscellaneous metals.
b. Carpentry/ drywall (to review ceiling/alignments).
c. Curtain walls.
d. Polished Concrete
e. Steel and Glass walls
f. Display Niche and Vestibule

1.5 SUBMITTALS

A. Agenda Items: To the maximum extent possible, digitally advise the Owner and Architect at least twenty-four (24) hours in advance of the project meeting regarding all items to be added to the agenda.

B. Minimum Agenda

1. Review work progress since last meeting.
2. Note field observations, problems and decisions.
3. Identify problems which impede planned progress.
4. Review off-site fabrication problems.
5. Develop corrective measures and procedures to regain schedule.
6. Coordinate projected progress with other prime contractors.
7. Review submittal schedules, expedite as required to maintain schedule.
8. Review upcoming schedule of work for next two weeks.

C. Minutes: The Architect will compile minutes of each project meeting and will distribute copies to the Owner and the Contractor. The Contractor shall make and distribute such other copies as he wishes. Minutes shall be distributed within five (5) business days

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 MEETING SCHEDULE

A. Coordinate with the Architect and Owner as required to establish a mutually acceptable schedule for project meetings. (Wednesdays are not acceptable).

3.2 MEETING LOCATION

A. To the maximum extent practicable, project meetings shall be held at the job site. Provide adequate space and facility including table, chairs, and lighting for proper conduct of meeting.

3.3 ATTENDANCE

A. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout the construction period. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspects of the work are involved.

END OF SECTION

SECTION 012300

ALTERNATES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. To allow the Owner to compare total costs where alternate materials and methods might be used, and to enable the Owner's decision prior to awarding the Contract, certain alternates have been established as described in this Section of these Specifications.

1.3 RELATED SECTIONS

A. Where noted herein, pertinent Sections of these Specifications describe the materials and methods required under the various alternates.

1.4 SUBMITTALS

A. Alternates described in this Section are required to be submitted on appropriate form as approved by the Owner.

B. Any additional costs to the Contractor due to the inclusion of alternates shall be included in the amount to be added to the Contract Sum, so that no additional costs shall be borne by the Owner due to the inclusion of the additive alternates.

C. Any deductive costs to the Contractor due to the inclusion of alternates shall be included in the amount to be deducted from the Contract Sum, so that all deductive costs will accrue to the Owner due to the inclusion of deductive alternates.

1.5 PROCEDURES FOR ALTERNATE BIDS

A. Each Bidder shall submit on the Proposal Form all Alternate Bids stated herein. Alternate Bids shall state the difference in price as "additions to" or "deductions from" the Base Bid, unless otherwise noted, for the substitution, omission, or addition to the alternate materials, items or construction from that shown and specified.

B. The Alternate Bids, when accepted, become part of the Contract.

C. Bidder shall carefully check the Drawings and Specifications to determine the extent of each Alternate Bid required.

D. Alternate Bids shall include all overhead and profit applicable thereto.

E. Alternate Bids shall reflect the increase or decrease in cost of all work of every name and nature which may be affected thereby and no subsequent claims for extras by reason of the Contractor's failure to observe this requirement will be considered.

F. The description herein for each Alternate Bid is recognized to be incomplete and abbreviated, but implies that each change must be complete for the scope of the work affected. Refer to the applicable Specification Sections, and to applicable drawings, for the specific requirements of the work, regardless of whether references are so noted in the description of each Alternate. Coordinate related work and modify surrounding work as required to properly integrate with the work of each Alternate. It is recognized that the descriptions of Alternate Bids are primarily scope definitions, and do not necessarily detail the full range of materials and processes needed to complete the work as required. Any change of details, construction, etc., as required to accommodate the Alternate shall be the responsibility of the Contractor and shall be included in his Alternate Bid Price.

G. Except as otherwise described or approved, materials and workmanship of the Alternate Bids shall conform to the requirements specified under the various Sections of the Specifications for similar items of work.

H. Where methods of construction, materials, finishes, or details of installation required by the various Alternate Bids differ from the requirements shown on drawings or specified for corresponding items, the Alternate construction, materials, etc., will be subject to approval by the Architect.

I. The Contractor shall submit shop drawings and samples for the work under each accepted Alternate Bid for approval in conformance with requirements of Section 013300.

PART 2 PRODUCTS

2.1 ALTERNATES

A. ADD-ALTERNATE: Refer to schedule on drawings.

B. DEDUCT-ALTERNATE: Refer to schedule on drawings.

PART 3 EXECUTION

3.1 ADVANCE COORDINATION

A. Immediately after award of Contract, and to the maximum extent practicable, thoroughly and clearly advise all necessary personnel and suppliers as to the nature and extent of Alternates as selected by the Owner; use all means necessary to alert those personnel and suppliers involved as to all changes in the work caused by the Owner's selection of alternates.

3.2 SURFACE CONDITIONS

A. Prior to installation of the Alternate items, verify that all surfaces have been modified as necessary to accept the installation and the item or items may be installed in complete accordance with their manufacturer's current recommendations; in the event of discrepancy, immediately notify the Architect and proceed as directed.

3.3 APPROVAL OF ALTERNATE

A. Approval of the Alternate makes all requirements of scope, performance, submissions, service and guarantee binding as if that material name appeared in the Specifications for the Base Bid. All necessary changes in building design or construction to accommodate the alternate materials shall be the sole responsibility of the Contractor without extra cost to the Owner.

END OF SECTION

SECTION 013100

COORDINATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the Project Coordination as specified herein, including but not limited to, the following:

1. General project coordination procedures.

2. Conservation.

3. Administrative and supervisory personnel.

4. Cleaning and protection.

1.3 RELATED SECTIONS

A. Progress meetings - Section 012020.

B. Submittals - Section 013300.

C. Materials and equipment - Section 016000.

D. Contract close-out - Section 017700.

1.4 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

3. Make provisions to accommodate items scheduled for later installation.

4. Show relationship of components shown on separate shop drawings.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.

2. Installation and removal of temporary facilities.

3. Delivery and processing of submittals.

4. Progress meetings.

5. Project close-out activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

PART 2 PRODUCTS

(NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each trade and major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposures during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity (i.e. below 25% or above 70%).
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Acids, bases, or other hazardous chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria and viruses.
17. Rodent, insect and dermestid infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.

26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes administrative and procedural requirements for documenting the progress of construction during performance of the work, including but not limited to, the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.
8. Construction photographs.

1.3 RELATED SECTIONS

A. Progress meetings – Section 012020.

B. Submittals – Section 013300.

C. Coordination – Section 013100.

D. Closeout procedures – Section 017700.

1.4 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.5 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.

2. Specification Section number and title.

3. Submittal category (action or informational).

4. Name of subcontractor.

5. Description of the Work covered.

6. Scheduled date for Architect's final release.

C. Preliminary Construction Schedule: Submit two printed copies; one a single sheet of reproducible media, and one a print.

D. Preliminary Network Diagram: Submit two printed copies; one a single sheet of reproducible media, and one a print; large enough to show entire network for entire construction period.

E. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, and labeled to comply with requirements for submittals. Include type of schedule Initial or Updated and date on label.

F. CPM Reports: Concurrent with CPM schedule, submit three printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

3. Total Float Report: List of all activities sorted in ascending order of total float.

4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

G. Daily Construction Reports: Submit two copies at weekly intervals.

H. Material Location Reports: Submit two copies at monthly intervals.

I. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

J. Special Reports: Submit two copies at time of unusual event.

K. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.

1. Format: Digital.

2. Identification: On back of each print, provide an applied label or rubber stamped impression with the following information:

a. Name of Project.
b. Name and address of photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3. Submit a complete set of photographs. Identify date photographs were taken.

1.6 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

B. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.

C. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.7 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Startup and Testing Time: Include not less than 10 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect’s administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date. Delivery dates indicated stipulate the earliest possible delivery date.

5. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Startup and placement into final use and operation.

7. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Permanent space enclosure.
    c. Completion of mechanical installation.
    d. Completion of electrical installation.
    e. Substantial Completion.

E. Milestones: Include milestones indicated in the schedule.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Purchase of materials.
c. Delivery.
d. Fabrication.
e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.

2. Description of activity.

3. Principal events of activity.

4. Immediate preceding and succeeding activities.

5. Early and late start dates.

6. Early and late finish dates.

7. Activity duration in workdays.

8. Total float or slack time.

9. Average size of workforce.

10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.

2. Changes in early and late start dates.

3. Changes in early and late finish dates.

4. Changes in activity duration’s in workdays.

5. Changes in the critical path.

6. Changes in total float or slack time.

7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.

2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.

3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.

4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.

2. List of separate contractors at Project site.

3. Approximate count of personnel at Project site.

4. High and low temperatures and general weather conditions.

5. Accidents.

6. Meetings and significant decisions.

7. Unusual events (refer to special reports).

8. Stoppages, delays, shortages, and losses.

9. Meter readings and similar recordings.

10. Emergency procedures.

11. Orders and requests of authorities having jurisdiction.

12. Change Orders received and implemented.

13. Construction Change Directives received.

14. Services connected and disconnected.

15. Equipment or system tests and startups.

16. Partial Completions and occupancies.

17. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, duration’s, actual starts and finishes, and activity duration’s.

3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified commercial photographer to take construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in the file name for each image.

D. Preconstruction Photographs: Before starting construction, take four color photographs of Project site and surrounding properties from different vantage points, as directed by Architect. Show existing conditions adjacent to property.

E. Periodic Construction Photographs: Take four color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect may direct photographer for desired vantage points.

END OF SECTION

SECTION 013300

SUBMITTALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete submittal requirements as specified herein, including, but not limited to, the following:

1. Shop drawings and samples.

2. Integrated drawings.

3. Manufacturer's literature.

B. Layout of all work.

1.3 RELATED SECTIONS

A. Progress meetings - Section 012020.

B. Materials and equipment - Section 016000.

C. HVAC – Division 23.

PART 2 PRODUCTS

2.1 WORK LAYOUT

A. Be responsible for properly laying out the work and for the lines and measurements for the work executed under the Contract Documents. Verify the figures shown on the Drawings before laying out the work, and report errors or inaccuracies both orally and in writing to the Architect before commencing work. The Architect or his representative will in no case assume the responsibility for laying out the work. Survey as required to establish grades, datums, benchmarks, and reference points. Layout all work of all trades both horizontally and vertically.

B. The mechanical and electrical trades may be delegated the responsibility to lay out the duct work, piping, and conduit based on the reference lines and benchmarks established and on approved submittals, but the General Contractor shall oversee their layouts and shall ensure that all layouts conform to approved submittals as well as to the Contract Documents.

2.2 SHOP DRAWINGS AND SAMPLES

A. General

1. The Contractor shall be responsible for coordinating the schedule for submittal of shop drawings and samples with his progress schedule and the requirements of the Contract Schedule, and shall promptly submit a coordinated schedule of submission of all shop drawings and samples to the Architect.

2. Failure of the Contractor to schedule and submit shop drawings and samples in ample time for checking, correction, and rechecking will not justify any delay in the Contract Schedule. Allow ample time for items to be tested, including time for retesting if the tests or mock-ups fail.

3. Samples, shop drawings, manufacturers' literature, and other required information shall be submitted in sufficient time to permit proper consideration and action on same before any materials and items are fabricated or ordered. Stagger submissions so that the Architect can review the documents in an orderly and timely manner. All samples of materials requiring laboratory tests shall be submitted to the laboratory for testing not less than 90 days before such materials are required to be shipped to the site. All other samples, manufacturers' literature, and other sample information shall be submitted for approval not less than 30 days before such materials are required to be shipped to the site.

4. Shop drawings for each Section of the work shall be numbered consecutively, and the numbering system shall be retained throughout all revisions. Each drawings shall have adequate clear space for the stamps of the Contractor, Architect, and one of the Architect's consultants.

5. All shop drawings shall be thoroughly checked by the Contractor for compliance with the Contract Documents before submitting them to the Architect and shall bear the Contractor's stamp of approval certifying that they have been so checked. Any shop drawings submitted without this stamp of approval and certification, and shop drawings which, in the Architect's sole opinion, are incomplete, contain errors or have not been checked, or only checked superficially, will be returned unchecked by the Architect for re-submission by the Contractor.

6. In checking shop drawings, the Contractor shall verify all dimensions and field conditions and shall check and coordinate the shop drawings of any Section or trade with the requirements of all other Sections or trades whose work is related thereto, as required for proper and complete installation of the work. The Architect will review shop drawings. The Architect's acceptance of shop drawings is for design only and not method of assembly or erection. Acceptance shall in no way be construed as (1) permitting any departure whatsoever from the Contract Documents; (2) relieving the Contractor of full responsibility for any error in details, dimensions, omissions, or otherwise that may exist; (3) relieving the Contractor of full responsibility for adequate field connections, erection techniques, bracing, or deficiencies in strength; (4) relieving the Contractor of full responsibility for satisfactory performance of all work and coordination with the work of all subcontractors and other contractors; or (5) permitting departure from additional details or instructions previously furnished by the Architect. Acceptance of such drawings shall not be construed as a complete check, nor shall it relieve the Contractor from responsibility for proper fitting of the work, nor from the necessity of furnishing any work which may not be indicated on shop drawings when approved. The Contractor shall be solely responsible for any quantities which may be shown on the shop drawings.

7. No work shall be fabricated, manufactured, or installed from shop drawings stamped "Revise and Resubmit" or "Rejected," and such shop drawings shall be corrected and resubmitted by the Contractor until accepted by the Architect. At least one complete set of "No Exceptions Taken, Corrections Noted" shop drawings shall be kept at the site in the Contractor's field office for reference at all times. "Revise and Resubmit" and "Rejected" shop drawings shall not be permitted at the site, except for reference in regard to approved submittals.

8. Submittals marked "No Exceptions Taken":

    a. Submittals which require no corrections by the Architect will be marked "No Exceptions Taken."

9. Submittals marked "Corrections Noted" or "Accepted as Noted":

    a. Submittals which require only a minor amount of correcting shall be marked "Corrections Noted" or "Accepted as Noted." This mark shall mean that checking is complete and all corrections are obvious without ambiguity. Fabrication will be allowed on work marked "Corrections Noted" or "Accepted as Noted" provided such action will expedite construction and noted corrections are adhered to. If fabrication is not made strictly in accordance with corrections noted, the item shall be rejected in the field, and the Contractor will be required to replace such work in accordance with corrected submittals.

10. Submittals marked "Revise and Resubmit" or "Rejected":

    a. When submittals are contrary to contract requirements or too many corrections are required, they shall be marked "Revise and Resubmit" or "Rejected." No work shall be fabricated under these marks. The Architect shall list his reasons for rejection on the submittals or in the transmittal letter accompanying their return. The submittals must be corrected and resubmitted for approval.

11. All shop drawings and samples shall be identified as follows:

    a. Date of submittal.
    b. Title of project.
    c. Name of Contractor and date of his approval.
    d. Name of subcontractor or supplier and date of submittal to Contractor.
    e. Number of submission.
    f. Any qualification, departure, or deviation from the requirements of the Contract shall be EXPLICITLY NOTED.
    g. Federal Specification or ASTM number where required.
    h. Such additional information as may be required by the Specifications for the particular material being furnished.

12. If the Contractor wishes to deviate from the materials or details as shown in Specifications or Drawings, he shall submit the proposed deviation with shop drawings and/or samples stating the extent and the materials or details being replaced. Submittals must be delivered to the Architect within fourteen (14) calendar days of the signing of the agreement between the Owner and the Contractor. Any such submittal received after that deadline will not be considered. The Contractor shall also submit information on the allowed credit or extra cost required for the proposed deviation, if any, and also all information relating to the work of any other Sections revised by the proposed deviation.

13. The Architect and Engineer will review and approve or reject shop drawings and samples for approval within 20 calendar days, but only for conformance with the design concept of the work and with information contained in the Contract Documents.

14. Incomplete shop drawings will be returned without checking for proper submission, and this shall not be considered as cause for delay of the work or extra compensation to the Contractor.

15. The Contractor shall submit appropriate transmittal forms with every submittal of shop drawings, manufacturer's literature, and samples. The Contractor shall submit all required shop drawings, manufacturer's literature and samples in accordance with the procedures specified herein.

16. Unless otherwise specifically directed by the Architect, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.

17. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

18. Submit one copy of each standard referred to in the Specifications (ASTM, Fed. Spec., etc.) with the submission of each respective shop drawing, sample, or literature.

19. Upon receipt of returned submittals, Contractor shall again review the submittal to ascertain all implications of the A/E comments and marks, and shall distribute the submittal to all relevant subcontractors, taking care to ensure that each is cognizant of relevant notes, comments, and other information.

B. Submission of Shop Drawings

1. Architectural Work: Submit a pdf of each shop drawing to the Architect for approval. If approved, the Architect will return pdf stamped "No Exceptions Taken" or "Make Corrections Noted," and the Contractor shall print the required number of copies. In the event the Architect returns pdf stamped "Revise and Resubmit" or "Rejected," the Contractor shall make indicated changes and resubmit pdf to the Architect.

2. Structural Work and Mechanical Work: Submit pdf of each shop drawing to the Engineer, with pdf to the Architect. For all mechanical submittals, also submit pdfs simultaneously to the Commissioning Agent. If accepted, the Architect shall return pdf stamped "No Exceptions Taken" or "Make Corrections Noted," and the Contractor shall print the required number of copies. In the event the Architect returns pdf stamped "Revise and Resubmit" or "Rejected," the Contractor shall make indicated changes and resubmit pdf to the Engineer and the Architect.

3. Prints: The Contractor shall provide all prints or shop drawings as reasonably required by subcontractors, material suppliers, superintendents, inspectors, and others as required for the work, or as directed by the Architect. The Contractor shall pay all costs in connection with printing and distribution of shop drawings. Also see Article #2.2, 19, above.

C. Submission of Manufacturer's Literature, Including Catalog, Catalog Cuts, Brochures, Charts, Test Data, and Similar Information

1. Manufacturer's literature will receive consideration only when accompanied by the transmittal form properly filled out, as indicated, and listing each item of literature, as well as the Specification Section and paragraph numbers describing such materials. All submittals must include clear and explicit notations indicating exactly which model(s), color(s), accessories, etc., are being submitted. Any deviations from contract requirements shall be stated on the above form or attached to it.

2. Architectural Work: Submit original of manufacturer's literature to the Architect for acceptance. If accepted, the Architect will return it stamped "No Exceptions Taken" or "Make Corrections Noted."

The Contractor shall resubmit corrected literature of all submissions stamped by the Architect "Revise and Resubmit" or "Rejected."

3. Structural Work and Mechanical Work: Submit original of manufacturer's literature to the Engineer and the Architect. If accepted, the Architect will return it stamped "No Exceptions Taken" or "Make Corrections Noted." The Contractor shall resubmit corrected literature to the Engineer and Architect for all submissions stamped "Revise and Resubmit" or "Rejected."

4. All copies of manufacturer's literature required to be resubmitted hereunder shall be original printed material. Pdfs and/or reproductions of printed material will not receive consideration unless they are as precisely legible and clear as original literature.

D. Submission of Samples

1. All samples shall be submitted in triplicate to the Architect unless otherwise indicated in the Specifications, or unless more are required to ensure that supplier and sub-suppliers all receive submittals back.

2. Samples will receive consideration only when each is clearly labeled and when accompanied by the transmittal form properly filled out, as indicated, and listing each sample, as well as the listing of any ASTM, Federal or other standard references specified or applicable and such additional information as may be required by the Specifications for the materials being submitted. Any deviation from the contract requirements shall be so stated on the above form or attached to it.

3. The Architect shall have the right to require submission of samples of any materials, whether or not specifically indicated in the various Sections of the Specifications.

4. Unless otherwise specified, samples of sufficient size to indicate general visual effect shall be submitted. Where samples must show a range of color, texture, finish, graining, or other similar property, the Contractor shall submit sets of pairs illustrating the full scope of the range.

5. Two (2) sample of each submission will be returned to the Contractor; one for the supplier and one for the contractor to store on site for reference by installer and the Architect. Samples stamped "Revise and Resubmit" or "Rejected" by the Architect shall be resubmitted in triplicate by the Contractor.

6. All samples stamped "No Exceptions Taken" or "Corrections Noted" shall be kept at the site in the Contractor's field office facilities for reference at all times. "Revise and Resubmit" or "Rejected" samples shall not be kept at the site.

2.3 INTEGRATED DRAWINGS

A. Within seven (7) days of award of Contract, the HVAC subcontractor shall prepare 3/8" scale drawings in plan and section showing air handlers, fans, pumps, valves, chillers, boilers, duct work, heating and sprinkler piping. This Drawing shall include location of re-heat boxes, grilles, registers, etc., and access doors in finished walls and soffits. Locations shall be fixed in plan by and dimensions from column center lines and/or finished walls, and in elevation from established finish floor benchmarks, in strict accordance with the architectural drawings.

B. The HVAC subcontractor shall lay out on his reproducible the reflected ceiling plan, beam and soffit elevations, ceiling heights, roof openings, etc.

C. The HVAC subcontractor shall prepare and distribute to the Plumbing, Fire Protection, and Electrical subcontractors, the General Contractor, and to the Architect a reproducible of the above.

D. The Plumbing subcontractor shall lay out on his reproducible the piping, valves, clean-outs, etc., indicating locations and elevations and shall indicate the necessary access doors.

E. The Fire Protection subcontractor shall lay out on his reproducible locations of standpipes, mains piping, valves, branch lines, pipe drops, and sprinkler heads.

F. The Electrical subcontractor shall indicate on his reproducible the panels, fixtures, all large (larger than 1" dia.) and all exposed small conduit runs, clearances, pull boxes, junction boxes, low voltage devices, fire alarm devices, A/V devices, etc.

G. The General Contractor shall indicate on his reproducible any structural framing, ceiling hangers, etc.

H. The General Contractor shall review all of the mark-ups by all of the subcontractors, and shall integrate them into one set of drawings, highlighting all conflicts and near-conflicts. He shall then call as many meetings with the subcontractors as are necessary to resolve any conflicts that become apparent. He will call on the services of the Consultant Engineer or Architect where necessary. The General Contractor is responsible for the coordination of the Drawings.

I. On resolution of the conflicts, each subcontractor shall enter his own work on the HVAC subcontractor's reproducibles, in plan and in section, which shall become the Master or Integrated Drawings. The master reproducibles shall be signed by each contributing subcontractor to indicate his acceptance of the arrangement of the work.

J. A reproducible copy of the master Integrated Drawings will be prepared by the HVAC subcontractor. The General Contractor will make distribution.

K. Each subcontractor shall prepare his Shop Drawings in strict accordance with the Integrated Drawings. No fabrication or installation work will be permitted without approved Shop Drawings. It is therefore essential that this procedure be instituted and completed as diligently as possible. The Architect reserves the right to reject any and all work that is fabricated or installed without complying with the approved shop drawings or the final Master Integrated Drawings, with no cost to the Owner.

PART 3 EXECUTION

3.1 COORDINATION OF SUBMITTALS

A. Prior to submittal for Architect's review, use all means necessary to fully coordinate all material and submittals, including the following procedures:

1. Determine and verify all field dimensions and conditions, materials, catalog numbers and similar data.

2. Coordinate as required with all trades and with public agencies involved.

3. Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.

4. Clearly indicate any and all deviations from the Contract Documents.

B. Unless otherwise specifically permitted by the Architect, make all submittals in groups containing all associated items; the Architect may reject partial submittals as not complying with the provisions of the Contract Documents.

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

1.3 RELATED SECTIONS

A. Coordination – Section 013100.

B. Testing and inspection – Section 014100.

C. Divisions 2 through 32 Sections for specific test and inspection requirements.

1.4 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.5 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.6 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

12. Name and signature of laboratory inspector.

13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:

a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect and Owner seven days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups, unless otherwise directed by the Architect.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 014100

TESTING AND INSPECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the testing and inspection requirements as specified herein.

1.3 RELATED SECTIONS

A. Requirements for testing and inspection shall be described in various Sections of these Specifications. Where no testing and inspection requirements are described but the Owner decides that it is required, the Owner may require additional testing and inspection to be performed at his own expense.

B. Work Not Included

1. Unless otherwise noted in this Section or other Section of work, the Owner will select a pre-qualified independent testing laboratory and inspection professional.

2. Unless otherwise noted in this Section or other Sections of work, the Owner will pay for all initial services of the testing laboratory and inspection professionals as further described in Article 2.1 of this Section of these Specifications.

1.4 QUALITY ASSURANCE

A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E 329-13b "Standard Specification for Agencies Engaged in Construction Inspection, Testing or Special Inspection."

B. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

1.5 PRODUCT HANDLING

A. Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the work.

PART 2 PRODUCTS

2.1 PAYMENTS FOR TESTING AND INSPECTION SERVICES

A. Initial Services: The Owner will pay for all initial testing and inspection services.

B. Retesting: When initial tests and inspections indicate non-compliance with local Codes and the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and inspectors and the costs thereof will be deducted by the Owner from the Contract Sum.

2.2 CODE COMPLIANCE TESTING AND INSPECTION

A. Inspections and tests required by Codes or Ordinances, or by a plan approval authority, shall be paid by for by the Owner unless otherwise noted in this Section or other Sections of work. Retesting or inspection as required shall conform to the requirements of Article 2.1 B of this Section.

2.3 CONTRACTOR'S TESTING

A. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

B. Where operating tests are specified, the Contractor shall test his work as it progresses, on his own account, and shall make satisfactory preliminary tests in all cases before applying for official tests.

C. Tests shall be made in the manner specified, for the different branches of the work. Each test shall be made on the entire system for which such test is required, wherever practical. In case it is necessary to test portions of the work independently, the Contractor shall do so without extra compensation. The Contractor shall furnish all labor, material and apparatus, make corrections and conduct the official test. The test will be conducted in the presence of a representative of the Architect.

D. All parts of the mechanical and electrical work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition. All defects disclosed by these tests shall be corrected to the satisfaction of the Architect, Commissioning Agent, and Engineer without any additional cost to the Owner. Tests shall be repeated on this repaired or replaced work if deemed necessary by the Architect. The Engineer shall be notified at least forty-eight (48) hours in advance of all tests, and shall be represented at tests that he deems necessary. The Contractor shall furnish all necessary instruments, other equipment, and personnel required for such tests.

E. Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered by him to the Architect.

F. If the Architect or Engineer is to observe the inspections, tests or approvals required by the Contract Documents, he will endeavor to do so promptly and, where practicable, at the source of supply.

PART 3 EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY AND INSPECTORS

A. Representatives of the testing laboratory and inspectors shall have access to the work at all times. Provide facilities for such access in order that they may properly perform their functions.

3.2 SCHEDULES

A. Establishing Schedule

1. By advance discussions with the inspection service and testing laboratory selected by the Owner, determine the time required to perform inspections and tests and to issue each of its findings.

2. Provide all required time within the construction schedule.

B. Revising Schedule

1. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the inspectors and testing laboratory as required.

C. Adherence to Schedule

1. When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay will be back-charged to the Contractor.

3.3 TAKING SPECIMENS

A. All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the testing laboratory; all sampling equipment and personnel will be provided by the testing laboratory; and all deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

END OF SECTION

SECTION 015000

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the temporary facilities and controls as shown on the drawings and specified herein, including, but not limited to, the following:

1. Temporary field office.
2. Fire protection.
3. Temporary light and power.
4. Temporary toilets.
5. Temporary water service.
6. Temporary partitions.
7. Environmental controls.

PART 2 PRODUCTS

2.1 GENERAL

A. Arrange for and provide temporary facilities and controls as specified herein and as required for the proper and expeditious prosecution of the work.

B. Make all temporary connections to existing utilities and services; maintain such connections; remove temporary connections when no longer required; restore the services and sources of supply to proper operating condition.

C. Contractor shall pay all costs for temporary electrical power and water consumed, except as otherwise specified, until final acceptance of the work.

2.2 TEMPORARY FIELD OFFICE

A. The Contractor may use space for a field office in the existing area of work. Provide a telephone, fax line and email link with machine, and pay all charges for installation and calls, including long distance calls.

2.3 FIRE PROTECTION

A. Provide and maintain adequate fire protection, ready for instant use, distributed around the project.

B. Make arrangements for periodical inspection by City fire protection authorities and insurance underwriters' inspections. Cooperate with said authorities and promptly carry out their recommendations.

2.4 TEMPORARY HEAT AND VENTILATION

A. Provide temporary heat as required during construction to protect the work from freezing or frost damage, and as necessary to ensure suitable working conditions for the construction operations of all trades. In areas of the building where work is being conducted, the temperature shall be maintained as specified in the various sections of the Specifications, but not less than 45 degrees F. Under no circumstances shall the temperature be allowed to reach a level that will cause damage to any portion of the work which may be subject to damage by low temperatures.

2.5 TEMPORARY LIGHT AND POWER

A. Tap off existing electrical service for temporary power and lighting. The electrical service shall be of 120v and 240v for single phase loads up to 30 amps for all construction tools and equipment without overloading the temporary facilities, and shall be made available for power, lighting, and construction operations of all trades. Contractor shall assume full responsibility for the entire power and lighting system and pay costs for operation, maintenance, and restoration of the system.

2.6 TEMPORARY TOILETS

A. Provide enclosed weathertight toilets for the use of all construction personnel at a location within the contract limits, and maintain toilets in a sanitary condition. Upon completion of the work, toilets shall be removed. Installation shall be in accordance with all applicable codes and regulations of authorities having jurisdiction. The number of toilet rooms required shall be in accordance with the ANSI Standard Safety Code for Building Construction or other local authorities.

2.7 TEMPORARY WATER SERVICE

A. Make all temporary connections to existing water service as required for construction.

2.8 TEMPORARY PARTITIONS

A. Dust- and odor- proof, acoustically dampened, temporary partitions, doors and barriers as required to separate areas of work from adjoining occupied areas but still allowing required egress.

B. Temporary power, light, exhaust, heat and ventilation as required for construction operations and for temporary egress conditions. Take any and all necessary steps to ensure continuing of HVAC, electrical service, plumbing, fire alarm and fire protection for occupants of other tenants in the building while mechanical and other systems are being tied into, tested, and/or otherwise impacted by the work of this project.

C. Temporary protection to be provided as required to maintain, in found condition, all existing interior and exterior elements to remain and/or to be refurbished. Contractor is responsible to provide photographic condition surveys of all areas of work and to repair all damage to existing work to remain.

2.9 ENVIRONMENTAL CONTROLS

A. The Contractor shall comply with provisions of building management regarding environment controls, including, but not limited to, minimization of dust and containment of chemical vapors, proper storage of fuels and other potential contaminants, minimization of noise and vibration levels during construction, and proper and legal disposal, off site, of waste resulting from construction activities.

PART 3 EXECUTION

3.1 REMOVAL

A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the work. Remove all such temporary facilities and controls as rapidly as progress of the work will permit or as directed by the Architect.

END OF SECTION

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete product requirements as specified herein, including but not limited to, the following:

1. Product delivery, storage and handling.
2. Storage and protection.
3. Identifying markings.
4. Substitution requirements.
5. Temporary use of equipment.
6. General standards.

1.3 RELATED SECTIONS

A. Execution requirements – Section 017300.

1.4 TRANSPORTATION AND HANDLING

A. Materials, products, and equipment shall be properly containerized, packaged, boxed, and protected to prevent damage during transportation and handling.

B. More detailed requirements for transportation and handling are specified under the technical Sections.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage and liquids from freezing.

7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 IDENTIFYING MARKINGS

A. Name plates and other identifying markings shall not be affixed on exposed surfaces of manufactured items installed in finished spaces.

1.7 PRODUCT APPROVAL STANDARDS

A. Where the words "or approved equal" or other synonymous terms are used, it is expressly understood that they shall mean that the approval of any such submission is vested in the Architect, whose decision shall be final and binding upon all concerned. All submissions are subject to such approval and shall conform to the requirements of Article 1.8 herein.

1.8 SUBSTITUTIONS

A. After the contract has been executed, the Architect will consider a formal request for the substitution of products in place of those specified, under the following conditions:

1. The request is accompanied by complete data on the proposed substitution substantiating compliance with the Contract Documents including product identification and description, performance and test date, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified or named by Addenda, with data relating to Contract time schedule, design and artistic effect where applicable, and its relationship to separate contracts.

2. The request is accompanied by accurate cost data on the proposed substitution in comparison with the product specified, whether or not modification of the Contract Sum is to be a consideration.

B. Requests for substitution based on Para (1) above, when forwarded by the Contractor to the Architect for review are understood to mean that the Contractor:

1. represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified:

2. will provide the same guarantee for the substitution that he would for that specified;

3. certifies that the cost data presented is complete and includes all related costs under this Contract, but excludes costs under separate contracts and the Architect's redesign costs, and that he waives all claims for additional costs related to the substitution which subsequently become apparent; and

4. will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects, at no additional cost to the Owner and at no extension of the contract completion date.

C. Substitutions will not be considered if:

1. they are indicated or implied on shop drawings submissions without the formal request required in Para (1) above; or

2. for their implementation they require a substantial revision of the Contract Documents in order to accommodate their use.

3. The Architect will examine, with reasonable promptness, such substitution submittals, and return of submittals to the Contractor shall not relieve the Contractor from responsibility for deviations and alternatives from the contract plans and specifications, nor shall it relieve him from responsibility for errors in the submittals. A failure by the Contractor to identify in his letter of transmittal material deviations from the plans and specifications shall void the submittals and any action taken thereon by the Architect. When specifically requested by the Architect, the Contractor shall resubmit such shop drawings, descriptive data and samples as may be required to evaluate substitutions.

D. If any mechanical, electrical, structural, or other changes are required for the proper installation and fit of alternative materials, articles, or equipment, or because of deviations from the contract plans and specifications, such changes shall not be made without the consent of the Architect and shall be made without additional cost to the Owner.

1.9 TEMPORARY USE OF EQUIPMENT

A. No equipment intended for permanent installation shall be operated for temporary purposes without the written permission of the Architect.

B. The temporary or trial usage by the Owner of any mechanical device, machinery, apparatus, equipment or any work or materials supplied under this Contract before final completion and written acceptance by the Architect, including equipment and materials used for temporary and/or interim HVAC, shall not be construed as evidence of the acceptance of same by the Owner. The Owner shall have the privilege of such temporary and trial usage, for such reasonable length of time as and when the Architect shall deem to be proper for making a complete and thorough test of same and no claim for damage shall be made by the Contractor for the injury to or breaking of parts of such work which may be caused by weakness or inaccuracy of structural parts or by defective material or workmanship. If the Contractor

so elects, he may at his own expense, place a competent person or persons to make such trial usage; such trial usage shall be under the supervision of the Contractor.

1.10 GENERAL REQUIREMENTS

A. In the event that it is necessary for the Contractor to store any materials offsite, he shall first obtain the approval of the Architect. The Contractor shall be responsible for insurance and warehousing charges of any materials stored offsite. The Contractor shall also be responsible for the cost of delivery to the job site of any materials that have been stored offsite.

B. Materials delivered to the job site or stored off site shall be carefully stored and protected from damage. Damaged material shall not be used in the work. The Contractor shall provide, where directed, temporary storage facilities as may be required for the storage of all materials which might be damaged by weather.

C. Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the representative manufacturers, unless otherwise specified.

D. Equipment, plant, and appliances, such as hoists, centering, concrete lifts, construction elevators, cranes, rigging, towers, derricks, walks, ramps, chutes, scaffolding, implements, transportation, cartage and other things necessary and required for the adequate execution of the work and as required by law and applicable Union rules shall be provided and shall be maintained in good and safe mechanical working order, be responsible for their safe use, and remove them when no longer required. Applicable requirements of OSHA shall become and form a part of this document.

E. During handling and installation of work at project site clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

F. To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or pollution, water, ice, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high speed operation, improper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping/handling, theft and vandalism.

G. Require installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to Contractor) unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

H. Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

I. Inspect each item of materials or equipment immediately prior to installation and reject damaged and defective items.

J. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerance if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual-effect choices to Architect for final decision.

K. Recheck measurements and dimensions of the work as an integral step of starting each installation.

L. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work in coordination with entire work. Isolate each unit of work from non-compatible work, as required to prevent deterioration.

M. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.

N. Mounting Heights: See Architect's drawings for explicit information regarding mounting heights of devices, fixtures, hardware, signs and other unis of work. If no information regarding heights provided, or if information is ambiguous or contrary to code or the Contractor's better judgement, notify the Architect for review and resolution prior to preparatory work affecting installation.

END OF SECTION

SUBSTITUTION REQUEST
(After the Bidding/Negotiating Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

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SUBSTITUTION REQUEST
(After the Bidding/Negotiating Phase — Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: ☐

A/E's REVIEW AND RECOMMENDATION

☐ Approve Substitution - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Approve Substitution as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
☐ Reject Substitution - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

OWNER'S REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.
☐ Substitution rejected - Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E

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SECTION 016300

MOCK-UPS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Mock-Up Assemblies: Models built accurately using full scale materials for the purpose of study, testing, display, material and methods approval and final approval.

1. Provide submittals and all labor, materials, equipment and services required for the approval of samples, Mock-Up Construction and removal of Work at the end of the project and after final approval; at no additional cost to the Architect or Owner.

1.3 RELATED SECTIONS

A. Submittals - Section 013300.

B. Construction Facilities and Temporary Controls - Section 015000.

1.4 DEFINITIONS

A. Materials mock-ups are intended for review of materials, components and to set standards of workmanship for all portions of assemblies demonstrated. Approval is required prior to release for purchase of materials and/or fabrication, as may be applicable. Mock-ups may or may not be incorporated into the work, as applicable.

B. Installation mock-ups are intended for review and to set standards of workmanship for all portions of assemblies demonstrated. Installation mock-ups are provided “in place” and may be incorporated into the work with the approval of the architect(s).

1.5 MOCK-UP ASSEMBLIES

A. Schedule: A time schedule for the construction of all mock-up assemblies shall be prepared by the Contractor and submitted to the Architect for review, prior to the start of construction. Incorporate Mock-Up Schedule into Construction and Submittal Schedules.

B. Shop Drawings: Prepare and submit shop drawings of each mock-up assembly for review by the Architect. Shop drawings shall indicate all details, dimensions, connections, tolerances, and the relationship of the various parts to each other and to adjoining work.

C. Samples and Product Data: Prior to delivery of materials for mock-up assemblies, submit product data and samples of all materials proposed for use in the construction of the mock-ups for review by the Architect. Samples shall illustrate all characteristics such as scale, color and texture of finishes, sizes, shapes, and physical properties of the materials to be used in the Work.

D. Photographs: All details and features of mock-ups shall be thoroughly documented by color photographs taken from various points of view (at least four). This is in the same format but in addition to the requirement for project photographs in Section 013300 - Submittals.

E. Construction: Refer to drawings for size and location of mock-ups; mock-up numbers coincide with numbers on drawings. All slabs, footings, supporting walls, frames, etc. required for mock-up construction shall be provided by the Contractor.

F. Sequence of Inspection

1. The Architect shall be notified by the Contractor at the start of building all the mock-up assemblies and shall be advised of progress to allow the Architect to schedule inspections.

2. Visual examination of all mock-up assemblies will be made by the Architect, Owner and other interested parties during construction.

3. Mock-ups shall be scheduled well in advance of actual construction of the specified area to allow adjustments in material use, material selections and construction techniques.

4. Should any mock-up assembly fail to receive the approval of the Architect, it shall be taken down or dismantled and rebuilt to the extent necessary or until the Architect's approval has been obtained; at no cost to the Architect or Owner.

5. The rebuilding and completion of any mock-up assembly as necessary to obtain acceptance shall be so timed by the Contractor as to avoid delay in the construction schedule of the project.

6. Obtain the Architect's and University’s acceptance of each finished mock-up before commencing the final corresponding work for the project.

7. Coordinate the product list schedule with the Contractor's Construction Schedule and the Schedule of Submittals, and the time schedule for construction of mock-ups.

8. Approved interior mock-ups shall be incorporated into the permanent construction.

G. Approvals Required: Before ordering the job requirements of any materials for construction of work of sections or of assemblies requiring mock-ups, the Contractor is advised that he shall obtain approvals of the following:

a. Material(s).
b. Mock-up.
c. Shop Drawings.

PART 2 PRODUCTS

2.1 MOCK-UPS ASSEMBLIES

A. Materials and finishes shall comply with the requirements specified in the various sections of the specifications, and shall match previously submitted and approved samples.

B. Mock-ups shall incorporate all related construction materials and finishes having a visual effect upon the completed work.

PART 3 EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Field Measurement: Before ordering any materials for mock-up work, the Contractor shall verify all measurements at the project site and shall be responsible for their correctness. Responsibility for dimensions of materials or assemblies shall rest with the Contractor, who shall be responsible to correct to the Architect's approval, or replace, any misfitting elements. No extra charge will be allowed for differences between actual dimensions and measurements indicated on the drawings.

B. Manufacturers Instructions and Recommendations: Unless more stringent requirements are indicated or specified in individual sections of these specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of substantial completion of the Project.

3.2 MOCK-UP ASSEMBLIES

A. Portion of Steel and Glass wall at Vestibule.

B. Storefront Window Assembly with Blackout Shade.

C. Stained polished portion of concrete slab.

D. Vapor Barrier installation.

END OF SECTION

SECTION 017300

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

1.3 RELATED SECTIONS

A. Cutting and patching – Section 017329.

B. Closeout procedures – Section 017700.

1.4 SUBMITTALS

A. Qualification Data: For land surveyor to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two copies signed by land surveyor.

E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies or uncertainties are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each

survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg. F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended.

If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017329

CUTTING AND PATCHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes procedural requirements for cutting and patching.

1.3 RELATED SECTIONS

A. Refer to Divisions 2 through 32 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 22, 23 and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.4 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.5 SUBMITTALS

A. Cutting and Patching: Submit a method describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.

4. Dates: Indicate when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

7. Architect's Approval: Obtain approval of cutting and patching before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.6 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

1. Provide a list of additional elements that are structural elements and that require Architect's or Construction Manager's approval of a cutting and patching proposal.

B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

1. Primary operational systems and equipment.

2. Air or smoke barriers.

3. Fire-protection systems.

4. Control systems.

5. Communication systems.

6. Conveying systems.

7. Electrical wiring systems.

8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

1. Water, moisture, or vapor barriers.

2. Membranes and flashings.

3. Exterior curtain-wall construction.

4. Equipment supports.

5. Piping, ductwork, vessels, and equipment.

6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces

in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.7 WARRANTY

A. Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void warranties.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. In-Place Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. In-Place Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Warranties.
4. Instruction of Owner's personnel.
5. Final cleaning.

1.3 RELATED SECTIONS

A. Execution requirements – Section 017300.

B. Operating and maintenance data – Section 017823.

1.4 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.

9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Advise Owner of changeover in heat and other utilities.

12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

13. Complete final cleaning requirements, including touchup painting.

14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.5 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest-control final inspection report and warranty.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

1.7 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

3. Mark important additional information that was either shown schematically or omitted from original Drawings.

4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Note related Change Orders, Record Drawings and Product Data, where applicable.

D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Drawings and Record Specifications, where applicable.

E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit on digital media acceptable to Architect.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

3. Schedule training with Owner with at least seven days' advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.

2. Review of documentation.

3. Operations.

4. Adjustments.

5. Troubleshooting.

6. Maintenance.

7. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    1). Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 017823

OPERATING AND MAINTENANCE DATA

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the operating and maintenance data as specified herein.

1.3 RELATED SECTIONS

A. Submittals - Section 013300.

B. Contract closeout - Section 017300.

1.4 GENERAL

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.

1. Sub-Contractors shall prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.

1.5 FORM OF SUBMITTALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 MANUAL FOR MATERIALS AND FINISHES

A. Submit pdf of complete manual in final form.

B. Content, for architectural products, applied materials and finishes

1. Manufacturer's data, giving full information on products.

a. Catalog number, size, composition.
b. Color and texture designations.
c. Information required for re-ordering special-manufactured products.

2. Instructions for care and maintenance.

a. Manufacturer's recommendation for types of cleaning agents and methods.
b. Cautions against cleaning agents and methods which are detrimental to the product.
c. Recommended schedule for cleaning and maintenance.

C. Content, for moisture-protection and weather-exposed products

1. Manufacturer's data, giving full information on products.

a. Applicable standards.
b. Chemical composition.
c. Details of installation.

2. Instructions for inspection, maintenance, and repair.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit pdf of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate.

1. Description of unit and component parts.

a. Function, normal operating characteristics, and limiting conditions.
b. Performance curves, engineering data and tests.
c. Complete nomenclature and commercial number of all replaceable parts.

2. Operating procedures

a. Start-up, break-in, routine and normal operating instructions.
b. Regulation, control, stopping, shut-down and emergency instructions.
c. Summer and winter operating instructions.
d. Special operating instructions.

3. Maintenance procedures

a. Routine operations.
b. Guide to "trouble-shooting".
c. Disassembly, repair and reassembly.
d. Alignment, adjusting and checking.

4. Servicing and lubrication schedule.

a. List of lubricants required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

    a. Predicted life of parts subject to wear.
    b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.

9. Each contractor's coordination drawings.

    a. As-installed color coded piping diagrams.

10. Charts of valve tag numbers, with the location and function of each valve.

11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

12. Other data as required under pertinent sections of specifications.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.

    a. Function, normal operating characteristics, and limiting condition.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories of panel boards.

    a. Electrical service.
    b. Controls.
    c. Communications.

3. As-installed color coded wiring diagrams.

4. Operating procedures

    a. Routine and normal operating instructions.
    b. Sequences required.
    c. Special operating instructions.

5. Maintenance procedures

    a. Routine operations.
    b. Guide to "trouble-shooting".
    c. Disassembly, repair and reassembly.
    d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

8. Other data as required under pertinent sections of specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: The respective sections of Specifications.

END OF SECTION

SECTION 024119

SELECTIVE DEMOLITION AND ALTERATION WORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the selective demolition and alteration work as shown on the drawings and/or specified herein, including but not limited to the following:

1. Alterations, selective demolition and removals as noted on drawings and as required to accommodate new construction.

2. Removal of debris.

3. Protection of existing building and spaces to remain, and shoring of the structure as required for structural integrity and personal safety.

4. Protection of existing curbs and sidewalks.

5. Temporary coverage passageways.

6. Alterations, selective demolition and removals of exterior facade where noted.

7. Patching and refinishing of existing surfaces damaged as a result of this work.

8. Protection.

1.3 QUALITY ASSURANCE

A. The Contractor shall comply with the requirements of all applicable Federal, State and local safety and health regulations regarding the demolition of structures including ANSI/NFPD 241-Building Construction and Demolition Operations.

B. The Contractor shall be responsible for any damage to any adjacent structures or buildings to remain.

C. Qualifications: Qualifications of Contractor for work of this Section shall not be less than ten (10) years of field experience in work of this nature.

D. Professional Engineering: The Contractor shall retain the services of a Professional Engineer licensed in the State of New York, who shall design and supervise installation of all underpinning and shoring.

1.4 RELATED SECTIONS

A. Alteration and removal requirements for mechanical and electrical work - Mechanical and Electrical Sections.

1.5 SUBMITTALS

A. Schedule of Demolition Operations: Submit demolition procedures and operational sequence for Architect's review prior to start of work. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:

1. The work of tying in or connecting to operational systems of the building, including electrical, mechanical and security systems.

2. The work of the Owner or any separate Contractor.

3. The structural value or integrity of any element of the project or of adjacent structures.

4. The integrity or effectiveness of weather-exposed and moisture-resistant elements or systems.

5. The efficiency, operational life, maintenance, or safety of operational elements or systems.

B. Notice of Differing Conditions: Submit a written notification if, during the work of demolition and cutting, conditions are discovered which significantly vary from those shown on the drawings. Do not commence work until approval of Architect.

C. Shop Drawings: Submit the following prior to starting work:

1. Submit for Architect's information shop drawings indicating location and typical construction details of temporary dustproof and weatherproof partitions.

2. Submit drawings of temporary structural shoring, bracing, framing or support, for the information of the Architect. Such drawings will be reviewed by the Structural Engineer for the effects of such temporary members on the structural elements to remain. These drawings shall include the reason for such temporary members, the location, the direction and magnitude of design reaction forces on existing structure, and details showing how these reaction forces will be applied to the existing structure.

a. Shop drawings shall be submitted with the Seal of the P.E. engaged by Contractor; P.E. must be licensed in the State of New York.
b. The Architect will receive acknowledgment for concepts shown. Such acknowledgments shall be of the concept only and not of actual capacities or structural design and shall not in any way diminish or limit the Contractor's responsibility for the quality and performance of the work and for protecting existing structures and facilities.

1.6 SPECIAL PRECAUTION

A. Hazardous materials may be encountered during demolition operations including asbestos; comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

1.7 JOB CONDITIONS

A. Condition of Structure

1. The Contractor for the work of this Section shall be held to have visited the site, examined the premises, determined for himself the existing conditions, character of equipment and facilities needed for the performance of the work, and all matters which may in any way affect the work before submitting a bid.

    a. Information regarding existing construction or conditions is based on available record drawings which may or may not truly reflect existing conditions. Such information is included on the assumption that it may be of interest to the Contractor, but the Architect, Owner and their consultants do not assume responsibility for its accuracy or completeness.
    b. Notify the Architect if, during the course of demolition, conditions are discovered which significantly vary from those shown on the drawings. Do not proceed until authorized by Architect.

2. The Contractor shall accept the condition of the site and structures as found. The Architect and Owner assume no responsibility for condition of site or structures nor the continuation of the condition existing at time of bidding or thereafter.

B. Areas of building to be demolished or altered will be vacated and discontinued in use prior to the start of the work.

1. Surrounding areas of the building shall remain operational by the Owner.

C. Partial Removal

1. Items of savable value to the Contractor may be removed from the structure as the work progresses. Salvaged items must be transported from the site as they are removed.

2. Storage or sale of removed items on the site will not be permitted.

D. Explosives: The use of explosives will not be permitted.

E. Traffic

1. Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.

2. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Utilities

1. Refer to Division 22 and 26 of the specifications for special requirements concerning utilities and services.

2. Maintain any existing utilities required to remain; keep in service and protect against damage during demolition operations.

3. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities.

4. Disconnect and seal any abandoned utilities before starting demolition operations. Coordinate all work with local utility companies having jurisdiction.

1.8 SCHEDULING

A. Before commencing any alteration or demolition work, submit for review by the Architect, and approval of the Owner, a schedule showing the commencement, the order, and the completion dates for the various parts of this work.

B. Before starting any work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the structures to remain, notify the Architect and the Owner 7 days in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.

PART 2 PRODUCTS

Refer to Part 3 - Execution, for Product Requirements

PART 3 EXECUTION

3.1 PROTECTION

A. Take full precautions to protect workmen, passersby or any other persons from falling debris and other hazards of demolition operations.

B. Execute demolition work to insure protection of existing portions of building to remain against damages which might occur from falling debris or other cause. Do not interfere with use of adjacent occupied buildings and areas. Maintain free, safe passage to and from occupied adjacent buildings.

C. Materials Placement: Do not load structure with weight that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.

D. Construction Operations: Do not employ any construction operation, equipment or vehicles that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.

E. Take precautions to guard against movement, settlement, damage, or collapse of any part of building, sidewalks, adjacent property or street passages; be liable for any such movement, settlement or collapse. If such damage does accidentally occur, Contractor shall repair promptly at no cost to Owner.

F. Provide the necessary safeguards to prevent accidents, to avoid all necessary hazards and protect the public, the work and property at all times, including Saturdays, Sundays, and holidays.

G. Be responsible for any and all damages which may arise or occur to any party whatsoever by reason of the neglect in providing proper lights, guards, barriers, or any other safeguards to prevent damage to property, life and limb.

H. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.

1. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain. The Contractor's Professional Engineer shall advise on bracing, shoring, underpinning, or other structural requirements. The Contractor shall bear all responsibility for prevention of movement or other structural fault.

2. The Contractor shall restore, by repair or otherwise, the portions of structure or their contents altered by the Contractor in furtherance of his underpinning and support operations. Restoration shall be completed to the conditions which existed prior to the start of the work. Any damage caused by inadequate support shall also be restored by the Contractor at no cost to the Owner.

I. Provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in demolition and alteration operations, occupants of the building, public and adjacent property. Any damage caused by the Contractor's operations shall be promptly repaired by the Contractor at no cost to the Owner.

J. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal, and new work are being done, connections made, materials handled, or equipment moved.

K. Take necessary precautions to prevent dust and dirt from rising. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.

L. Provide adequate fire protection in accordance with local Fire Department requirements.

M. Do not close or obstruct walkways, passageways, or stairways. Do not store or place materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.

N. Be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.

O. Erect temporary covered passageways at street level as required by authorities having jurisdiction.

P. Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.

Q. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

3.2 INSPECTION

A. Verify that areas of demolition work are protected and temporary dustproof partitions have been installed.

B. Verify that construction to be removed is not load bearing or has been properly braced, framed or supported.

C. Inspect existing conditions of the project, including elements subject to damage or to movement during demolition and cutting.

D. After uncovering work, inspect the conditions affecting the installation or performance of the work.

1. Report differing or questionable conditions to the Architect in writing; do not proceed with the work until the Architect has provided further instructions.

3.3 PREPARATION

A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work

B. Provide devices and methods to protect other portions of the project from damage.

C. Pollution Controls

1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.

a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing prior to the start of the work.

3. Provide drainage for temporary water use.

3.4 DEMOLITION AND CUTTING

A. Selectively demolish existing construction in conformance with the drawings and these specifications.

1. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surface to receive installation of work by others and patching of finish surfaces.

2. Do all cutting or removal so as to leave neat, true, plumb and square edges, at edges to remain. Use carborundum or diamond saw equipment for cutting masonry, concrete and stone work, where edges or surfaces are to remain.

3. Do not cut or remove construction which might weaken or impair the structural integrity or strength of the structural framing or support systems which are to remain.

4. Demolish and remove materials as shown on the drawings without damage to the remaining parts of the structure or mechanical/electrical/utility systems.

5. Remove materials so as to not impose excessive loads in supporting walls, floors or framing and so as not to damage remaining undemolished portions of the structure.

6. Where portions of structures are to be removed, remaining portions shall be protected from damage and prepared to fit new construction. Damage to portions of structures to remain shall be repaired.

7. Reinforcing steel in existing structures shall be left in place, cleaned and aligned to provide tie with new work.

8. Existing waterproofing systems and flashings shall be carefully exposed and protected to maintain workable conditions of fitting new work with existing construction.

9. Proceed with demolition in a systematic manner.

10. Demolish concrete and masonry in small sections.

11. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.

B. Shoring

1. Design, provide, erect and maintain necessary temporary shoring, bracing, framing, or support where load bearing structural or supporting members are removed or weakened by cuts or openings or are subject to damage from demolition operations, and otherwise as required for safety or to protect finish surfaces from damage.

2. Construction and adequacy of the shoring shall be the entire responsibility of the Contractor. Any damage caused by the inadequacy of the shoring or other support shall be the responsibility of the Contractor to remedy at no additional expense to the Owner.

3. Shoring and bracing shall remain until new structural framing and/or supports are installed. Coordinate operations fully with other trades.

4. Be ready at any time to promptly provide, add to, or strengthen temporary shoring, bracing, or support for existing work, in case existing construction begins to show signs of structural stress.

3.5 WORKMANSHIP STANDARDS FOR ALTERATION AND REMOVAL WORK

A. Cut, remove, alter, temporarily remove and replace, or relocate existing work as required for performance of the work. Perform such work required with due care, including shoring and bracing.

B. Coordinate patching involving the various trades whether or not specifically mentioned in the respective specification Sections.

C. Materials or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property.

D. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the adjacent buildings.

E. In general, demolish masonry in small sections. Where necessary to prevent collapse of any construction, install temporary shores, struts, or bracing.

F. Materials to be removed by existing elevators shall be put in enclosed containers.

G. Where existing equipment and/or fixtures are indicated to be reused, repair such equipment and/or fixtures and refinish to put in perfect working order. Refinish as directed.

H. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.

I. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. Cut and fold back existing roofing. Cut and remove insulation and related items. Provide temporary weathertight protection as required until new roofing and flashings are installed. Consult the Owner to ascertain if existing guarantee bonds are in force and execute the work so as not to invalidate such bonds.

J. Where utilities are removed, relocated or abandoned, cap, valve, plug, or by-pass to make complete and working installation.

K. Restore existing pipe and duct coverings damaged by work under this Contract to original undamaged condition.

L. Immediately restore to service and repair any damage caused by Contractor's workmen to existing pipe and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems which are not scheduled for discontinuance or abandonment.

M. Upon completion of contract, deliver work complete. Damage that may be caused by Contractor or Contractor's workmen to existing structures designated to remain, grounds, and utilities shall be repaired by Contractor and left in as good condition as existed prior to damaging.

N. Restore finish work of floors, walls, and ceilings remaining in place but damaged or defaced because of demolition or alteration work to condition equal that which existed at beginning of work under this Contract.

O. Where alteration or removals expose damaged or unfinished surfaces or materials, refinish such surfaces or materials, or remove them and provide new or salvaged materials to make continuous surfaces uniform.

P. Perform new work and restore and refinish existing work in conformance with applicable requirements of the specifications, except as follows:

1. Materials for use in repair of existing surfaces, but not otherwise specified, shall conform to the highest standards of the trade involved, and be in accordance with approved industry standards, and shall be as required to match existing surfaces.

2. Workmanship for repair of existing materials shall, unless otherwise specified, be equal to similar workmanship existing in or adjacent to the space where the work is being done.

3. Installation of salvaged items where no similar items exist shall be done in accordance with the highest standards of the trade involved and in accordance with approved shop drawings.

Q. Materials or items designated to become the property of the Owner shall be as shown on the drawings. Remove such items with care and store them in a location at the site to be designated by the Owner.

R. Materials or items designated to be reinstalled shall be as shown on the drawings. Remove such items with care under the supervision of the trade responsible for reinstallation; protect and store until required. Replace materials or items damaged in their removal with similar new material.

S. The existing building shall not be used as a work shop. Neither shall the furnishings or equipment in any room be used as work benches. Should any damage occur during the progress of the work to any furniture, fixtures, equipment, or appurtenances therein, such damage shall be repaired, replaced or made good by the Contractor without extra cost to the Owner.

T. Where removing existing floor finish and base, remove all adhesive and leave floors and walls smooth and flush, ready to receive new finish.

U. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease and loose paint before refinishing.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General

1. Remove from the site debris, rubbish and other materials resulting from work of this Section.

2. Burning of removed materials from demolished structures will not be permitted on the site.

B. Removal: Transport materials removed from demolished structures and legally dispose of off site. Pay any and all fees associated with disposal work. Leave the site in an orderly condition to the approval of the Architect.

3.7 CLEANING UP

A. Remove debris as the work progresses. Maintain existing premises in a neat and clean condition.

END OF SECTION

SECTION 030130

MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the concrete maintenance work as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Patching of concrete to provide surface for finishes.

1.3 RELATED SECTIONS

A. Stained and Polished Concrete – Section 033543

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's complete technical data sheets for the following:

1. Materials.

2. Equipment.

1.5 QUALITY ASSURANCE

A. Installation of the product must be completed by a factory-trained applicator, using mixing equipment and tools approved by the manufacturer.

B. Product must be cement-based having an inorganic binder content which includes a minimum 80% Portland cement per ASTM C150: Standard Specification for Portland cement and other specialty hydraulic cements. Gypsum products are not acceptable.

C. Manufacturer Experience: Provide products of this section by companies which have successfully specialized in production of this type of work for not less than 5 years.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

C. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels indicating brand name, directions for storage, directions for mixing with other components and directions for application.

D. Storage and Protection

1. Store materials in compliance with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

2. Dispense materials from factory-numbered and sealed containers. Maintain record of container numbers

1.7 ENVIRONMENTAL LIMITATIONS/ JOB CONDITIONS

A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting cleaning of concrete operations.

PART 2 PRODUCTS

2.1 MATERIALS

A. Self-Drying, Cement-Based Finish Underlayment by Ardex Engineered Cements (basis of design as listed below) or comparable product by Laticrete, MAPEI, or approved equal.

1. Ardex Featheredge.

2. Primers

a. Other non-porous substrates, such as epoxy coating systems and metal: ARDEX P 82 Ultra Prime

B. Water: Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where maintenance of cast-in place-concrete is to be completed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper completion of the work.

3.2 PREPARATION

A. General: Prepare substrate in accordance with manufacturer's instructions.

B. Concrete:

1. Prior to proceeding please refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean if necessary using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.

2. Substrates shall be inspected in accordance with ASTM F2170 and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor

covering. For areas where moisture vapor emissions exceed the required limits install the appropriate ARDEX Moisture Control System.

3. Crack and Joint Preparation

   a. Moving Joints and Moving Cracks – honor all moving joints and moving cracks up through the installation. A flexible sealing compound such as ARDEX ARDISEAL Rapid Plus Semi-Rigid Joint Sealant may be installed.
   b. Dormant Control Joints and Dormant Cracks – Fill all dormant control joints and dormant cracks with ARDEX ARDIFIX Low Viscosity Rigid Polyurethane Crack & Joint Repair or ARDEX FEATHER FINISH as recommended by the manufacturer.

3.3 APPLICATION OF PATCHING MATERIAL

A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

C. Mixing: Comply with manufacturer's printed instructions and the following.

   1. Add 2 1/2 quarts (2.4 L) of clean potable water per 10-pound (4.5 kg) bag.

   2. Mix using a 1/2" (12 mm, 650 rpm) low speed heavy-duty mixing drill with an ARDEX T-2 ring mixing paddle. Do not overwater.

D. Application: Comply with manufacturer's printed instructions and the following.

   1. Patch material can be installed from a true featheredge up to 1/2" (12.7 mm) over large areas. It can also be installed up to any thickness in small, well-patching material to the substrate with the flat side of a trowel to obtain a solid mechanical bond before applying the desired thickness.

E. Curing: As soon as the patching material can be worked on without damaging the surface (15-20 minutes), standard floor coverings such as VCT, sheet vinyl and carpeting can be installed. If installing wood flooring, or, if high-performance adhesives will be used, such as epoxies or urethanes, patching material must first cure for 16 hours (70°F).

3.4 FIELD QUALITY CONTROL

A. Where specified, field sampling of the underlayment is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

3.5 PROTECTION

A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitableprotection course.

END OF SECTION

SECTION 033543

STAINED AND POLISHED CONCRETE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the stained and polished concrete floors, both new and existing, as indicated on drawings and specified herein.

1.3 RELATED SECTIONS

A. Maintenance of Cast in Place Concrete – Section 030130.

1.4 QUALITY ASSURANCE

A. Applicator must be approved and licensed by the manufacturer of the material selected for use.

B. Installation of materials shall not begin until a manufacturer's representative has inspected the surface to receive the sealer and acknowledges acceptable preparation.

C. Dynamic Coefficient of Friction: Flooring surfaces shall have a minimum wet DCOF value of 0.45 when measured according to ANSI B101.3.

1.5 SUBMITTALS

A. Indicate form work on shop drawings, including pertinent dimensions, materials, and arrangement of joints, reinforcing, and ties.

B. Samples:

1. Submit two (2) 12-inch by 12-inch samples.

2. Sample will be approved for appearance, color, and texture.

1.6 QUALITY ASSURANCE

A. Applicator: Company specializing in performing the work of this Section with a minimum of 3 years' experience and approved by the manufacturer of the product used.

B. Mock-Ups: Provide mock-ups of each type finish and color, to demonstrate typical joints, surface finish, color variation, and standard of workmanship.

1. Build mock-ups approximately 48" x 48" for each color and texture in the location indicated or if not indicated, as directed by the Architect.

2. Notify Architect seven days in advance of dates and times when mock-ups will be constructed.

3. Obtain from the Architect approval of mock-ups before starting construction.

4. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.

1.7 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Schedule and conduct pre-installation conference at Project site to establish guidelines and expectations for scheduling of floor treatment application stain color, degree of polish, concrete finish specifications, floor flatness, and similar issues. Ensure attendance at Pre-Installation Conference by at least:

1. Owner's Representative

2. Prime Contractor

3. Applicable Subcontractors

4. Certified Applicator

5. Floor Treatment Manufacturer's Representative.

1.8 COORDINATION

A. Notify appropriate trades of concrete pour and polishing schedules to allow adequate time for installation of complementary trade work.

B. From material supplier, obtain anchor bolts/other steel items to be cast into concrete.

C. With appropriate trades, coordinate size and location of mechanical equipment concrete pads.

1.9 WARRANTY

A. Manufacturer/applicator Warranty: 10 years for labor and materials.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Subject to the requirements specified herein, Ameripolish Pro Guard Series - Stain Shield, and Ameripolish Dye, with the following characteristics:

1. Ameripolish, In colors as selected by Architect, Field mockup required showing clear, medium and dark stain each in burnished, light & medium level polish

2. Abrasion Resistance: ASTM C 779 – Up to 400% increase in abrasion resistance.

3. Impact Strength: ASTM C 805 – Up to 21% increase impact strength.

4. Ultra Violet Light and Water Spray: ASTM G 23-81 – No adverse effect to ultra violet and water spray.

5. Coefficient of Friction per ASTM C1028.

6. Reflectivity: Up to 30% increase in reflectivity.

2.2 ACCESSORIES

A. Neutralizing Agent: Tri-sodium Phosphate.

B. Water: Potable.

PART 3 EXECUTION

3.1 SLAB PROTECTION

A. Contractor shall provide Masonite protection over entire concrete area that is to receive floor finish.

B. Protection shall be provided from pour until application of floor finish.

3.2 INSPECTION

A. Examine the areas and conditions where concrete sealer, hardener and finishing are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

B. Manufacturer's representative must inspect surfaces to receive sealer and hardener compounds approve those surfaces in writing to the Architect prior to start of application.

3.3 SURFACE PREPARATION (TO BE PERFORMED SUCCESSIVELY):

A. Prepare concrete by performing three steps of machine grinding with grits listed below. Between each step, contractor is required to remove excess concrete debris using a HEPA vacuum.

1. Machine grind with 16 grit metal bond diamonds.

2. Machine grind with 30 grit metal bond diamonds.

3. Machine grind with 80 grit metal bond diamonds.

B. Prepare concrete by performing three steps of machine buffing with grits listed below. Between each step, contractor is required to remove excess concrete debris using a HEPA vacuum.

1. Machine buff with 100 grit metal bond diamonds.

2. Machine buff with 200 grit metal bond diamonds.

3. Machine buff with 400 grit metal bond diamonds.

C. Apply Densifier/base Prepration product.

1. Work the product into the floor for approximately one (1) hour.

2. Wet vacuum off any excess and dispose.

D. Prepare concrete by performing five steps of machine polishing with grits listed below. Between each step, contractor is required to remove excess concrete debris using a HEPA vacuum.

1. Machine polish with 200 grit resins

2. Machine polish with 400 grit resins

3. Machine polish with 800 grit resins

4. Machine polish with 1,500 grit resins

5. Machine polish with 3,000 grit resins

E. Machine burnish three (3) coats of protectant, on top of polished concrete.

F. Buff the floor after each coat.

3.4 APPLICATION

A. Install concrete sealer and hardener in accordance with manufacturer's instructions.

B. Concrete must be in place a minimum of 21 days or as directed by the manufacturer before application can begin.

C. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample

D. Concrete slab must be broom swept and completely uninhibited for application.

E. Apply compounds to achieve water repellancy, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.

F. Polish to sheen level as per Architects approved mock up.

G. Apply protectant or approved equal.

3.5 WORKMANSHIP AND CLEANING

A. The premises shall be kept clean and free of debris at all times.

B. Remove spatter from adjoining surfaces as necessary.

C. Repair damages to surface caused by cleaning operations.

D. Remove debris from jobsite.

1. Dispose of materials in separate, closed containers in accordance with local regulations.

E. Protection of work area shall be provided to ensure no dust particulate debris adheres to surrounding areas or overhead structures.

F. All grinding equipment shall include all integral dust collection system with HEPA filtration.

3.6 PROTECTION OF FINISHED WORK

A. Do not permit traffic over unprotected floor underlayment surfaces and until underlayment is completely dry.

END OF SECTION

SECTION 055000

MISCELLANEOUS METALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the miscellaneous metal work as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Vertical steel ladders and ship's ladders.
2. Open riser steel service stairs.
3. Steel pipe handrails and railings not part of steel pan stair assemblies.
4. Light steel framing and supports not included as part of work of other trades.
5. Custom Interior Shop painted Steel Storefront Framing.
6. Steel Floor Plate at Display Case.
7. Steel gratings and frames.
8. Steel plate covers and frames.
9. Unistrut.
10. Miscellaneous steel trim, corner guards, angle guards and channels.
11. Steel floor access door.
12. Sleeves in concrete walls and slabs.
13. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section.
14. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.
15. Cutting, fitting, drilling and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section.

1.3 RELATED SECTIONS

A. Custom Entrances and Storefronts – Section 084323.13.

B. Painting - Section 099000.

1.4 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

C. Reference Standards: The work is subject to requirements of applicable portions of the following standards:

1. "Manual of Steel Construction," American Institute of Steel Construction.

2. AWS D1-1 "Structural Welding Code," American Welding Society.

3. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning," Steel Structures Painting Council.

4. SSPC PA-1 "Painting Application Specification," Steel Structures Painting Council.

5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute.

D. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.

E. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years' experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coatings within the same facility as outlined herein. The Architect has the right to inspect and approve or reject the galvanizer/galvanizing facility.

F. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of five years and shall provide the Architect with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

G. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

1.5 PERFORMANCE STANDARDS

A. Stairs and railings shall be constructed to conform to the following performance standards:

1. Stairs and platforms shall support a live load of one hundred (100) psf and a concentrated live load of three hundred (300) lbs. and shall have a live load deflection limited to 1/360 of the span. Loads shall not apply simultaneously.

2. For projects in New York City, railings shall be designed to resist loads per New York City Building Code.

3. Railings shall be designed to resist loads per New York Building Code.

1.6 SUBMITTALS

A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.

B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.

C. Engineering Data

1. Before any stairs, ladders or railings are fabricated, submit engineering data drawings to the Architect for review indicating how performance standards specified here shall be met. The Contractor is responsible for the structural design and supports for these systems and must show his proposed systems on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of New York and shall be signed and sealed by this Engineer.

D. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4" weld, weld and tack weld are not acceptable.

E. Certification: For items to be hot-dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Metals

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Steel Plates, Shapes and Bars: ASTM A 36.

3. Steel Bar Grating: ASTM A 1011 or ASTM A 36.

4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

5. Structural Steel Sheet: Hot rolled, ASTM A 1011; or cold rolled, ASTM A 1008, Class 1; of grade required for design loading.

6. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.

7. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

8. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B. Grout: Non-shrink, non-metallic grout conforming to the requirements of Section 033000.

C. Fasteners

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

3. Anchor Bolts: ASTM F 1554, Grade 36.

4. Lag Bolts: ASME B18.2.1.

5. Machine Screws: ASME B18.6.3.

6. Plain Washers: Round, carbon steel, ASME B18.22.1.

7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.

D. Shop Paint: Shop prime all non-galvanized miscellaneous metal items using Series 88 Azeron Primer made by Tnemec, ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403, or "Interlac 393" by International Protection Coatings.

1. If steel is to receive high performance coating as noted in Section 099000, shop prime using primer noted in Section 099000.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Galvanizing Repair Coating: For touching up galvanized surfaces after erection, provide repair coating that is V.O.C. compliant, equal to "Silver Galv" made by Z.R.C. Worldwide or approved equal. Apply to a dry film thickness of 1.5 to 3.0 mils.

2.2 PRIME PAINTING

A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work.

B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.

1. Steel to get high performance coating as noted in Section 099000 shall be cleaned as per SSPC SP.6 "Commercial Blast Cleaning."

C. Application

1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.

2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.

3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.

D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.

E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 GALVANIZING

A. Scope: All ferrous metal exposed to the weather, and all ferrous metals indicated on drawings or in specifications to be galvanized, shall be cleaned and then hot-dipped galvanized after fabrication as provided by Duncan Galvanizing or approved equal.

B. Avoid fabrication techniques that could cause distortion or embrittlement of steel items to be hot-dip galvanized. Fabricator shall consult with hot-dip galvanizer regarding potential warpage problems or handling problems during the galvanizing process that may require adjustment of fabrication techniques or design before finalizing shop drawings and beginning of fabrication.

C. Cleaning: Thoroughly clean metal surfaces of all mill scale, rust, dirt, grease, oil, moisture and other contaminants prior to galvanizing.

D. Application: Hot-dip galvanizing shall conform to the following:

1. ASTM A 143: Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel.

2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A 153: Galvanized Coating on Iron and Steel Hardware - Table 1.

4. ASTM A 384: Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.

5. ASTM A 385: Practice for Providing High Quality Zinc Coatings.

6. ASTM A 924: Galvanized Coating on Steel Sheets.

7. Minimum weight of galvanized coating shall be two (2) oz. per square foot of surface.

E. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

F. All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the weight of the coating, and the appropriate ASTM number.

G. To minimize surface imperfection (e.g.: flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc will not be permitted.

H. After galvanizing all materials not exposed to view must be chromated by dipping material in a 0.2% chromic acid solution.

I. Galvanized surfaces, where exposed to view, must have a smooth, level surface finish. Where this does not occur, piece shall be rejected and replaced to the acceptance of the Architect.

2.4 PROTECTIVE COATINGS

A. Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

2.5 WORKMANSHIP

A. General

1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced tradesman.

2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.

3. All work shall be accurately and neatly fabricated, assembled and erected.

B. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the miscellaneous metal subcontractor to assure himself that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.

C. Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.

D. Holes: Drill or cleanly punch holes; do not burn.

E. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by Architect.

1. Welding

a. Shall be in accordance with AWS D1.1 Structural Welding Code of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.
b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces; undercut metal edges where welds are required to be flush.
c. All welds on or behind surfaces which will be exposed to view shall be done so as to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.

2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.

F. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

G. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section of the Specifications to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

H. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

I. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

J. Exposed Work

1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.

2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.

3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

K. Preparation for Hot-Dip Galvanizing: Fabricator shall correctly prepare assemblies for galvanizing in consultation with galvanizer and in accordance with applicable Reference Standards and applicable AGA publications for the "Design of Products to be Hot-Dip galvanized After Fabrication." Preparation shall include but not be limited to the following:

1. Remove welding flux.

2. Drill appropriate vent holes and provide for drainage in inconspicuous locations of hollow sections and semi-enclosed elements. After galvanizing, plug vent holes with shaped lead and grind smooth.

2.6 MISCELLANEOUS METALS ITEMS

A. Rough Hardware

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.

B. Ladders

1. Vertical steel ladders shall be eighteen (18) inches wide with 3/4" diameter non-slip steel rungs spaced twelve (12) inches o.c. Stringers shall be 3/8" thick by 2-1/2" wide steel bars; rungs welded to bars. Attach ladders to walls six (6) inches from top and bottom and maximum thirty-six (36) inches o.c. from these points. At the roof, gooseneck the rails back to the structure to provide secure ladder access.

2. Provide sloping ladders (ship's ladders) where noted. Fabricate open type construction with structural steel channel or steel plate stringers, pipe handrails, and open steel grating treads. Provide all necessary brackets and fittings for installation.

3. Ladders shall be fabricated to support a live load of one hundred (100) lbs. per square foot and a concentrated load of three hundred (300) lbs. per rung; loads not to act simultaneously.

C. Open Riser Service Stairs

1. General: Construct stairs to conform to sizes and arrangements shown; joint pieces together by welding. Provide complete stair assemblies, including metal framing, hangers, railings, newels, balusters, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure.

2. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as shown. Bolt or weld headers to strings and newels and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

3. Attach treads to stringers by means of brackets made of steel and angles or bars. Weld brackets to strings and attach metal treads to brackets by welding, riveting or bolting.

4. Provide platforms of same metal as treads and in thicknesses required to support design loading. Attach platform to platform framing members with welds.

5. Steel Floor Plate Treads and Platforms: Provide raised pattern steel floor plate complying with FS QQ-F-461, Class I. Provide diamond pattern.

    a. Form treads of 1/4" thick steel floor plate with integral nosing and back edge stiffener. Weld steel supporting brackets to strings and treads to brackets.
    b. Fabricate platforms of steel floor plate. Provide nosing matching that on treads at all landings. Secure to platform framing members with welds.

D. Steel Pipe Handrails

1. Steel pipe of size shown on Drawings, Schedule 40. Fittings shall be flush type, malleable of cast iron. Brackets shall be malleable iron, design as selected by the Architect.

2. Construction: Form direction changes in rails using solid bar stock or elbows. Connections shall be shop welded and ground smooth and flush, except where field connections and expansion joints are required. Field connections may be welded, internal sleeve and plug weld, or internal sleeve and set screw.

3. Secure handrails to walls with wall brackets. Provide brackets of malleable iron castings, with not more than three (3) inches clearance from inside face of handrail to wall surface. Neatly drill wall plate portion of the bracket into concrete or masonry to receive bolts for concealed anchorage. For installation at drywall, Drywall trades shall provide plate to receive wall plate portion of bracket and anchor or bolt wall plate through drywall to supporting steel plate. Locate brackets at not more than 5'-0" o.c. unless otherwise shown.

4. Provide wall return fittings of cast iron, flush type, with the same projection as that specified for wall brackets.

5. Longitudinal members shall be parallel with each other and with floor surface or shape of stair to a tolerance of 1/8" in 10'-0" linear feet. Center line of members within each run of railing shall be in the plane.

6. For steel pipe posts where indicated, anchor posts in concrete by means of pipe sleeves set and anchored into concrete. Provide sleeves of galvanized steel pipe, not less than six (6) inches long and having an inside diameter not less than 1/2" greater than outside diameter of the inserted pipe. Provide steel plate closure secure to bottom of sleeve and of width and length not less than one (1) inch greater than outside diameter of sleeve. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-ferrous grout. Cover anchorage joint with a round steel flange welded to post. Posts shall be set plumb within 1/8" vertical tolerance.

7. Steel pipe handrails shall be capable of resisting a two hundred (200) lb. force applied to rail from any direction and a uniformly distributed load of fifty (50) lbs. per linear foot applied downward or horizontally, loads not to act simultaneously.

E. Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.

2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

F. Steel Floor Plate: 1/4” thick brushed stainless steel floor plate.

1. 304 Stainless Steel shall be hot rolled, annealed, with patterned finish as selected by the Architect.

2. Steel floor plate shall comply with all pertinent codes and regulations, complying with ANSI A326.3 Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

3. Manufacturer: Provide steel floor plate manufactured by McNichols, IKG, Ohio Gratings, or approved equal.

G. Steel Gratings and Frames

1. Provide hot dipped galvanized steel gratings with rectangular cross bars welded to bearing bars. Bars to have plain wearing surface.

2. Manufacturer: Provide gratings manufactured by McNichols, IKG, Ohio Gratings, or approved equal.

3. Hinged Section: Provide hinged sections in areaway gratings where required by the drawings. Each hinged section up to 4'-0" wide shall be provided with two (2) five knuckle, fast pin, regular weight, plain bearing, wrought bronze butt hinges. Each hinged section over 4'-0" wide shall be provided with three (3) butt hinges. Hinged sections shall have provisions for padlocking on the underside.

4. Furnish grating frames, with corners mitered, welded and ground smooth, and with welded-on straps for secure anchorage into concrete. Frames and anchors to be galvanized.

5. Structural Performance: Provide gratings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections:

   a. Floors: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 3000 lbf, whichever produces the greater stress.
   b. Walkways and Elevated Platforms Other Than Exits: Capable of withstanding a uniform load of 60 lbf/sq. ft. Limit deflection to L/360 or 1/4", whichever is less.
   c. Walkways and Elevated Platforms Used as Exits: Capable of withstanding a uniform of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress. Limit deflection to L/360 or 1/4", whichever is less.
   d. Sidewalks and Vehicular Driveways: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 8000 lbf, whichever produces the greater stress.

H. Miscellaneous Steel Trim: Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

I. Corner Guards: Provide steel corner guards where shown. Unless otherwise indicated, use 4" x 4" x 1/4" steel angles to a height of four (4) feet above finished floor with 1-1/4" x 8 1/4" bent steel strap anchors welded to backs of angles at each end and approximately sixteen (16) inches o.c. Set and adjust guards to finish flush with adjacent surfaces.

J. Steel Floor Access Door: Provide Series JD steel floor access door for interior use with checkered plate top, angle iron frame and manufacturer's standard hardware as manufactured

by Bilco or equal made by Babcock-Davis, Dur-Red Products or approved equal; size as shown on drawings.

K. Sleeves in Concrete Walls and Slabs

1. Sleeves through concrete walls shall be of Schedule 40 steel pipe with i.d. two (2) inches larger than o.d. of pipe or conduit (including insulation, if any) to be accommodated. Sleeves shall project one-half (1/2) inch on each side of finished wall. Provide rectangular one-quarter (1/4) inch steel plate collar at center, continuously welded to the perimeter of the sleeve, and six (6) inches wider than the o.d.

2. Slots in slabs shall be 12 gauge steel sheet, galvanized, of dimensions indicated, with strap anchors welded in place not more than twelve (12) inches on centers.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where miscellaneous metal is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 ERECTION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.

E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

F. Field Touch-Up of Galvanized Surfaces: Touch-up shop applied galvanized coatings damaged during handling and installation. Use galvanizing repair coating specified herein for galvanized surfaces.

END OF SECTION

SECTION 062000

CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the carpentry work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Blocking and miscellaneous wood, including plywood subflooring and wall lining for telephone and electric closets.

2. Rough hardware.

3. Coat closet pole and shelving.

4. Installation only of finish hardware.

5. Installation only of doors and hollow metal frames.

6. Temporary controls furnished by Carpentry trades.

1.3 RELATED SECTIONS

A. Steel doors and frames - Section 081113.

B. Finish hardware - Section 087100.

1.4 QUALITY ASSURANCE

A. Lumber Standard: Comply with PS 20.

B. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).

C. Shop fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.

D. Grade Marks: Identify lumber and plywood by official grade mark.

1. Lumber: Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.

a. S-Dry: Maximum nineteen (19) percent moisture content as per ASTM D 2016.
b. MC-15 or KD: Maximum of fifteen (15) percent moisture content.

E. Installation of doors, frames and hardware shall conform to the minimum standards of "Installation Guides for Doors and Hardware" of the Door and Hardware Institute.

1.5 SUBMITTALS

A. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.

B. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.

C. Submit 12" x 12" samples of plastic laminate finish of thickness specified for countertops.

1.6 PRODUCT HANDLING

A. Deliver carpentry materials to the site ready to use with each piece of lumber clearly marked as to grade, type and mill, and place in an area protected from the elements.

B. Deliver rough hardware in sealed kegs and/or other containers which shall bear labels as to type and kind.

C. Pile lumber for rough usage, when delivered to the site in stacks to insure drainage and with a minimum clearance of six (6) inches above grade. Cover stacks with tarpaulins or other watertight coverings. Store grounds and similar small sized lumber inside the building as soon as possible after delivery.

D. Do not store seasoned lumber in wet or damp portions of the building.

E. Protect fire retardant treated materials against high humidity and moisture during storage and erection.

F. Remove delivered materials which do not conform to specified grading rules or are otherwise not suitable for installation from the job site and replace with acceptable materials.

G. All items specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored and applied under this Section.

H. Hardware shall be sorted and stored in space assigned by Contractor and shall be kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

1.7 JOB CONDITIONS

A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Architect.

B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 PRODUCTS

2.1 WOOD MATERIAL

A. General

1. All wood shall be sound, flat, straight, well seasoned, thoroughly dry and free from all defects. Warped or twisted wood shall not be used.

2. For miscellaneous wood blocking, grounds, furring as required, use Utility Grade Coastal Douglas Fir or Southern Pine, free from knots, shakes, rot or other defects, straight, square edges and straight grain, air seasoned with maximum moisture content of nineteen (19) percent. Wood shall be S4S, S-Dry, complying with PS-20.

3. For closet shelving, provide 3/4" thick Purebond by Columbia Forest Products with 1/4" thick hardwood edges, fire retardant treated as specified herein.

4. Plywood and rough carpentry for interior partitions, floors, telephone and electric closets, provide 3/4" thick Purebond by Columbia Forest Products, fire retardant treated as specified herein and on the drawings.

B. Wood Treatment

1. All interior wood material specified herein shall be fire retardant treated to comply with the AWPA standard U1 to achieve a flame spread rating of not more than 25 (UL Class "FR-S") when tested in accordance with UL Test 723 or ASTM E 84. The fire retardant chemicals used to treat the lumber must comply with FR-1 of AWPA Standard P49 and be free of halogens, sulfates and ammonium phosphate.

   a. After treatment, kiln dry to a moisture content of fifteen (15) percent; if wood is to be painted or finished, kiln dry to a moisture content of twelve (12) percent. Treatment shall be equal to "Dricon" made by Arch Wood Protection Inc. or approved equal. Provide UL approved identification on treated materials.

2. For exterior blocking, pressure treat wood with copper azole, Type B (CA-B); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWPA Standard U1, (.25 lbs./cubic foot of chemical in wood).

   a. After treatment, kiln dry to a maximum moisture content of fifteen (15) percent. Treatment shall be equal to "Wolmanized Natural Select" made by Arch Wood Protection Inc. or approved equal.

3. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWPA Standard M-4.

2.2 HARDWARE

A. Rough Hardware for Treated Woods and Exterior Use: Hot-dipped galvanized or Type 304 stainless steel.

B. Nails: Common steel wire, untreated for interior work as per ASTM F 1667.

C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers conforming to the following:

1. Bolts: ASTM A 307, Grade A.

2. Nuts: ASTM A 563.

3. Lag Screws and Bolts: ASME B 18.2.1.

D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2; use stainless steel for treated woods and exterior use.

E. Wood Screws: ASME B 18.6.1.

F. Concrete and Masonry Anchors: Standard expansion-shield self-drilling type concrete anchors where so shown or noted on the drawings, or where approved by the Architect.

G. In coat closets, provide 1" OD chrome on steel clothes rod with a wall thickness of 0.125", running full width of closet wall, supported at ends with end brackets and supported in the center from shelf above rod using chrome plated rod support.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where carpentry is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF FINISH HARDWARE

A. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.

B. Unless otherwise noted, mount hardware units at heights established in Section 081113.

C. Install each hardware item in compliance with the manufacturer’s instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

G. All keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. All construction keys shall be returned to the Owner.

H. Adjusting and Cleaning

1. Adjust and check each operating item of hardware and each door, to ensure proper operation and function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.

2. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.3 INSTALLATION OF DOORS AND FRAMES

A. Preparation

1. Remove welded-in shipping spreaders installed at factory.

2. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

B. Installation

1. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. Install frames in accordance with ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames, unless more stringent requirements are specified herein.
    b. At fire-protection-rated openings, install frames according to NFPA 80.
    c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    d. Install frames with removable glazing stops located on secure side of opening.
    e. Frames set in masonry walls shall have door silencers installed in frames before grouting.
    f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    g. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of Section 092900.

5. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.

8. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the tolerance given in HMMA 841 of ANSI/NAAMM, current edition.

9. Steel Doors: Fit hollow metal doors accurately in frames to the tolerances given in HMMA 841 of ANSI/NAAMM, current edition.

    a. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

10. Glazing: Comply with installation requirements in Section 088000 "Glass and Glazing" and with standard steel door and frame manufacturer's written instructions.

    a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

C. Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

3.4 BLOCKING AND MISCELLANEOUS WOOD

A. General

1. Erect rough carpentry true to line, levels and dimensions required; squared, aligned, plumbed, and securely fastened in place.

2. Shim where required to true up furring, blocking and the like. Use wood or metal shims only.

3. Do all cutting, fitting, drilling and tapping of other work as required to secure work in place and to perform the work included herein. Do all the cutting and fitting of carpentry work, for the work of other trades as required.

B. Blocking and Miscellaneous Wood

1. Furnish and install all wood grounds, furring, blocking, curbs, bucks, nailers, etc., that may be necessary and required in connection with the carpentry and with the work described for any other trades and including required carpentry for electrical fixtures. All blocking and nailers shall be continuous wherever required, whether or not so indicated.

2. Blocking shall be as required for the proper installation of the finished work and for items in mechanical sections as required. Blocking, edgings, stops, nailing strips, etc., shall be continuous, unless distinctly noted otherwise. Provide blocking as required to install all equipment. Provide blocking and nailers where shown or required to fasten interior sheet metal work.

3. Fastening for wood grounds, furring and blocking shall be of metal and of type and spacing as best suited to conditions. Hardened steel nails, expansion screws, toggle bolts, self-clinching nails, metal plugs, inserts or similar fastenings shall be used, of suitable type and size to draw the members into place and securely hold same.

3.5 TELEPHONE AND ELECTRIC EQUIPMENT MOUNTING BOARDS

A. Furnish and install 3/4" thick plywood panels to the walls of the telephone and electric equipment rooms in accordance with the requirements of the local utility company.

B. Secure to wall using proper devices for substrates encountered, spaced twelve (12) inches o.c., maximum around the edges, 1-1/2" from corners, and in three (3) rows of three (3) each in the field. Recess fastening devices flush with the plywood surface. Adjacent panels shall be butted with 1/16" space between without lapping.

3.6 COAT CLOSET

A. In coat closets provide twelve (12) inches wide plywood shelf running full width of closet, supported on continuous wood pin rail. Below shelf install coat rod as specified herein.

3.7 ROUGH HARDWARE

A. Securely fasten rough carpentry together. Nail, spike, lag screw or bolt as required by conditions encountered in the field and the Contract Documents.

B. Provide rough or framing hardware, such as nails, screws, bolts, anchors, hangers, clips, inserts, miscellaneous fastenings, and similar items of the best quality and of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner.

C. Secure rough carpentry to masonry with countersunk bolts in expansion sleeves or other acceptable manner, with fastenings not more than sixteen (16) inches apart. Secure woodwork to hollow masonry with toggle bolts spaced not more than sixteen (16) inches apart.

D. Countersink bolts in nailers and other rough woodwork and include washers and nuts. Cut bolts off flush with surfaces and peen as may be required to receive finished work.

E. Inserts to secure wood nailers to concrete shall be malleable iron threaded inserts with 3/8" diameter bolts of length to allow for countersinking. Locate at end of each nailer and at intervals not exceeding thirty (30) inches o.c.

F. Furnish to the mason for building into the work, or attaching the work which is to be built in, anchors, bolts, wall plates bolted to masonry, corrugated wall plugs, nailing blocks, etc., which are required for the proper fastening and installation for the work or other items as called for in this Section.

G. Detailed instructions with sketches of necessary requirements, shall be given to the masonry trade showing the location and other details of such nailing devices.

3.8 TEMPORARY PROTECTION BY CARPENTER

A. General: Provide temporary protection as follows:

1. Temporary wood doors at exterior entrances and at interior door openings, as required.

2. Temporary protection and enclosures at elevators, stairs, and other shafts, at openings in floor and roof.

3. Temporary elevator cabin and temporary hatchway doors for each floor of elevators used for temporary service.

4. Temporary sills at door thresholds and other openings.

5. Temporary stair handrails continuously from top to bottom of each stair.

B. Stair Protection: Provide wood protection for stairs: cover finished treads. Protect platforms, treads and risers with dressed planking full stair width; hold in place with continuous edge strips. Erect required handrails and railings for closing in open wells and open sides of stairs. Protect railing from damage. Protect door sills and saddles.

C. Openings in Floors and Roofs: Protect openings in floors and roof slabs with adequate wood railings, substantially framed, braced and nailed. Cover openings not required to be kept open with not less than two (2) inches thick planking, cleat together, brace; make sufficiently strong and secure. Protect openings in floors and roofs immediately after forms are removed.

D. Exterior Openings: Provide temporary enclosures for exterior openings where required, properly secured and maintained until finished work is in place. Provide a sufficient number of temporary doors to give access to the building, all provided with hardware, locks and keys.

E. Maintenance: Maintain all temporary protection in good repair during the construction period. Remove when no longer required.

F. Temporary Locks: Provide temporary locks, including keys, for temporary doors. Use of permanent building hardware in connection with temporary doors is prohibited.

3.9 CLEANING UP

A. General: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends and debris.

B. Sweeping

1. At the end of each working day, or more often if necessary, thoroughly sweep all surfaces where refuse from this portion of the work has settled.

2. Remove the refuse to the area of the job site set aside for its storage.

3. Upon completion of this portion of the work, thoroughly broom clean all surfaces.

END OF SECTION

SECTION 072710

INTERIOR VAPOR-PERMEABLE AIR BARRIER MEMBRANE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the vapor permeable air barrier membrane as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Gypsum Drywall – Section 092900.

1.4 SUBMITTALS

A. Product Cut Sheets for all materials as stated herein. Cut sheets shall indicate that the submitted products are the products installed in the project.

B. Submit certification in writing indicating that sealant specified in Section 079200 and 092900 for joints between sheathing panels is compatible with vapor barrier air barrier specified herein.

1.5 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Variable Permeance Vapor Retarder: CertainTeed MemBrain, The SMART Vapor Retarder. Polyimide film vapor retarder for use with vapor permeable glass fiber and mineral wool insulation in wall and ceiling cavities. Material has a permeance of 1 perm or less when tested to ASTM E 86, dry cup method and increases to greater than 10 perms using the wet cup method.

1. Water Vapor Permeance:

a. ASTM E 86, dry cup method: 1.0 perms (57ng/Pa*s*m2).
b. ASTM E 86, wet cup method: 10.0 perms (1144ng/Pa*s*m2).

2. Fire Hazard Classification: ASTM E 84:

a. Maximum Flame Spread Index; 25.

b. Maximum Smoke Developed Index; 450.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where the vapor permeable membrane is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the work.

3.2 SURFACE PREPARATION

A. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants.

3.3 GENERAL

A. Verify that surfaces and conditions are ready to accept the Work of this section. Notify Contractor in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.

B. All surfaces must be sound, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the water resistive air barrier flashings. Fill voids, gaps in substrate to provide an even surface. Strike masonry joints full-flush.

C. Minimum application temperature self-adhered membrane flashings to be above 20 degrees F (minus 6.0 degrees C).

D. Ensure all preparatory Work is complete prior to applying primary water-resistive weather barrier membrane.

E. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing and fastened into solid backing.

3.4 INSTALLATION - AIR BARRIER

A. Install air barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Install air barrier prior to installation of windows and doors.

C. Start air barrier installation at a building corner, leaving 6” - 12” of air barrier extended beyond corner to overlap.

D. Install air barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain air barrier plumb and level.

E. Sill Plate Interface: Extend lower edge of air barrier over sill plate interface 3’ - 6”. Secure to foundation with elastomeric sealant as recommended by air barrier manufacturer.

F. Window and Door Openings: Extend air barrier completely over openings.

G. Overlap Air Barrier

1. Exterior corners: Minimum 12”.

2. Seams: Minimum 6”.

H. Air Barrier Attachment

1. Attach air barrier to studs through exterior sheathing. Secure using air barrier manufacturer recommended fasteners, space 12” - 18” vertically on center along stud line, and 24 inch on center, maximum horizontally.

a. Apply 4” by 7” piece of DuPont StraightFlash to air barrier membrane prior to the installation cladding anchors.

3.5 SEAMING

A. Seal seams of air barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by air barrier manufacturer.

3.6 FIELD QUALITY CONTROL

A. Make notification when sections of Work are complete to allow review prior to covering water-resistive weather barrier system.

B. Owner to engage independent consultant to observe substrate and membrane installation prior to placement of cladding systems and provide written documentation of observations.

3.7 PROTECTION

A. Protect wall areas covered with primary water-resistive vapor permeable air barrier from damage due to construction activities, high wind conditions, and extended exposure to inclement weather.

B. Review condition of water-resistive weather barrier prior to installation of cladding. Repair, or remove and replace damaged sections with new membrane.

C. Recommend to cap and protect exposed back-up walls against wet weather conditions during and after application of membrane, including wall openings and construction activity above completed primary water-resistive weather barrier installations.

D. Remove and replace water-resistive vapor permeable air barrier affected by chemical spills or surfactants.

END OF SECTION

SECTION 078413

FIRESTOPS AND SMOKESEALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the firestops and smokeseals as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

4. Sealant joints in fire-resistance-rated construction.

5. Penetrations at each floor level in shafts and/or stairwells.

6. Construction joints, including those between top of fire rated walls and underside of floors above; and those between exterior curtain walls and the outer perimeter edge of floor assemblies.

1.3 RELATED SECTIONS

A. Joint sealers - Section 079200.

B. Aluminum curtain wall - Section 084413.

C. Drywall - Section 092900.

D. Piping penetrations - Division 22.

E. Duct penetrations - Division 23.

F. Protection of Emergency Fuel Lines – Division 23

G. Cable and conduit penetrations - Division 26.

H. Communications -Division 27

1.4 REFERENCES

A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."

B. UL 1479, UBC 7-5 (Both are same as A. above).

C. ASTM E 136 "Standard Test Method for Assessing Combustibility of Materials."

D. UL 263, UBC 7-1 "Fire Tests of Building Construction and Materials"

E. UL 2079 "Tests For Fire Resistance of Building Joint Systems."

F. ASTM E 1399 "Test For Dynamic Movement Conditions."

G. ASTM E 1966 (Same as E. above).

H. ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi."

I. ASTM E 1725 "Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components"

J. UL 1489 "Fire Tests of Fire Resistant Pipe Protection Systems Carrying Combustible Liquids"13

K. Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus."

L. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Firestops."

M. Published Through-Penetration Systems by recognized independent testing agencies.

1. UL Fire Resistance Directory, Volume II of current year.

2. Warnock Hersey Certification Listings, current year.

3. Omega Point Laboratories, current year.

N. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

O. NFPA 101 – Life Safety Code

P. NFPA 70 – National Electric Code

Q. NFPA 72 – National Fire Alarm and Signaling Code

R. Material must have approval for use in New York City.

1.5 SUBMITTALS

A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria, test data and indication that products comply with specified requirements.

B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, for proposed UL listed (or equal) firestop and smokeseal assembly required for the Project.

C. Safety Data Sheets: Submit SDS for each firestop product.

D. Submit qualifications of firestop installer, including letter from firestop manufacturer of products proposed to be installed, wherein manufacturer approves or recognizes as trained/ or certifies installer for installation of that manufacturer's products.

E. Engineering Judgment: For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

F. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For fire-resistive joint system sealants, documentation including printed statement of VOC content.

2. Laboratory Test Reports for Credit IEQ 4: For fire resistive joint and penetration system sealants and sealant 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."

1.6 QUALITY ASSURANCE

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire and the passage of smoke and other gases.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor unless preformed devices are utilized.

1. Installer Qualifications (one of the following):

a. A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors
b. A firm that has been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
c. A manufacturer's Accredited Firestop Specialty Contractor (see Part 2.0 for list of acceptable manufacturers).

d. A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this project, whose work has resulted in construction of a minimum of five projects with a record of successful performance.

C. Single Manufacturer Sourcing: Source all firestop products and required accessories from a single manufacturer. See Part 2.0 for list of acceptable manufacturers.

D. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479. The F-rating must be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated. T-rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

1. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   a. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
   b. T-Rating: When penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated
      1). T-ratings shall be achieved by utilizing a Low Bio Persistent Endothermic Mat incorporating foil scrim on both sides.
   c. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

2. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

E. Firestopping products shall be asbestos free and free of any PCBs.

F. Do not use any product containing solvents or that requires hazardous waste disposal.

G. Do not use firestop products which after curing, dissolve in water.

H. Do not use firestop products that contain ceramic fibers.

I. Mock-Up: Prepare job site mock-ups of each typical Firestop System proposed for use in the project. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.

J. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

K. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of less than or equal to 1 as determined by ASTM G 21.

L. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post-installed." Provide cast-in-place firestop devices prior to concrete placement.

M. Firestop systems do not reestablish the structural integrity of load bearing partitions or assemblies, or support live loads and traffic. Installer shall consult the Structural Engineer prior to penetrating any load bearing assembly.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened containers with manufacturer's name, product identification, lot numbers, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.

B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.

C. All firestop materials shall be installed prior to expiration of shelf life.

1.8 PROJECT CONDITIONS

A. Verify existing conditions and substrates before starting work

B. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.

C. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.

D. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.

E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations.

F. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.

G. Coordinate this work as required with work of other trades.

1.9 SEQUENCING AND SCHEDULING

A. Firestop & Life Safety Design: Obtain all required tested firestop systems before installation and document on shop drawings. Where possible, identify all conditions where tested firestop systems will not meet Project conditions. Obtain Engineering Judgements (EJs) for these conditions from firestop manufacturer and confirm advance approval from Authorities Having Jurisdiction (AHJs).

B. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Invite all

applicable parties including installers, general contractors, and firestop manufacturer's representative to conference.

C. Sequence: Perform work of this and other sections in proper sequence to prevent damage to the firestop systems and to ensure that their installation will occur prior to enclosing or concealing work.

D. Install all firestop systems after voids and joints are prepared sufficiently to accept the applicable firestop system.

E. Do not cover firestop systems until they have been properly inspected and accepted by the authority having jurisdiction.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following manufacturers:

1. Basis-of-Design: Hilti, Inc., Plano, TX, (800) 879-8000, www.hilti.com

2. Firestop systems and products from manufacturers listed below shall be considered in accordance with contract provisions and performance requirements listed in this document:

   a. Specified Technologies Inc.
   b. 3M; Fire Protection Products Division

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:

   a. Semirefractory fiber (mineral wool) insulation.
   b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Joint fillers for joint sealants.

2. Temporary forming materials.

3. Substrate primers.

4. Collars.

5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

D. Smokeseals at top of partitions shall be flexible to allow for partition deflection.

E. Rated and non fire rated smokeseals utilized at joints and penetrations for walls and floors must have acoustical performance qualities. Provide manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C839, ASTM C919 and the following:

a. Sealant effectively reduces airborne sound transmission through head-of-wall and bottom-of-wall joints and openings to accommodate through-penetrations in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.
b. Lightweight, semi-foam smoke and acoustical sealant with movement capability of minimum 12.5% in accordance with ISO 11600.
c. Latex sealant according to ASTM C 834 class OP -18°C with shrinkage according to ASTM C 1241 < 29 % C.
d. Acoustical Sealant to maintain STC ratings at sound rated partitions as indicated on the drawings.
e. Sealant has flame-spread and smoke-developed ratings of less than 25 as tested in accordance with ASTM E84.
f. Sealant is mold and mildew resistant per ASTM G21 with a rating of one (1), "no growth".
g. Proposed acoustic sealant materials and methods shall conform to applicable governing codes having local jurisdiction.
h. Smokeseals at top of partitions shall be flexible to allow for partition deflection.

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Intumescent, Latex Sealant: Single-component, Intumescent, latex formulation.

1. Basis of Design: Hilti Intumescent Firestop Sealant (FS-ONE MAX)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI Intumescent Latex Sealant
b. 3M Fire Barrier Sealant CP 25WB+
c. Or Approved Equal

B. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

1. Basis of Design: Hilti Firestop Putty Stick (CP 618)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI SSP Putty
b. 3M Fire Barrier Moldable Putty
c. Or Approved Equal

C. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum or polyethylene foil on one side.

1. Basis of Design: Hilti Firestop Wrap Strips (CP 648)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

    a. STI SSW Intumescent Wrap Strips
    b. 3M Fire Barrier Wrap Strips
    c. Or Approved Equal

D. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

1. Basis of Design: Hilti Firestop Mortar (CP 637)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

    a. STI SSM Firestop Mortar
    b. 3M Fire Barrier Mortar
    c. Or Approved Equal

E. Moldable putty pads by

1. Basis of Design: Hilti Firestop Putty Pad (CP 617)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

    a. STI SSP Putty Pads
    b. 3M Fire Barrier Moldable Putty Pads
    c. Or Approved Equal

F. Silicone Foam: Two-component, polyurethane foam thatexpands and cures in place to produce a flexible, non-shrinking foam.

1. Basis of Design: Hilti Firestop Foam (CP 660)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

    a. 3M Fire Block Foam
    b. Or Approved Equal

G. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless firestop system limits use to non-sag grade for both opening conditions.

2. Basis of Design: Hilti Firestop Silicone Sealant Self Leveling (CFS-S SIL SL)

3. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

    a. STI Self Leveling Silicone Firestop Sealant
    b. 3M Fire Barrier Water Tight Sealant 1003 SL
    c. Or Approved Equal

H. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic or polypropylene sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

1. Basis of Design: Hilti Cast-in Firestop Sleeve (CP 680)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

    a. STI SpecSeal Cast In Firestop Device
    b. 3M Fire Barrier Cast-In Device
    c. Or Approved Equal

I. Low Voltage Cable Management Devices: Factory-assembled round or rectangular metallic sleeve device for use with cable penetrations. Round devices shall contain an integrated smoke seal fabric membrane that can be opened and closed for re-penetration. Rectangular devices shall be modular to accommodate future use.

1. Basis of Design: Hilti Firestop Modular Sleeve System or Firestop Speed Sleeve (CFS-MSL or CP 653, respectively)

2. Substitution requests shall be considered in accordance with contract provisions.

    a. STI EZ Path
    b. 3M Fire Barrier Pass-Through Device Square
    c. Or Approved Equal

J. Drop-In Firestop Devices: Factory-assembled devices for use with combustible or noncombustible penetrants in cored holes within concrete floors. Device shall consist of galvanized steel sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete floor, and neoprene gasket.

1. Basis of Design: Hilti Drop-In Device (CFS-DID)

2. Substitution requests shall be considered in accordance with contract provisions.

K. Firestop Collars : Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

1. Basis of Design: Hilti Firestop Collar (CP643)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI SSC Intumescent Firestop Collar
b. 3M Fire Barrier Plastic Pipe Device
c. Or Approved Equal

L. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

1. Basis of Design: Hilti Firestop Composite Sheet (CFS-COS)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI SpecSeal Composite Sheet
b. 3M Fire Barrier Composite Sheet CS-195+
c. Or Approved Equal

M. Blocks/Plugs: Non curing, re-penetrable intumescent materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways.

1. Basis of Design: Hilti Firestop Block (CFS-BL)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. 3M Fire Barrier Block B258
b. Or Approved Equal

N. Tub Box Kit: Cast-in place pre-formed plastic tub box kit with three support legs for use with drain piping assembly associated with bathtub installations.

1. Basis of Design: Hilti Tub Box Kit (CP 681)

2. Substitution requests shall be considered in accordance with contract provisions. The following are acceptable:

a. STI Firestop Cast in Tub Box
b. 3M Fire Barrier Cast In Tub Box Assembly
c. Or Approved Equal

O. Endothermic Mats: Low Bio Persistent Endothermic Mat incorporating foil scrim on both sides. Mat evaluated for protection of cable pathways and liquid fuel lines, for firestopping of through-penetrations and membrane-penetrations, and for achieving T-ratings

1. Basis of Design: Hilti Endo-Shield (CFP-ES) . No substitutions

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

1. Sealant Colors: Color of exposed joint sealants as selected by the Architect.

B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.

C. Multi-Component, Non-Sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.

D. Single-Component, Non-Sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.5 PRE-FORMED FIRE RESISTIVE MATERIALS FOR JOINTS

A. Firestop Top Track Seal: One-piece, pre-formed, polyurethane foam based, firestop seal for use with standard head-joint top tracks and slip-type head joints in fire-rated construction at top of partition to maintain continuity of the fire-resistance-rated assembly indicated. Provide in width and configuration required to accommodate depth and installation of studs and designed to saddle-over the top track.

1. Use only firestop top track seal product that has been UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, space requirements and fire-rating required for each application.

2. Performance Requirements:

a. Movement: +/- 50 percent.
b. Surface Burning Characteristics (U.L. 723) ASTM E84: Flame Spread: 10; Smoke Development: 20.
c. Mold-Mildew Performance (ASTM G21-96): Class 0.
d. VOC (LEED): 0.18 lb./gallon.
e. LBC (Living Building Challenge) compliant; International Living Future Institute, 1501 East Madison Street, Suite 150, Seattle WA. 98122.

3. Basis of Design: Hilti Firestop Top Track Seal (CFS-TTS)

B. Perimeter Fire Barrier System: One-piece, pre-formed, polyurethane foam based, firestop seal for use with building perimeter joints between fire-resistance-rated floors and exterior wall assemblies.

1. Use only firestop perimeter joint device that has been ASTM E2307 tested for specific fire-rated construction conditions conforming to construction assembly type, space requirements, and fire-rating required for each application.

2. Basis of Design: Hilti Edge of Slab QuickSeal (CFS-EOS QS)

2.6 MINERAL FIBER/CERAMIC WOOL NON-COMBUSTIBLE INSULATION (FIRE SAFING)

A. Provide min. 4 pcf safing insulation; Thermafiber Safing Mineral Wool Insulation by Thermafiber, Inc. (an Owens Corning company), Roxul Safe Fire Safing Insulation by Rockwool, Mineral Wool Safing by Johns Manville or approved equal to suit conditions and to comply with fire resistance and firestop manufacturer's requirements.

B. Material shall be classified non-combustible when tested per ASTM E 136.

C. For pre-condensed mineral wool products, the following shall serve as the basis of design:

1. Hilti Speed Plug (CP 777)

2. Hilti Speed Strips (CP 767)

3. Hilti Top Track Plug (CFS-TTS MD P FS)

2.7 HILTI TOP TRACK COVER (CFS-TTS MD C FS)MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or

damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 CONDITIONS REQUIRING FIRESTOPPING

A. Building Exterior Perimeters

1. Where exterior facing construction is continuous past a structural floor, and a space (i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.

    a. If mineral wool is part of firestop system, the mineral wool must be completely covered by appropriate thickness of UL or Warnock Hersey listed firestop sealant or spray, as listed in an ASTM E 2307 approved firestop system.

2. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.

3. Where an exterior wall passes a perimeter structural member, such as a girder, beam, or spandrel, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space would otherwise remain open between the interior face of the wall and the structural member, provide firestopping to continuously fill such open space.

B. Interior Walls and Partitions

1. Construction joints between top of fire rated walls and underside of floors above, shall be firestopped.

2. Firestop system installed shall have been tested by either UL or Omega Point, including exposure to hose stream test and including for use with steel fluted deck floor assemblies.

3. Firestop system used shall allow for deflection of floor above.

C. Penetrations

1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.

2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.

3. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall of opening.

D. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.4 INSTALLING THROUGH PENETRATION FIRESTOPS

A. General: Comply with the through penetrations firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 INSTALLING FIRESAFING INSULATION

A. Install fire safing insulation utilizing welded or screw applied galvanized steel impaling pins and retaining clips; space clips or pins 24" o.c. maximum.

B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/floor edges, depth of insulation top to bottom shall be at least four (4) inches.

C. Cover top of all safing insulation with firestop sealant or spray.

3.7 FIELD QUALITY CONTROL

A. Inspecting agency employed and paid by the Owner will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor, Owner and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, Contractor must repair or replace firestopping so that it complies with requirements.

3.8 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which openings and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to product firestopping complying with specified requirements.

END OF SECTION

SECTION 079200

JOINT SEALERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the joint sealers work as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Flashing
2. Exterior wall joints not specified to be sealed in other Sections of work.
3. Interior wall joints not specified to be sealed in other Sections of work, including caulking to fill between architectural woodwork and any wall, floor and/or ceiling imperfections.
4. Control and expansion joints in walls.
5. Joints at wall penetrations.
6. Joints between items of equipment and other construction.
7. All other joints required to be sealed to provide a positive barrier against penetration of air and moisture.

1.3 RELATED SECTIONS

A. Firestop sealants – Section 078413.

B. Sealant at metal to metal components of curtain wall - Section 084413.

C. Glazing sealants - Section 088000.

D. Sealant within drywall construction - Section 092900.

1.4 QUALITY ASSURANCE

A. Qualification of Installers: Use only personnel who are thoroughly familiar, skilled and specially trained in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.

1.5 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.

1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.

B. Samples: Submit the following:

1. Color samples of sealants, submit physical samples (not color chart).

2. Sealant bond breaker and joint backing.

C. Product Data: Submit manufacturer's technical information and installation instructions for:

1. Sealant materials, indicating that material meets standards specified herein.

2. Backing rods.

D. Submit manufacturer's certification as required by Article 1.6 herein.

E. Submit results of testing required in Article 1.4 herein.

1.6 MANUFACTURER'S RESPONSIBILITY AND CERTIFICATION

A. Contractor shall require sealant manufacturer to review the Project joint conditions and details for this Section of the work. Contractor shall submit to the Architect written certification from the sealant manufacturer that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vaportight seals (as applicable), and that materials supplied meet specified performance requirements.

1.7 PRECONSTRUCTION COMPATIBILITY AND ADHESION TESTING (EXTERIOR WALL SEALANTS ONLY)

A. Submission: Prior to mockups and sample installations, submit samples of materials contacting or affecting exterior wall joint sealants to manufacturers for compatibility and adhesion testing.

B. General Requirements: Confirm compatibility and adhesion for all concealed and exposed sealant materials in contact with glazing, other sealants, flashings, metal framing, and shims before constructing and testing full-size mockups and sample installations.

C. Timing: Allow at least 3 months for testing and result analysis to avoid work delays.

D. Corrective Actions: Investigate failed materials and obtain written sealant manufacturer recommendations for remedies (e.g., primers, cleaners, curing conditions).

E. Definitions, Compatibility: Ability of sealants and substrates to contact each other without softening, staining, oil exudation, discoloration, or other adverse effects.

F. Definitions, Adhesion: Mechanical or chemical bonding ability between sealants and substrates at their interface.

G. Specimen Sizes and Shapes: As required by the manufacturer's testing laboratory, unless otherwise specified.

1.8 TESTS REQUIRED

A. Adhesion in Peel Testing, Test Methods:

1. ASTM C794, Adhesion and Peel of Elastomeric Joint Sealants, modified for project-specific substrates, reporting cohesive or adhesive failure mode. Test samples of sealants, flashings, and metal framing in contact with concealed and exposed sealants.

2. ASTM C1135, Determining Tensile Adhesion Properties of Structural Sealants, modified for project-specific substrates, excluding manufacturer-modified interpretations. Test samples of exterior structural glazing and metal framing with structural sealants under standard and project-specific environmental conditions (primed and unprimed). Sealant manufacturer's modified interpretations of ASTM C 1135 will not be permitted.

3. Report: Include testing date(s), project ID, test method, substrates, sealants, preparation details, results (failure type and force in pounds per linear inch), recommendations (primer optional if equal or better unprimed performance), and remarks (e.g., color changes, voids, blistering).

B. Compatibility Testing, Test Methods:

1. ASTM C1248, Staining of Porous Substances by Joint Sealants, modified for project-specific substrates. Test samples of sealants with concealed and exposed materials (primed and unprimed).

2. ASTM C1087, Determining Compatibility of Liquid Applied Sealants with Accessories Used in Structural Glazing Systems, modified for project-specific substrates, excluding manufacturer-modified interpretations. Test samples of dry glazing gaskets, spacers, shims, and setting blocks with structural sealants.

3. Report: Include testing date(s), project ID, test method, preparation details, sealant details (name, type, movement capability, batch number), substrates, equipment, curing conditions, test variations, observed effects (e.g., discoloration, adhesion failure, stain measurements), recommendations (primer optional if equal or better unprimed performance), and remarks (e.g., voids, bubbling).

1.9 PRECONSTRUCTION FIELD-ADHESION TESTING

A. Procedure: Before installing exposed exterior elastomeric sealants, test adhesion to joint substrates as follows:

B. Location: Test joints where indicated or as directed by the Architect, with the Architect and manufacturer's technical representative present.

C. Method: For each sealant and substrate type:

D. Install 60-inch-long test joints using final laboratory-recommended materials and methods; allow curing.

E. Make a cross cut and two 3-inch side cuts, marking 1 inch from the cross-cut end.

F. Pull the 3-inch sealant piece at 90 degrees for 10 seconds, then at 180 degrees for 10 seconds, extending to the manufacturer's recommended distance.

G. Repair joints per manufacturer recommendations.

H. Rejection: Sealants showing adhesive failure, insufficient elongation, or noncompliance with specified performance will be rejected by the Architect. Discontinue use of associated materials and notify the manufacturer and Architect immediately.

I. Report: Submit a written summary of each compatibility and adhesion test.

1.10 ENVIRONMENTAL CONDITIONS

A. Temperature: Install all work of this Section when air temperature is above forty (40) degrees F. and below eighty (80) degrees F., unless manufacturer submits written instructions permitting sealant use outside of this temperature range.

B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

1.11 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section, before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

C. Storage

1. Store sealant materials and equipment under conditions recommended by their manufacturer.

2. Do not use materials stored for a period of time exceeding the maximum recommended shelf life of the material.

3. Material shall be stored in unopened containers with manufacturers' name, batch number and date when shelf life expires.

1.12 WARRANTY

A. Special Installer's Warranty

1. Terms: The Installer shall provide a written warranty, signed by the Installer, to repair or replace elastomeric joint sealant work failing to maintain a weathertight system within the warranty period.

2. Period: 5 years from the date of Substantial Completion.

B. Special Manufacturer's Warranties

1. Terms: The elastomeric sealant manufacturer shall provide written warranties (covering weatherseal and stain resistance), signed by the manufacturer, to furnish sealants for repair or replacement of those failing to provide airtight and watertight joints, or failing in adhesion, cohesion, abrasion resistance, stain resistance, weather resistance, durability, or exhibiting unspecified deterioration within the warranty period.

2. Periods:

a. Silicone Sealants: 20 years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

A. Exterior Wall Sealant: Provide one (1) part non-sag sealant equal to "DOWSIL 790" or "DOWSIL 795" made by The Dow Chemical Company, "Silpruf SCS 2000" or "LM SCS 2700" made by G.E., "Spectrem 1" or "Spectrem 3" made by Tremco conforming to the minimum standards of ASTM C 920, Type S, Grade NS, Class 50.

B. Interior Sealant: Provide a one (1) part acrylic based sealant conforming to ASTM C 834, equal to "AC-20+ Silicone" made by Pecora, Masterseal NP 520 by BASF or equal made by Tremco.

C. Colors: Colors selected from manufacturer's standard selection.

2.2 MISCELLANEOUS MATERIALS

A. Back-Up Materials: Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, equal to "HBR" made by Nomaco Inc. or approved equal, twenty-five (25) percent wider than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Provide back-up materials only as recommended by sealant manufacturer in writing.

B. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.

C. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.

D. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.

E. Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached. Materials shall be used per manufacturer's printed instructions.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where joint sealers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with instructions and recommendations of the manufacturer and in accordance with ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.

B. Sample Section of Sealant

1. During sealant installation work in exterior wall, the manufacturer of sealant shall send their representative to the site, under whose supervision a section of the wall (used as "control section") shall be completed for purposes of determining performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of control section.

2. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.

3. Accepted control section shall be standard to which all other sealant work must conform.

C. Supervision: The Contractor shall submit to the Architect written certification from the sealant manufacturer that the applicators have been instructed in the proper application of their materials. The Contractor shall use only skilled and experienced workmen for installation of sealant.

D. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. Neatly point or tool joint to provide the contour as indicated on the drawings.

E. Preparation and Application

1. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.

2. Stone, masonry and concrete surfaces to receive sealant shall be cleaned where necessary by grinding, water blast cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.

   a. Do not use any acid or other material which might stain surfaces.
   b. Remove laitance by grinding or mechanical abrading.
   c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil and water free, or vacuuming joints prior to application of primer or sealant.

3. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.

4. Do not seal joints until they are in compliance with drawings, or meet with the control section standard.

5. Joint Size and Sealant Size: Joints to receive sealant shall be at least 1/4" wide. In joint 1/4" to 3/8" wide, sealant shall be 1/4" deep. In joints wider than 3/8" and up to 1" wide, sealant depth shall be one half the joint width. For joints wider than 1", sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside face of joint to closest point of the filler.

6. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner

faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape prior to priming. Apply primer with clean brush and only when temperature is above 45 deg. F.

7. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately twenty-five (25) percent compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.

8. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to the sides of the joint and not backing.

9. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.

10. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C 1193. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.

11. Replace sealant which is damaged during construction process.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

   a. Perform 5 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 5,000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.

c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION

SECTION 081113

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the steel doors and frames work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Interior and exterior hollow metal doors and frames for fire-rated and unrated door openings.
2. Trimmed openings.
3. Interior hollow metal vision panels.
4. Preparation of metal doors and frames to receive finish hardware, including reinforcements, drilling and tapping necessary.
5. Preparation of hollow metal doors to receive glazing where required.
6. Steel louvers for hollow metal doors.
7. Furnishing anchors for building into masonry and drywall.
8. Factory prime painting of work of this Section.

1.3 RELATED SECTIONS

A. Installation of doors and frames - Section 062000.

B. Finish Hardware - Section 087100.

C. Glass and Glazing - Section 088000.

D. Gypsum Drywall - Section 092900.

E. Painting and Finishing - Section 099000.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, compliance with standards referenced herein, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

1. Coordinate glazing frames and stops with glass and glazing requirements.

D. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.

D. Sound Rated Acoustic Assemblies: All entry door openings into residential units shall comply with applicable requirements of the Building Code of New York, Section BC-1207.2," Airborne Sound. Provide hollow metal door and frame products in combination with sound seal accessories with sound reduction characteristics meeting a minimum STC 35 rating, as determined by laboratory measurements made in accordance with ASTM E90. STC Rating is assessed on the entire door assembly including frame, hardware and acoustical seals.

E. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40" or less above the sill.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.

3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating as required by prevailing Building Code in 30 minutes of fire exposure.

F. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-

protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

G. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

H. Fire rated assemblies must have UL approved label.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.

B. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames under cover at building site. Conform to the requirements of ANSI/SDI A250.11 for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 PRODUCTS

2.1 FABRICATION - GENERAL

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.

B. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

C. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."

D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

2.2 MANUFACTURERS

A. Provide products manufactured by Steelcraft, Curries, Ceco Door Products, Fleming, Pioneer or approved equal meeting these specifications.

B. Exterior Doors and Frames

1. Basis of Design (door): Energy Efficient – TrioE 777E Door by Curries or approved equal.

2. Basis of Design (frame): Curries Company (CU) – Mercury Thermal Broken Frame by Curries or approved equal..

2.3 FRAMES

A. Materials

1. Frames for exterior openings shall be made of commercial grade cold-rolled steel conforming to ASTM A 1008, Type B not less than 14 ga., and shall have a hot dipped galvannealed coating conforming to ASTM A 924 and A 653 with A60 coating. The zinc-alloy coating shall be a dull matte surface treated for paint adhesion.

2. Frames for interior openings shall be either commercial grade cold-rolled steel conforming to ASTM A 1008, Type B or commercial grade hot-rolled steel conforming to ASTM A 1011, Commercial Steel, Type B. Metal thickness shall be not less than sixteen (16) ga. for frames in openings 4'-0" or less in width; not less than fourteen (14) ga. for frames in openings over 4'-0" in width.

B. Design and Construction

1. All frames shall be welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Knock-down frames are not permitted.

2. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16” positive thermal break and integral vinyl weatherstripping.

3. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.

4. Jamb depths, trim, profile and backbends shall be as shown on drawings.

   a. Frames at drywall partitions shall be formed with double return backbends to prevent cutting into drywall surface.

5. Welded frames shall have corners mitered and reinforced and faces of welded frames shall be continuously back welded full depth and width of frame conforming to NAAMM Standard HMMA-820; face joints shall be hairline.

6. Minimum depth of stops shall be 5/8". Cut-off (Sanitary or hospital type) stops, where scheduled, shall be capped at forty-five (45) degrees at heights shown on drawings, and all jamb joints below cut-off stops shall be ground and filed smooth, making them imperceptible. Do not cut off stops on frames for soundproof, light proof or lead-lined doors.

7. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.

   a. Mullions shall have 16 ga. internal steel stiffeners welded not less than 4" o.c.

8. Hardware Reinforcements

a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully-templated mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates.

b. Minimum thickness of hardware reinforcing plates shall be as follows (contractor shall provide larger and thicker plates as required to accommodate weight of door):
   1). Hinge and pivot reinforcements - seven (7) ga., 1-1/4" x 10" minimum size.
   2). Strike reinforcements - twelve (12) gauge.
   3). Flush bolt reinforcements - twelve (12) gauge.
   4). Closer reinforcements - twelve (12) gauge.
   5). Reinforcements for surface mounted hardware - twelve (12) gauge.

9. Floor Anchors

   a. Provide adjustable floor anchors, providing not less than two (2) inch height adjustment.
   b. Minimum thickness of floor anchors shall be fourteen (14) gauge.

10. Jamb Anchors

   a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the wire type. Anchors shall be not less than 0.156" diameter steel wire. The number of anchors provided on each jamb shall be as follows:
      1). Frames up to 7'-6" height - three (3) anchors.
      2). Frames 7'-6" to 8'-0" height - four (4) anchors.
      3). Frames over 8'-0" height - one (1) anchor for each 2'-0" or fraction thereof in height.
   b. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb as follows:
      1). Frames up to 7'-6" height - four (4) anchors.
      2). Frames 7'-6" to 8'-0" height - five (5) anchors.
      3). Frames over 8'-0" height - five (5) anchors plus one additional for each 2'-0" or fraction thereof over 8'-0".
   c. Frames to be anchored to previously placed concrete or masonry shall be provided with minimum 3/8" concealed bolts set into expansion shields or inserts at six (6) inches from top and bottom and twenty-four (24) inches o.c. Reinforce frames at anchor locations with sixteen (16) gauge sheet steel stiffeners welded to frame at each anchor.

11. Anchors in exterior frames and in masonry walls shall be hot dip galvanized per ASTM A 153.

12. Frames for installation in masonry wall openings more than 4'-0" in width shall have an angle or channel stiffener factory welded into the head. Such stiffeners shall be not less than twelve (12) gauge steel and not longer than the opening width and shall not be used as lintels or load bearing members.

13. Dust cover boxes (or mortar guards) of not thinner than twenty-six (26) gauge steel shall be provided at all hardware mortises on frames to be set in masonry or plaster partitions.

14. Ceiling Struts: Minimum 3/8" thick x 2" wide steel.

15. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.

16. Loose glazing stops shall be of cold rolled steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium-or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.

17. Except on weather-stripped frames, drill stops to receive three (3) silencers on strike jambs of single door frames and two (2) silencers on heads of double-door frames.

C. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth. Frames shall then be chemically treated to insure maximum paint adhesion and shall be coated on all surfaces with one coat of rust-inhibitive baked-on alkyd primer standard with the manufacturer which is fully cured before shipment to a dry film thickness of 2.0 mils.

2.4 HOLLOW METAL DOORS

A. Materials: Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A 1008, Commercial Steel, Type B and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than eighteen (18) gauge. Face sheets for exterior doors shall be not less than sixteen (16) gauge and shall have a hot dipped galvannealed coating conforming to ASTM A 924 and A 653, A60 coating. The zinc alloy coating shall be a dull matte surface treated for paint adhesion.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. 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: Foamed in place polyurethane and steel reinforced core with no stiffener face welds.

    a. Provide 16 gauge steel vertical reinforcements 6 inches apart and welded in place. Foamed in place polyurethane core is chemically bonded to all interior surfaces. No face welding is permitted.
    b. Thermal properties to rate at a fully operable minimum U-Factor 0.36 and R-Value 2.53, including insulated door, Mercury thermal-break frame and threshold.
    c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.36 and R-Value 2.5, including insulated door, kerf type frame, and threshold.

C. Design and Construction

1. All doors shall be of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".

2. All doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.

3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty-two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by

spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound deadened and thermal insulated the full height of the door with an inorganic non-combustible batt type material.

4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.

5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than fourteen (14) gauge, extending the full width of the door and spot welded to both faces. Exterior doors shall have an additional flush closing channel at their top edges and, where required for attachment of weather stripping, a flush closure also at their bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.

6. Edge profiles shall be provided on both vertical edges of doors as follows:

    a. Single-acting swing doors - beveled 1/8" in two (2) inches.
    b. Double acting swing doors - rounded on 2-1/8" radius.
    c. No square edge doors permitted.

7. Hardware Reinforcements

    a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
    b. Minimum gauges for hardware reinforcing plates shall be as follows (contractor shall provide larger and thicker plates as required to accommodate weight of door):
        1). Hinge and pivot reinforcement - seven (7) gauge.
        2). Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers - twelve (12) gauge.
        3). Reinforcements for all other surface mounted hardware - sixteen (16) gauge.

8. Glass Moldings and Stops

    a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on drawings.
    b. Fixed moldings shall be securely welded to the door on the security side.
    c. Loose stops shall be not less than twenty (20) gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced eight (8) inches o.c. Snap-on attachments will not be permitted. Stops shall be flush with face of door.

9. Louvers shall be sixteen (16) gauge sheet steel, stationary type, closely spaced inverted "V" blade design, flush with face sheets of door, integral with and welded to door. Fifty (50) percent free area, unless indicated otherwise on drawings.

D. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall then be chemically treated to insure maximum paint adhesion and shall be coated, on all exposed surfaces,

with manufacturer's standard rust-inhibitive alkyd primer as specified for frames which shall be fully cured before shipment.

E. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in any direction, including in a diagonal direction.

2.5 LABELED DOORS AND FRAMES

A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings as scheduled on drawings. Such doors and frames shall be labeled by Underwriters' Laboratories or other nationally recognized agency having a factory inspection service.

B. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.

2.6 HARDWARE LOCATIONS

A. The location of hardware on doors and frames shall be as noted in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" of the Door Hardware Institute unless otherwise required by prevailing Handicapped Codes.

2.7 CLEARANCES

A. Fabricate doors and frames to meet edge clearances as follows:

1. Jambs and Head: 1/8" plus or minus 1/16".

2. Meeting Edges, Pairs of Doors: 1/8" plus or minus 1/16".

3. Bottom: 3/4" if no threshold, 3/8" at threshold.

B. Fire rated doors shall have clearances as required by NFPA 80.

2.8 MANUFACTURING TOLERANCES

A. Manufacturing tolerance shall be maintained within the limits given in HMMA 841 of ANSI/NAAMM, current edition.

2.9 PREPARATION FOR FINISH HARDWARE

A. Prepare door and frames to receive hardware:

1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.

2. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

B. Provide reinforcements for both concealed and surface applied hardware:

1. Drill and tap mortise reinforcements at factory, using templates.

2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

2.10 REJECTION

A. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware or work of other trades, shall be removed and replaced with new at no cost.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where steel doors and frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Refer to Section 062000 for installation procedures for all work of this Section.

END OF SECTION

SECTION 081216

MINIMALIST INTERIOR ALUMINUM DOOR FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the minimalist interior aluminum door frames as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Steel doors and frames - Section 081113.

B. Wood doors - Section 081416.

C. Door hardware - Section 087100.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets to include:

1. Preparation instructions and recommendations.

2. Storage/handling requirements and recommendations.

3. Installation instructions.

B. Shop Drawings: Submit drawings for fabrication and installation of flush interior aluminum frames, to include:

1. Details jambs, headers, trims and connections.

2. Details and identification of each frame type.

3. Elevations.

4. Location and installation requirements of door hardware and reinforcements.

5. Door Frame Schedule of openings and locations.

C. Quality Assurance Certification: Submit manufacturer's certification that products have been constructed and tested.

D. Color Samples: Two sets of color chips representing manufacturer's full range of available colors.

E. Product Samples: Two samples, minimum size 6 inches long, representing specified product and color.

F. Certificates of Compliance: Submit product test report from Independent Laboratory indicating compliance with performance testing herein specified.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years' experience in manufacturing similar systems.

B. Installer Qualifications: Minimum 2 years' experience installing similar systems and acceptable to the manufacturer.

1.6 WARRANTY

A. Provide manufacturer's written warranty against defects in materials and workmanship for a period of one year from date of substantial completion.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver frames in crates or cartons suitable for storage at the site. Do not bulk pack frames.

1. Protect products from damage by covering and properly storing in a cool, dry area, elevated above ground level as near as possible to final location. Do not use non-vented plastic or canvas covers.

2. Protect materials and finish from damage during handling and installation.

1.8 PROJECT CONDITIONS

A. Field measurements: Verify actual dimensions of frame openings by field measurement prior to installation of frames. Have incorrect openings corrected prior to frame installation.

B. Work area must be completely enclosed and protected from the elements prior to frame installation.

C. Maintain temperature, humidity, and ventilation conditions so as to not adversely affect door frames or packaging. Keep cartons dry.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Fry Reglet Corporation; Minimalist interior aluminum door frames, or approved equal by the Architect, adhering to specifications herein.

2.2 DESIGN / PERFORMANCE REQUIREMENTS

A. General: Fabricate frames for scheduled openings providing extruded flanges for integration to adjoining drywall.

1. Minimum Frame Extrusion Wall Thickness: 0.078 inch.

2. Construction: Extruded aluminum hinge jamb, strike jamb and header section factory mitered to install with hair-line seams.

3. Provide continuous door silencer of thermoplastic vulcanizate (TPV) material.

4. Frame sections shall be extruded to include continuous, punched, taping flanges along each exposed section for application of tape, mud, primer and paint.

B. Door Sizes: Provide frame capable of accepting standard 1-3/8 inch or 1-3/4 inch door thicknesses:

1. Minimalist door frame throat size: 4-5/8 inches.

2. Minimalist door frame throat size: 4-7/8 inches.

C. Test Procedures and Performances: Provide independent lab test report based on *ANSI/SDI A250.4-2011 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors* indicating that frame has been tested and achieved a count of at least 35,000 cycles when subjected to a shutting force of 7 pounds per cycle, showing no visible cracking in abutting drywall finishing.

D. Hardware Installation: Provide flush mounting plates for field sizing to accommodate hardware locations as defined in the specifications and drawings.

E. Reinforcements: Include integral hinge and strike reinforcements designed to position hinge and strike plates flush with face of frame.

2.3 MATERIALS

A. Aluminum: Meeting requirements of ASTM B 221, 6063-T5 alloy, and as otherwise required to ensure compliance with dimensional tolerances and maintain color uniformity.

B. Finish: As selected by Architect.

C. Hardware: As specified in Section 087100, Door Hardware.

D. Anchorage Devices, Clips and Fasteners: Manufacturer's standard type, compatible with materials being secured.

E. Accessories: As necessary for complete system.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where minimalist interior aluminum door frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

B. Before beginning installation, verify that wall thickness does not exceed industry standard tolerance of + or – 1/16”.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions, comply with detailed installation requirements of final approved shop drawings. Set frames plumb, square and level.

B. Fasteners: Use screws, per manufacturer's standard installation instruction, for secure attachment to wall conditions.

C. Adjust doors and hardware to operate properly.

3.3 PROTECTION

A. Protect installed flush frames until completion of project.

B. Touch-up, repair or replace damaged areas before Substantial Completion.

C. Clean-Up: Clean frames, if necessary, using mild soap and water. Use NO abrasive agents.

END OF SECTION

SECTION 081416

WOOD DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the wood doors as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Solid core flush wood doors.

2. Fire rated flush wood doors.

1.3 RELATED SECTIONS

A. Installation of wood doors - Section 062000.

B. Hollow metal frames - Section 081113.

C. Finish hardware - Section 087100.

D. Field painting – Section 099000.

1.4 SUBMITTALS

A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.

1. Include details of core and edge construction and trim for openings.

2. Include factory finish specifications.

3. Include certifications to show compliance with specifications.

4. Include certification to show compliance with AWI and WDMA requirements specified herein.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for finishing and other pertinent data.

1. Include requirements for veneer matching.

C. Submit the following

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated"; latest edition "Premium" grade and WDMA “Extra Heavy Duty” Performance Level.

1. Only manufacturers that are certified and listed by AWI to be QCP qualified are acceptable for this project.

2. Provide letter of licensing for Project indicating that doors comply with requirements of grade specified.

C. Fire Rated Wood Doors: Doors complying with Category A, Positive Pressure or Neutral Pressure testing standards per UBC 7-2-1997 and UL 10-C (UBC 7-2-1994 and UL 10B) that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Door Schedule, based on testing according to NFPA 252.

1. Conform to prevailing Code requirements to determine which pressure standard (Positive or Neutral) is required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) in excess of permitted standard noted in Article 2.5 herein, or show telegraphing of core construction in face veneers.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect during the following period of time from date of Substantial Completion:

a. Solid Core Flush Wood Doors: Life of installation.

PART 2 PRODUCTS

2.1 SOLID CORE FLUSH WOOD DOORS

A. Provide AWI PC-5 Premium Grade hot pressed 5-ply solid core particleboard doors, 1-3/4" thick, conforming to standards specified herein. Subject to meeting standards specified herein, the following manufacturers are acceptable: Masonite, VT Industries, Mohawk or approved equal.

1. Core shall consist of a formed flat panel consisting of wood particles bonded together with synthetic resins or other added binder, with an average density of 30 to 32 lbs. per cubic foot. The material shall meet or exceed the requirements of ANSI A208.1, Grade 1-LD-2 covering mat formed particleboard with face screw holding of 124 lbs., modulus of rupture of minimum 700 psi and modulus of elasticity of not less than 148,000 psi.

2. Core shall be capable of satisfying this WDMA TM-7 cycle slam test for 1 million slams for surface mounted hardware. Where the manufacturer's core does not meet this criteria, stiles and rails must measure a minimum of 5-1/2" and must be fabricated of hardwood.

a. Surface mounted hardware must be installed with minimum 1-1/4" screw penetrations using threaded to the head screws; coordinate with Section 087100.

B. Cross Bands: Shall be 1/16" thick hardwood extending full width of door and laid with grain at right angles to face veneers. Cross bands and faces shall be laminated to the core with Type I MF or PVA glue.

C. Stiles, Rails: Stile and rail shall be a minimum of 1-3/8" solid hardwood or structural composite lumber (after trimming) laminated to the core. Stiles and rails must be securely glued to the core with no voids allowed. Stiles and rails must be capable of screw holding of 550 lbs. per WDMA TM-10.

D. Vertical door edge must be capable of screw holding of 550 lbs. per WDMA TM-10; horizontal door edge must be capable of screw holding of 400 lbs. per WDMA TM-10.

E. Doors shall have hinge loading capacity of 500 lbs. per WDMA TM-8.

F. Where glass lites are noted, factory cut openings. Trim openings with solid hardwood moldings of same type of wood as face veneer. Lite openings in 20 minute rated doors shall have manufacturer's 20 minute approved hardwood system.

G. Doors to be field painted shall have MDO face.

1. Color: as indicated in finish schedule.

2.2 FIRE RATED WOOD DOORS ("B" LABEL)

A. Provide mineral core 1-3/4” thick solid core wood doors conforming to standards specified herein, manufactured by one of the manufacturers noted above. Stile construction on both stiles shall conform to the following:

1. Stile edge screw withdrawals when tested in accordance with ASTM D 1037-78 shall exceed 650 lbs. This applies to both stiles.

2. Stile edge split resistance when tested in accordance with ASTM D 143-52 (78) Modified must exceed 950 lbs. This applies to both stiles.

B. Door to have face finish as specified above in Article 2.1.

1. Where the core is free of urea formaldehyde, provide a layer of veneer over the substrate prior to application of finish veneer to prevent telegraphing of patterns from the adhesive.

C. Blocking: For surface mounted hardware only, provide composite blocking designed to maintain fire resistance of door but with improved screw-holding capability of same thickness as core and with minimum dimensions as follows:

1. 5-inch top rail blocking.

2. 5-inch bottom rail blocking.

3. 1 – 5" x 18" lock block at cylinder or mortise locksets.

4. 2 – 5" x 18" lock blocks at exit devices.

D. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.3 SHOP FINISH

A. Opaque Finish: For doors to be field painted, shop prime on all surfaces with one coat of alkyd wood primer applied to a dry film thickness of 1.5 mils.

2.4 FABRICATION

A. Prefit and premachine wood doors at the factory.

B. Comply with the tolerance requirements specified herein. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.

D. Doors shall be factory sized to door opening so that trimming and fitting are not required in the field.

E. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances unless otherwise indicated.

1. Three degree bevel or bevel to suit frame sizes indicated, with 3/16" prefit in width, +0/-1/32" tolerances. Prefit top of door 1/8" + 1/16"/-0" and undercut as required by floor condition. Undercut shall not exceed 1/8" from bottom of door to top of finished floor; where threshold occurs undercut shall not exceed 1/8" from bottom of door to top of threshold.

2. Comply with requirements in NFPA 80 for fire-rated doors.

F. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3 unless otherwise noted. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2. Provide concealed intumescent seals at fire-rated pairs of doors meeting the requirements of U.L. 10 C.

G. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kinds of doors required.

2.5 SOURCE QUALITY CONTROL

A. Once installed, maximum allowable warp, bow, cut or twist in doors shall be 1/16" as measured by the 1/16 inch feeler gauge and a straight-edge extending from corner to corner of the door face at stiles, top and bottom rails and along both diagonals.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Section 062000 for installation of wood doors.

END OF SECTION

SECTION 083113

ACCESS DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the access doors as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Frameless recessed panel access doors at drywall ceilings and walls.

2. Framed flush panel access doors at masonry and tile walls.

3. Provide access doors and frames for access from occupied spaces to the following, where indicated or required, and as directed by the trades of Divisions 23 and 26.

a. All shutoff or balancing valves.
b. Fire dampers, as required.
c. Points of duct access.
d. Pull boxes.
e. Controls of mechanical and electrical items.
f. Masonry shafts for pipes and conduits, as required.
g. Pipe spaces, if required.
h. Inlets of fans.
i. Fusible link and splitter damper at filter bank.
j. Automatic damper and motor.
k. Equipment not otherwise accessible.

1.3 RELATED SECTIONS

A. Drywall - Section 092900.

B. Valves and connections - Division 23.

1.4 QUALITY ASSURANCE

A. For actual installation of the work of this Section, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the skills required.

B. Fire-Resistance Ratings: Wherever a fire-resistance classification is shown, or for construction where access doors are installed, provide required access door assembly with panel door, frame, hinge and

latch from manufacturers listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for the rating shown.

1. Provide UL label on each access panel.

2. Provide flush, key operated cylinder lock.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

1.5 SUBMITTALS

A. Before any materials of this Section are delivered to the job site, submit complete manufacturer's literature to the Architect. Submit plans and schedules showing size and location of each and every access door for Architect's acceptance prior to installation.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Provide access door assembly manufactured by Milcor Inc, or equal made by Nystrom Inc., Karp Associates, Inc. or approved equal. Assembly shall be an integral unit complete with all parts and ready for installation.

B. Fabricate units of continuous welded steel construction. Grind welds smooth and flush with adjacent surfaces. Provide attachment devices and fasteners of the type required to secure access panels to the types of supports shown.

C. Frameless Units for Drywall Surfaces (Recessed Panel Units): Provide access doors without exposed frames for drywall adhered to recessed panel.

D. Panels: Fabricate from fourteen (14) gauge steel, with concealed spring hinges set to open to 175 degrees. Provide removable pin type hinges of the quantity required to support the access panel sizes used in the work. Finish with manufacturer's factory applied baked enamel prime coat applied over phosphate protective coating on steel.

E. Locking Devices

1. For non-rated access doors, provide flush, screwdriver operated cam locks of number required to hold door in flush, smooth plane when closed.

2. For fire rated doors, provide locks as described in paragraph 1.04, B. herein.

F. Inserts and Anchorage: Furnish inserts and anchoring devices which must be built into masonry for the installation of access panels. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where access doors are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 COORDINATION

A. Coordinate all work with the mechanical trades to insure proper locations and in a timely manner to permit orderly progress of the total work.

B. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

D. Remove and replace panels or frames which are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 084228

ALL GLASS INTERIOR DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the all glass doors, as shown on the drawings, and/or specified herein, as needed for a complete and proper installation, including the following:

1. ¾" thick clear tempered glass doors.
2. Stainless steel bottom rail, as indicated on drawings.
3. Top center pivot hinge plate, stainless steel.
4. Top plate for mounting of electric lock clad in stainless steel.
5. 1" diameter push/pull bars.
6. Cylinder lock in bottom rail.
7. Recessed floor closer, center pivots, extruded aluminum saddle with removable section at closer.

1.3 RELATED SECTIONS

A. Finish hardware - Section 087100.

B. Custom stainless steel entrances and storefronts – Section 084323.13.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: For actual installation of doors, use only personnel who are thoroughly trained and experienced in installation of the selected products and who are completely familiar with the requirements of this work.

1.5 PERFORMANCE REQUIREMENTS

A. Provide systems, including anchorage, capable of withstanding loads indicated without structural failure, deflection exceeding specified limit, support components transferring stresses to glazing, and glazing-to-glazing or glazing-to-support contact as determined by structural analysis.

1. Deflection Normal to Glazing Plane: Limited to 1/175 of clear span or ¾", whichever is smaller.

B. All doors shall comply with all building code requirements.

1.6 SUBMITTALS

A. Product Data: For each type of product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings; Show details of fabrication and installation, including the following:

1. Plans, elevations, and sections.

2. Details of fittings.

3. Hardware quantities, locations, and installation requirements.

4. Anchorages and reinforcement.

5. Glazing details.

C. Samples for Verification: Of size indicated below and of same thickness and material indicated for Work. Show the full range of color and texture variations expected.

1. Metal Finishes: 6-inch long sections of patch fittings, rails, and other items.

2. Glass: 6 inches square showing exposed-edge finish.

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify opening dimensions of all-glass entrances by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Submit a written warranty executed by the manufacturer agreeing to repair or replace components of all-glass entrances that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures.

2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

3. Failure of operating components to function normally.

B. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide all glass doors manufactured by CR Lawrence, Assa Abloy Glass Solutions or aproved equal.

2.2 MATERIALS

A. Clear Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear) requirements. Provide products of thickness indicated that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to CPSC 16 CFR, Part 1201 for Category II materials.

1. Thickness: 3/4 inch.

2. Exposed Edges: Flat polished.

3. Corner Edges: Mitered.

B. Stainless Steel: ASTM A 666, Type 302 or Type 304; No. 4 finish.

2.3 COMPONENTS

A. Fittings: Provide fittings and accessories for all-glass entrances of configurations shown on drawings fabricated of stainless steel, minimum 12 ga.

B. Anchors and Fastenings: Manufacturer's standard concealed anchors and fastening.

C. Weather Stripping: Manufacturer's standard sweep-type weather stripping.

2.4 HARDWARE

A. General: Heavy-duty hardware units indicated in sizes, numbers, and type recommended by manufacturer for all-glass entrances indicated. For exposed parts, match fitting metal and finish.

B. Closers: Center-hung, concealed floor closers complying with ANSI/BHMA A156.4, Grade 1 or Grade 2 requirements, including cases, bottom arms, top pivots, plates and accessories required for a complete installation, and as follows:

1. Swing: Single acting.

2. Hold Open: Selective.

3. Positive Dead Stop: Coordinated with hold-open angle.

4. Delayed-Action Closing: Comply with requirements of authorities having jurisdiction of the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," whichever are more stringent.

a. Opening Force: 5 lbf.

C. Push/Pull: 1" diameter stainless steel, as shown on drawings.

D. Lockset: Bottom rail dead bolt, dead bolt operated by key outside and inside engaging cutout in threshold or floor plate.

1. Lock cylinder furnished by Section 087100.

E. Make provisions for and coordinate with installation requirements for electro/magnetic lock and door release at door head as specified in Section 087100.

F. Threshold: Manufacturer's standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips. not more than 1/2 inch high with beveled edges providing a floor-level change with a slope of not more than 1:2, and fabricated of stainless steel.

2.5 FABRICATION

A. General: Fabricate all-glass entrance components in sizes, profiles, and configurations indicated.

1. Provide holes and cutouts in glass to receive hardware, fittings, rails, and accessories before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.

2. Fully temper glass using horizontal roller hearth process.

3. Factory assemble components and factory install hardware to greatest extent possible.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where all glass doors are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install all-glass entrances and associated components according to manufacturer's written instructions; coordinate installation with structural glass wall fabricator.

B. Set units level and plumb.

C. Maintain uniform clearances between adjacent components.

D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

E. Set, seal, and grout floor closer cases as required by hardware and substrate.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer that ensure all-glass entrances are without damage or deterioration.

END OF SECTION

SECTION 084323.13

CUSTOM STEEL FRAMED INTERIOR ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Custom entrance assemblies and storefronts required for this work are indicated on the drawings and include, but are not limited to, the following:

1. Custom shop powder coated and stainless steel entrance assemblies including swinging doors, sidelights, and fixed frames.

2. All necessary steel or stainless steel where required to support, strengthen and/or reinforce the work.

3. Sealants, caulking, joint fillers, gaskets, thermal isolating members, fasteners, vents and weeps, weep tubes, closures, trim, as shown or as may be required within the system.

4. Anchors, supporting members, reinforcing, bracing, stiffeners, gutters.

5. Shop drawings, engineering calculations, erection drawings, samples and conformance testing.

6. Protection and cleaning, as defined herein.

1.3 RELATED SECTIONS

A. Miscellaneous Metals - Section 055000.

B. Glass and glazing - Section 088000.

C. Finish Hardware - Section 087100.

1.4 PLANS AND SPECIFICATIONS

A. The drawings (building elevations, floor plans and design details) and specifications are an outline of the criteria and performance requirements of the work. The requirements shown by the details are intended to establish basic dimensions of the module and the site lines and profiles of members. Within these parameters, the Contractor is responsible for the design and engineering of the system, including whatever modifications or additions may be required to meet the specified requirements and maintain the visual design concept for the entire project.

B. Contractor shall submit, along with his bid, sketches showing how he will address typical conditions for each type of unit.

C. It is recognized that the design details do not cover many conditions. It is, however, intended that conditions not detailed shall be developed through the Contractor's shop drawings to the same level of

aesthetics and in compliance with performance criteria, as indicated for detailed areas and stipulated in these specifications. The Contractor, by accepting a contract for the work, acknowledges this and agrees that the Architect shall have the final say as to all matters whether detailed or not on the design details.

1.5 QUALITY ASSURANCE

A. The work of this Section shall be performed by Subcontractors who are regularly engaged in the engineering, manufacture, fabrication, finishing, installation, glazing and sealing of similar work. Each subcontractor shall demonstrate to satisfaction of the Architect that he has successfully performed on comparable projects over the previous 5 years. All fabricating shall be done in subcontractor's own plant. Further subcontracting of any work included hereunder is specifically prohibited, except for that which may be approved by the Architect in writing prior to award of this Contract.

B. The Architect reserves the right to visit the fabricating facilities of the subcontractors at any time when the work is in progress. All shop and field materials and workmanship shall be subject to inspection by the Architect and his representatives at all times. Such inspections do not relieve the Contractor from obligations to provide materials conforming to all requirements of the Contract Documents.

1.6 PERFORMANCE REQUIREMENTS

A. Structural Requirements: The work, as erected, shall meet or exceed the following structural requirements, as demonstrated by engineering calculations and field testing.

B. Methods and fabrication and assembly, except as specified herein, shall be at the discretion of the Contractor provided that the exterior and interior visible architectural effect is not changed, the work of other Contractors is not affected, and the weathertightness and strength qualities, as demonstrated by engineering calculations are not reduced.

C. Remedial measures, which may be necessary, shall maintain standards of quality and durability and are subject to approval by the Architect.

D. Provision for Movement of the Structure

1. The work will be designed to accommodate dead load and live load deflection, creep and/or sway and torsion of the building as noted in Section 084413.

2. To this end Contractor shall obtain all necessary projected data and make such provision in the work as may be necessary. The amount of such movement that is accommodated in the Contractor's design shall be identified on Contractor's submittal drawings.

E. Partition system shall be designed, fabricated, and installed to withstand a 10 psf suction and pressure load (or greater if required by Code) with a maximum deflection of L/360.

F. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, “Minimum Design Loads for Buildings and Other Structures”, Section 9, “Earthquake Loads”, whichever are more stringent.

G. Variations in Structure: The work shall be designed to accommodate variation in location of surrounding and supporting work, as specified in other Sections of these specifications.

H. Flatness of Panels: It is intended that metal panels, fascias and other sheet or plate, fabricated or laminated sheet items read as flat and free of bow or "oil canning" or "read thru" of stiffeners when installed in the building. To this end, exposed metal faces when supported in the building shall be of such

flatness that the max. uniform bow in 2 ft. shall not exceed 1/32", and the max. overall variation in plane between high and low point within a panel shall not exceed 1/16”.

1.7 CODE REQUIREMENTS

A. All work shall be performed in accordance with the New York Building Code, or the requirements of this specification, whichever are more stringent.

1.8 DELEGATED DESIGN

A. Drawings and specifications, in these cases, are an outline of criteria and are not an engineered design. Drawings and specifications are meant to outline scope of work such as, system design, dimensions of module, sight lines and profiles of members. Drawings and specifications do not indicate or describe total work required for completion and may not cover some conditions which may be required.

B. The design and visual character of the Project is important and shall be maintained. There shall be no variation in the final surface finish of similar materials, which shall remain visually consistent, including color and texture, within agreed tolerances and agreed samples.

C. Engage the services of a Professional Engineer registered in the State of New York to prepare complete shop drawings and structural design computations for work of this Section. Drawings and calculations shall bear the engineer’s professional seal and signature.

1. Design work of this Section subject to gravity, seismic loads, and design loads, including comprehensive engineering analysis, using performance requirements and design criteria indicated.

D. The structural design computations shall provide a complete structural analysis of all typical and special conditions of construction. Show how design load requirements and other performance criteria have been satisfied and confirm to the governing laws and building codes.

E. The shop drawings shall show all pertinent details for fabrication and erection of each miscellaneous metal indicated, including stairs, railings etc. Include plans, elevations, sections and details of miscellaneous metals and their connections. Show anchorage and accessory items.

1.9 CODE REQUIREMENTS

A. All work shall be performed in accordance with the City of New York Building Code, or the requirements of this specification, whichever are more stringent.

1.10 GUARANTEE

A. Unless stated otherwise in these specifications, guarantee shall state that all work is in accord with drawings and specifications, as amended by any changes thereto authorized by the Architect, free from defects in materials and workmanship for a period of five (5) years from the date of acceptance of the work by the Owner. Contractor shall agree to repair or replace defective materials and workmanship to "like new condition", including such exploratory work, as necessary to determine the cause, during the guarantee period, at no additional cost to the Owner.

B. Guarantee shall further state that glass shall be guaranteed against breakage due to defects in glass materials and/or installation for a period of five (5) years after acceptance of the work by the Owner.

C. Defective materials and workmanship is hereby defined to include evidence of:

1. Structural failure of components resulting from forces within specified limits.
2. Delamination of panels.
3. Discoloration or fading, excessive non-uniformity or pitting of finish or corrosion.
4. Glass breakage.
5. Adhesive or cohesive failure of sealant.
6. Crazing on surface of sealant.
7. Sealant hardening beyond Shore A durometer 50 or softening below 20.
8. Failure to fulfill other specified performance requirements.
9. Failure of operating parts to function normally.

D. Contractor shall be responsible for damage to the building and furnishings occasioned by defective materials or workmanship or damage as part of repairs to the wall.

E. The guarantee, the enforcement or lack of enforcement thereof, shall not deprive the Owner of other actions, rights or remedies available to him. Guarantee shall be in form approved by the Architect. Guarantee does not cover damage resulting from vandalism or acts of nature exceeding performance criteria.

F. The terms below used in conjunction with finish guarantee are defined as follows:

1. "Excessive fading": Means a change in appearance which is perceptible and objectionable as determined by the Architect when viewed visually in comparison with the original color range standards.
2. "Excessive pitting of finish or corrosion": Means there shall be no pitting or other type of corrosion discernible from a distance of 10 ft., resulting from the natural elements in the atmosphere at the project site.

1.11 SUBMITTALS

A. Prior to construction of the work, submit shop drawings for the fabrication and installation of all work and associated components. Include:

1. Wall elevations at 1/4" scale, typical unit elevation at 1" scale.
2. Show full size details of all conditions for every member, joint, anchorage, glazing system and provision for expansion and contraction and sealant application.
3. Include coordination details for related and adjoining work, insert drawings and erection diagrams. Show relative layout for all adjacent walls, beams, columns and slabs, all correctly dimensioned.
4. Include structural calculations for the work and its anchorage to the building structure with all materials and all connections fully dimensioned. Show ultimate factor of safety. Drawings and calculations shall bear the seal and signature of a Professional Engineer licensed in the State of New York. The Architect and/or his consultants will not provide said seal and signature.

5. Show all dimensions including, but not necessarily limited to, section thickness, frame lap over glass and edge clearance. Show tolerances for all dimensions including, but not limited to, field dimensions, mill and shop dimensions and glass dimensions.

B. Submit samples of all materials to be encompassed in the work in size and quantity, as required by the Architect. These will include, but not be limited to, samples of:

1. Gaskets, sealing materials, joint fillers, back-up rods, flashing, hardware and insulation.

2. Stainless steel framing: Framing shall be vertical section 24" long. Samples shall be submitted in pairs to define max. variation of finish that can be anticipated in the work.

3. Stainless steel sheet, 12" x 6", with mechanical finish.

1.12 MOCKUP

A. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Mockup dimensions as indicated on drawings and by the 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide materials which have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces which exhibit pitting, seam marks, roller marks, "oil-canning" stains, discolorations or other imperfections on the finished units will not be acceptable.

B. Custom shop powder coated steel.

C. Stainless Steel

1. Comply with the following standard for the forms and types of stainless steel for the required items of work.

a. Type: Type 316L, complying with ASTM A-666.

D. Steel (Carbon) for Concealed Supports Only

1. Structural: ASTM A36.

2. Plates (for forming or bending cold): ASTM A283, Grade C.

3. Steel sheets: ASTM A245, Grade C.

E. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.

F. Fasteners: Furnish of basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Unless otherwise shown, provide Phillips flat-head screws for exposed fasteners.

G. Anchors and Inserts: Either furnish inserts to be set in concrete or masonry work, or provide other anchoring devices as required for the installation of ornamental metal items. Provide toothed steel or lead shield expansion bolt devices for the drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for exterior installations.

1. Provide units with exposed surfaces matching the texture and finish of the metal item anchored.

H. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.2 FABRICATION

A. Cutting: Cut metal by sawing, shearing or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp, square and free of burrs, without deforming adjacent surfaces or metals.

B. Holes: Drill or cleanly punch holes (do not burn), so that holes will be accurate, clean, neat and sharp without deforming adjacent surfaces or metal.

C. Connections

1. Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to water. Locate joints where indicated on drawings. Provide connections to allow for thermal movement of metal at locations and by methods approved by Architect. For work exposed to view, use concealed fasteners (unless welded or other connections indicated) with joints accurately fitted, flush and rigidly secured with hairline contacts.

2. Welding: Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturers of the metals being welded. Welds shall be continuous, except where spot welding is specifically permitted. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces so that joint will not be visible; undercut metal edges where welds are required to be ground flush and dressed smooth. All welds on or behind surfaces which will be exposed to view shall be done so that finished surfaces will be free of imperfections such as pits, runs, splatter, cracks, warping, dimpling, depressions or other forms of distortion or discoloration. Remove weld spatter and welding oxides from all welded surfaces.

3. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads, where shown to be exposed to view, shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts of adjacent metal.

D. Operating Mechanism: Operating devices, mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

E. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items for architectural metal work to be built into concrete, masonry, or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

F. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

G. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

H. Exposed Work: In addition to requirements specified herein or shown on drawings, all surfaces exposed to view shall be clean, and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, too marks, burrs and other defects which mar appearance of finished work. Ornamental metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

I. Materials shall be of such strength, thickness and alloy that they are capable of meeting all standards and descriptions specified herein and as detailed on drawings.

2.3 SHOP FINISHING

A. General

1. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.

2. Provide colors or color matches as indicated on selected samples.

3. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.

4. Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, masonry, wood or dissimilar metals, in exterior work with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

B. Stainless Steel

1. Brushed, vertical directional polish: AISI No. 4 finish.

C. Scratches and minor blemishes occurring on exposed surfaces of the metal work fabrication, including marks due to rolling, forming, drawing, welding or tooling shall be removed by grinding and polishing. Only clean polishing wheels and grinding and polishing compounds shall be used.

D. Shop Painting of Carbon Steel: (Non-Galvanized)

1. Clean steel to be shop painted in accordance with SSPC Surface Preparation Spec. No. 6, Commercial Blast Cleaning.

2. Paint as follows

a. First Coat: 90/03 Tneme-Zinc made by Tnemec, applied to a dry film thickness of 2.0 to 3.5 mils.
b. Second Coat: Series 104 H.S. epoxy primer made by Tnemec, applied to a dry film thickness of 5.5 to 8.0 mils.

2.4 PROTECTION

A. It shall be the responsibility of the Contractor to provide necessary protection to all exposed surfaces of architectural metal work, so as to prevent damage, staining, discoloration, abrasion, etc., to these surfaces from time of shipment from factory to acceptance of work of this project. Protection shall be provided by wrappings, strippable coatings, or other means. After installation, remove protective paper or strippable coating and clean exposed surfaces, and then provide additional temporary protection to protect architectural metal work from damage during subsequent construction activities. Surfaces which are damaged, stained, discolored, abraded, etc., shall be rejected and replaced with new by the Contractor, at no cost to the Owner.

2.5 STEEL FRAMING, BRACING, SUPPORTS, ETC.

A. Steel framing, plate reinforcing, supplementary steel framing or reinforcing, bracket assemblies, and the like required for the support, framing, reinforcing, bracing, etc., of work of this Section shall be of such sizes and shapes as indicated on the drawings and details, or as required to suit the conditions, and shall be provided with all necessary supports and accessory items such as inserts, hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly and rigidly fasten, anchor or attach work of this Section in place and to the concrete, masonry and other connecting and adjoining work.

2.6 SEALANT

A. All joints which are sealed with sealant as part of the fabrication or erection procedure shall be sealed with an approved butyl (concealed) or silicone (exposed or concealed sealant) in color to match the adjoining surfaces, or as may be required by the Architect.

B. In using specified sealants, strictly observe the printed instructions of sealant manufacturer regarding joint size, limitations, back-up rod, mixing, cleaning, surface preparation, priming and application. A primer shall be used unless printed instructions advise to the contrary. Sealants shall not be applied when substrates are wet or when the temperature is below 40 deg. F.

C. Care shall be exercised to insure against "Three Surface Adhesion". Bond breakers shall be provided where necessary.

D. Contractor shall provide certification from sealant manufacturer that the sealant manufacture has reviewed all sealant details and finds same suitable for the purpose intended and compatible with the surfaces with which they are in contact.

E. Acceptable Products

1. For silicone sealant provide "Silpruf SCS 2000" made by G.E. or "790" made by Dow Corning Co.

2. For butyl sealant provide No. 707 made by PTI, or Tremco Curtain Wall Sealant.

2.7 SWINGING GLASS DOOR

A. Refer to Section 084228 Glass Doors.

2.8 MISCELLANEOUS MATERIALS

A. Provide straps, plates and brackets, built-in inserts, as required for support and anchorage of the fabricated items to adjacent surfaces.

B. Brackets, Shims and Reinforcements

1. Provide aluminum and/or steel brackets, clips, shims and reinforcements as required.

2. Where steel reinforcement of units is required for strength.

C. Fabricate miscellaneous anchorage devices and support brackets from steel shapes, plates and bars of sizes indicated to meet structural loading criteria. Where no thickness is indicated, 12 ga. is min. allowable.

D. Fasteners, General: Provide type and size shown, or as required, for proper support and performance, fabricated of non-magnetic stainless steel where visible to color match context. Bolts and nuts of zinc coated bronze or steel, complying with ASTM A307, Grade A (and ASTM A143), may be used for concealed assembly and anchorage in locations not exposed to the weather and joining steel members to steel members only.

E. Slip Joint Linings/Sleeves: Provide stainless steel sleeve spacers and/or suitable bearing pads, as required, to insure free movement between surfaces where expansion and deflection movements are intended. Provide "Eel slip", "Nylatron" or high impact polystyrene shims or pads or equivalent plastic units of sizes and thicknesses (Min. 1/16" except 1/8" for "Eel Slip") recommended by the manufacturer to permanently prevent "freeze up" of joints.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where custom entrances and storefronts are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Qualifications of Workmen

1. All work shall be performed by skilled workmen, especially trained and experienced in this type of work.

B. Lines and Grades: Benchmarks for elevations and building lie offset marks for alignment shall be established on each floor level by the contractor, who shall be responsible for their accuracy. Should any error be found in their location, the installation Contractor shall so notify the Contractor in writing and installation work shall not proceed in the affected areas until the errors have been corrected.

C. Prior Inspection of the Structure: After lines and grades have been established, and before beginning installation in any area, the Installation Contractor shall examine all parts of the structure on which the work is to be placed in that area. Should any conditions be found which, in his opinion, will prevent the proper execution of the work, he shall report such conditions in writing to the Contractor. Installation work shall not proceed in that area until such conditions are corrected or adjusted by the Contractor to the satisfaction of the Installation Contractor.

D. Workmanship: All parts of the work shall be erected, plumb and true, in proper alignment and relation to established lines and grades, and as show on approved shop and/or erection drawings.

E. Erection Tolerances: Install entrances and storefronts to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8” in 12’; 1/4” over total length.

2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16”.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32".

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8”.

F. Welding of Steel Framing: All welding shall be done by skilled mechanics, certified, qualified or licensed in accord with local building regulations and shall conform to the recommended practices of the American Welding Society. Welds and adjoining burned areas shall be thoroughly cleaned and painted with 2 coats of material specified herein for shop priming. Special care shall be taken to protect glass and other finished surfaces from damage and to prevent causing fires.

G. Use of Sealing Materials: Sealing materials specified in this Section shall be used in strict accordance with manufacturer's printed instructions and shall be applied only by mechanics specially trained or experienced in their use. Before applying sealing materials, all mortar, dirt, dust, moisture and other foreign matter shall be completely removed from surfaces it will contact. Adjoining surfaces shall be masked, when required, to maintain a clean and neat appearance. Sealing compounds shall be tooled to fill the joint and provide a smooth finish surface.

H. Postponement of Complete Enclosure: If so directed by the contractor, installation of the work shall be postponed in any area, so as to facilitate moving material into and out of the building during construction.

I. Removal of Debris: All debris caused by or incidental to the installation work shall be promptly removed from the job site as the work progresses.

J. Protection and Cleaning: The Contractor shall remove from the installed work all mastic smears or other unsightly marks caused by his workmen that would not be readily removed by normal final cleaning using mild soap and water.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing agency to perform testing indicated for storefronts.

B. Test fixed frames for water infiltration per AAMA 501.2; latest edition. Test within the first 10% of work complete, area to be a minimum of 100 SF of wall and including a perimeter where frames adjoins adjacent construction. Interior finishes must not interfere with observation of test area or be removed from test area. Not appropriate for operable doors.

1. This test (AAMA 501.2) shall be performed infield on new construction.

C. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

END OF SECTION

SECTION 084413

GLAZED ALUMINUM CURTAIN WALLS

PART 1-GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the aluminum and glass curtain wall as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Aluminum and glass curtain wall assemblies.
2. Aluminum insulated panels.
3. Glass and glazing in conjunction with the work of this Section.
4. Insulation, fire separation, fire safing and smoke stop.
5. All necessary steel or aluminum members where required to support, strengthen and/or reinforce aluminum members.
6. Sealants, caulking, joint fillers, gaskets, fasteners, vents and weeps, weep tubes, bellows, closures, gutters, end dams, flashings, trim, as shown or as may be required in conjunction with the system or to joint the system to adjacent construction.
7. Anchors, inserts and insert setting diagrams, furnishing of inserts and insert setting diagrams, support brackets, reinforcing, bracing, stiffeners, flashing.
8. Shop drawings engineering calculations, erection drawings, samples and conformance test data.
9. Field check for water leakage.
10. Protection and cleaning, as defined herein.
11. Field measurements of adjacent and/or supporting construction and verification of existing conditions.

1.3 RELATED SECTIONS

A. Interior Vapor Permeable Vapor Barrier Membrane – Section 072710.

B. Joint Sealers - Section 079200.

C. Glazing other than in conjunction with the metal work of this Section - Section 088000.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by manufacturer's documented performance criteria and field testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of New York, including, but not limited to story drift, twist, column shortening, long term creep, using performance requirements and design criteria indicated.

C. Design Wind loads (unless greater by Code): Positive Design Wind Load shall be designed to meet the requirements of ASCE-7 or applicable building code, whichever is more restrictive. The design pressures are minimum; if prevailing Code require greater pressures, such pressures shall apply.

D. Structural-Test Performance: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.

F. Windborne-Debris-Impact-Resistance Performance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone in which Project is located.

1. Large-Missile Test: For glazed openings located within 30 feet of grade.

G. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

H. Seismic Loads: Provide curtainwall, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities have jurisdiction or ASCE-7, "Minimum Design Loads for Buildings and Other Structures, Section 9, "Earthquake Loads," whichever are more stringent.

I. Story Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement, Maximum Inter-story drift: as indicated on the Drawings.

2. Test Performance: Meeting criteria for passing based on building occupancy type when tested according to AAMA 501.4 at 1.5 times the design displacement.

3. Live Load Deflection: Wall System shall be designed to accommodate a maximum live load deflection (occurring at longest slab spans) of L/360 at any point in the wall unless the building code requirement is more stringent. Average live load deflection will not exceed L/360. This shall be achieved through the use of the manufacturer's standard retainer system at the head of the wall system providing a completely closed joint and allowing for the anticipated movement. (An exposed sealant joint at the head of the wall is not permitted.) Permanent deformation in any member not to exceed 0.2% of member span.

J. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

K. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

1. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

L. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2. Test Interior Ambient-Air Temperature: 75 deg F.

3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

M. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.24 Btu/sq. ft. x h x deg F as determined according to NFRC 100, unless more stringent is required by Code.

2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.39 as determined according to NFRC 200, unless more stringent is required by Code.

3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lb/sq. ft.

4. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC- certified condensation resistance rating of no less than 65 as determined according to NFRC 500 and no less than 68.28 as determined according to AAMA 1503, whichever is more stringent.

N. Sound Transmission: Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound-transmission characteristics:

1. Outdoor-Indoor Transmission Class: Minimum 30 when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

O. Dimensional Tolerances: Provide glazed aluminum curtain wall system, including anchorage, that accommodates dimensional tolerances of building frame and other adjacent construction.

1.5 SUBMITTALS

A. Submit Product Data for each product specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Submit Shop Drawings showing fabrication and installation of glazed aluminum curtain wall system including plans, elevations, sections, details of the entire assembly, including components, and attachments to other units of Work.

1. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by a professional engineer licensed in the State of New York responsible for their preparation.

C. Submit samples for verification of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

D. Submit cutaway sample of each vertical-to-horizontal intersection of system, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery.

2. Anchorage.

3. Expansion provisions.

4. Glass and glazing.

5. Flashing and drainage.

E. Submit field measurements: Take necessary field measurements before preparation of shop drawing and fabrication. Do not delay progress job. If field measurements are not possible prior to fabrication, allow for proper field cutting and fitting ,and coordinate with Section 088000 accordingly.

F. Submit welder certificates indicating that welders comply with requirements specified in "Quality Assurance" Article.

G. Submit installer certificates signed by manufacturer certifying that installers comply with requirements in "Quality Assurance" Article.

H. Submit product test reports from a qualified independent testing agency evidencing compliance of glazed aluminum curtain wall system with requirements based on comprehensive testing of manufacturer's current system.

I. Submit test reports, calculations, computer analysis and other necessary data from a qualified independent inspecting and testing agency retained by the Contractor indicating compliance with performance requirements of glazed aluminum curtain wall system.

J. Submit Verification: Submit certified letter attesting that installer has minimum experience and qualifications stipulated herein.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the 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 glazed aluminum curtain wall systems that are similar to those indicated for this Project in material, design, and extent.

C. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing glazed aluminum curtain wall systems similar to those required for this Project and shall be acceptable to manufacturer, with a minimum of five years experience.

1. Engineering Responsibility: Engage a qualified professional engineer to prepare or supervise the preparation of data for glazed aluminum curtain wall systems, including drawings, testing program development, test-result interpretation, and comprehensive engineering analysis that shows systems' compliance with specified requirements.

D. Source Limitations: Obtain each type of glazed aluminum curtain wall system from one source and by a single manufacturer.

E. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

F. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1. Engage welders who have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.

G. Mockups: Prior to installing glazed aluminum curtain wall system, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for Work.

1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.

2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's approval of mockups before start of Work.

5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

a. Approved mockups in an undisturbed condition may become part of the completed Work.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to glazed aluminum curtain wall system including, but not limited to, the following:

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

2. Review structural loading limitations.

3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review required inspecting, testing, and certifying procedures.

5. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of a glazed aluminum curtain wall system that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including, but not limited to, excessive deflection.

2. Noise or vibration caused by thermal movements.

3. Failure of system to meet performance requirements.

4. Failure of operating components to function normally.

5. Water leakage.

6. Glazing breakage.

7. Condensation.

C. Warranty Period: 10 years from date of Substantial Completion (except as noted below).

D. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 1600UT System 1 Curtain Wall by Kawneer Company, Inc. (Basis of Design)

2. EFCO Corporation, if approved equal to match existing.

3. Wausau Metals Corporation, if approved equal to match existing.

2.2 METALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209.

2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.

3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Structural Profiles: ASTM A 1008.

5. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plats, and Bars: ASTM A 36.

2. Cold Rolled Sheet and Strip: ASTM A 1008.

3. Hot Rolled Sheet and Strip: ASTM A 1011.

2.3 FRAMING

A. Framing Members: Extruded or formed aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.

2. Glazing System: Retained mechanically with gaskets on four sides.

3. Glazing Plane: Front.

B. Brackets and Reinforcements: Manufacturer's standard high strength aluminum with non-staining, non-ferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening o turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.

3. Use concealed fasteners where possible.

4. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Anchors: Three way adjustable anchors with minimum adjustment of 2" that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot dip galvanized cast iron, malleable iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

2.4 GLASS

A. Glass shall be of the types and minimum thickness, as shown on the drawings and specified herein, and shall, in addition, meet the requirements of the following paragraphs.

B. All glass shall be the manufactured product of one (1) company. All fabricated glass products shall be the fabricated and coated products of one (1) company. All glass shall be delivered to the site bearing the manufacturer's label, complete with glazing instructions where applicable.

C. Insulating glass units shall be 1" thick (minimum), consisting of two lites of 1/4" (minimum) glass separated by a desiccant filled metal spacer with welded, fused, soldered or bent corners and welded, fused or soldered splices or joints to provide a 1/2" hermetically sealed and dehydrated space. Insulating glass shall be dual seal and certified for compliance with seal classification "CBA" by the Insulating Glass Certification Council (IGC) and tested in accordance with the following ASTM Test methods. Secondary seal on structural silicone glazed units shall be a special silicone edge seal certified for use in structural silicone glazing applications over the temperature range and structural loading as called for under the performance criteria section of this Specification.

1. ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.

2. ASTM E 546-88 Standard Test Method for Frost Point of Sealed Insulating Glass Units.

3. ASTM E 576-88 Standard Test Method for Dew/Frost Point of Sealed Insulating Glass Units in Vertical Position.

D. The lites comprising insulating glass units shall be annealed, heat strengthened, (or fully tempered where required to meet wind load or safety glazing requirements), as shown, specified, required, or recommended by the specified glass fabricator to insure against heat breakage and to assure adequate glass performance at the specified design pressures specified under the performance criteria herein.

E. Glass shall conform to the requirements of ASTM C 1036. Heat strengthened and tempered glass shall conform to the requirements of ASTM C 1048. Tempered glass shall also conform to ANSI Z97.1-1975. All heat strengthening and tempering shall be by the horizontal process, and processed in such a manner as to have all roller distortion in a horizontal direction as installed on the building.

F. Fully tempered glass shall be heat soaked to EN 14179-1:2005-European Heat Soaking Standard. Glass manufacturer shall submit for approval their proposal for meeting this requirement. Heat soaked panes shall be marked to show they have been heat soaked.

G. Where glass manufacturer cannot assure adequate structural performance of insulating glass units, based upon combination of inner/outer lite, assume outer lite alone must satisfy structural requirements. Method of installation must be in accordance with the manufacturer's published literature, as well as the latest standards of the FGMA and SIGMA. Method of installation shall make provision to weep all sill glazing rabbets.

H. Contractor shall provide certification from glass producer/fabricator that glass producer/fabricator has reviewed all glazing details and thicknesses and finds same suitable for the purpose intended in accordance with these specifications. This shall include a written wind load and thermal stress analysis showing a probability of failure of no greater than 8 lites per thousand for conventional glazing and 4 lites per thousand for structural silicone glazing at the design loads and local climatic thermal conditions.

I. Glass producer/fabricator shall make regular inspections (maximum interval semi-monthly) of glazing work in progress at the point of glazing for both mock-up and job production units to verify that glazing is proceeding in accordance with his recommendations. Glass producer/fabricator shall attend the mock-up test at no additional cost to the Owner.

J. Insulating glass units shall be installed in such manner as to adequately drain the glazing rabbet in a manner, as approved in writing, by the insulating unit glass manufacturer.

K. Contractor shall include in his design provision for reglazing vision lites with access from the interior except for structurally glazed lites which shall be reglazed from the exterior and spandrel lites with access from the exterior only. Mock-up shall include lites shop glazed in the initial installation as well as field glazed in the replacement mode.

L. Glass deflection at full design load shall be limited to the lesser of L/100 or 0.50". In event specified glass cannot meet these requirements, Contractor shall submit calculations establishing anticipated deflections and reduction in glass bite as a consequence of deflections, along with his drawings. Submittal shall include a statement from glass manufacturer/fabricator that reduction in glass bite will not result in a reduction in load resistance capacity, an increase in breakage probability and that all specified warranties shall remain in effect.

M. Glass Types (subject to meeting all criteria herein above):

1. Vision Glass: Refer to Section 088000 Glass and Glazing.

2.5 GASKETS/WEATHERSTRIPPING

A. All gaskets and weather stripping shall be neoprene, except where used in contact with a silicone sealant. In contact with silicone sealants, gaskets and spacers shall be preformed, heat-cured, silicone rubber, chemically compatible with the silicone sealant and suitable for the specific purpose intended or equal, as recommended by the sealant manufacturer and approved by the Architect. All gaskets, weather stripping, and spacers shall have continuous mechanical engagement to framing members; adhesive attachment is not acceptable. All weather strips and gaskets shall be continuous with vulcanized/molded corners where possible.

B. Sponge gaskets/weatherstripping/spacers shall be extruded black neoprene or silicone rubber (or equal as provided for in 2.4 A) with a hardness of 40 + 5 durometer Shore A and conform to ASTM C 509-79 (for neoprene). Sponge gaskets shall be compressed 20% to 35% in the final installed position.

C. Dense gaskets/weatherstripping shall be extruded black neoprene conforming to NAAMM SG-1-70 or silicone rubber (or equal as provided for in 2.04 A) with a hardness of 75 + 5 durometer Shore A for hollow profiles and 60 + 5 for solid profiles.

2.6 SEALANTS (NON-STRUCTURAL)

A. All joints, which are sealed with sealant as part of the fabrication or erection procedure, shall be sealed with an approved butyl (concealed) or low modulus silicone (exposed or concealed) sealant in color to

match the adjoining surfaces or as may be required by the Architect. All perimeter sealant (metal to adjacent construction) shall be low or medium modulus silicone sealant. Silicone sealant shall be as manufactured by General Electric, Dow Corning, or Pecora. Butyl sealant shall be PTI 707.

B. In using specified sealants, strictly observe the printed instructions of sealant manufacturer regarding joint size, limitations, backer rod, mixing, cleaning, surface preparation, priming and application. A primer shall be used, unless printed instructions advise to the contrary, and sealant manufacturer certifies that the use thereof will reduce its performance. Sealant shall not be applied when substrates are wet or when the temperature is below 40 deg. F.

C. Care shall be exercised to insure against "Three Surface Adhesion." Bond breakers shall be provided where necessary.

D. Contractor shall provide certification from sealant manufacturer that the sealant manufacturer has reviewed all sealant details and finds same suitable for the purpose intended, compatible with and will not stain the surfaces with which they are in contact. Statement as to compatibility, adhesion sufficiency and non-staining shall be accompanied by actual test results on production substrates performed in accordance with applicable ASTM procedures.

2.7 SEALANTS (STRUCTURAL)

A. All components which are adhered with a structural silicone sealant/adhesive as part of the fabrication, glazing or erection procedure, shall be sealed/adhered with an approved structural silicone, as manufactured by General Electric, Dow Corning or Pecora and approved by the Architect. All glazing with structural silicone sealant/adhesive shall be accomplished in a shop wherever consistent with the design.

B. In using specified sealants, strictly observe the printed instructions of sealant manufacturer regarding joint size, limitations, backer rod, mixing, cleaning, surface preparation, priming and application. A primer shall be used, unless printed instructions advise to the contrary. Sealant shall not be applied when substrates are wet or when the temperature is below 40 deg. F. Units shall not be moved until structural silicone seal has achieved full cure.

C. Care shall be exercised to insure against "Three Surface Adhesion." Bond breakers shall be provided where necessary.

D. Contractor shall provide certification from sealant manufacturer that the sealant manufacturer has reviewed all sealant details and tested all contact surfaces, and finds same suitable for use with proposed sealant, the purpose intended and compatible with the surfaces with which they are in contact. Sealant manufacturer's certification shall include the following based upon tests performed on production run materials:

1. Test data of adhesion to production samples of metal and glass, tested in accordance with ASTM C 794.

2. Compatibility statement that the materials in contact with the sealant such as gaskets, spacers, setting blocks, are compatible with the sealant after 21 days exposure to ultra violet, 2000 - 4000 (micro watt UV radiation).

3. Stress statement that when exposed to the specified wind load the stress in the silicone sealant of dimensions shown does not exceed 20 psi with a safety factor of 6:1.

E. Where silicone bonds to a metal or glass surface, the weakest element in the line of stress must have a minimum strength of 120 psi. For each combination of substrates submit report from an independent laboratory for tests performed in the following manner:

1. Assemble and fully cure a minimum of 6 samples using actual substrates and a minimum sample length of 5".

2. Subject sample to a tensile load such that nominal stress on silicone is 20 psi, hold for one minute and remove load. Repeat for additional loadings, increasing nominal silicone stress by 20 psi with each successive loading. Continue until failure occurs or until 200 psi is successfully applied.

3. All 6 samples must successfully withstand at least 120 psi. Report maximum stress and mode of failure. If one or more samples do not meet this criterion, revise failed element and repeat tests with 6 new samples. Repeat until all 6 samples are successfully tested.

4. Testing shall be performed in such a manner as to establish stress and safety factor over the temperature range described herein.

5. Prepare an outline for a quality assurance program for evaluation of adhesion and other physical attributes of sealants and submit to Architect for review and approval.

6. Program shall cover both initial testing of components for sealant adhesion/compatibility, etc., and also random testing of production run materials, etc. Include testing at full negative design pressure, one unit per one hundred units manufactured for the project. Also include methods which will be employed to monitor sealant application to insure full sealant contact. No sealant work shall be performed prior to approval of program.

2.8 GLAZING BLOCKS

A. Provide setting blocks at the sill quarter points of all glass lites. Setting blocks shall be black dense neoprene or heat cured silicone rubber with a hardness of 80 to 90 durometer, Shore A, a minimum length of 4", and a minimum width, which will permit full support of both panes of glass in an insulating glass unit or a monolithic unit no matter how positioned within the glazing rabbet.

B. Shims used in conjunction with setting blocks must be of the same materials, hardness, length and width as the setting blocks.

C. Provide side blocks within the upper half of both jambs of all glass lites. Side blocks shall be black dense neoprene or heat cured silicone rubber with a 60 to 70 durometer, Shore A, or as recommended by the selected glass manufacturer. Provide 1/8" clearance between block and bearing surface.

2.9 MISCELLANEOUS MATERIALS

A. Provide straps, plates and brackets, built-in inserts, as required for support and anchorage of the fabricated items to adjacent surfaces.

B. Where steel reinforcement of units is required for strength or other unavoidable necessity and concealed within (encased) in aluminum sections or employed in potentially wetted areas, hot dip galvanize the pieces after fabrication with 2.0 ounce zinc coating, complying with ASTM A 123. All other steel reinforcement shall be coated with two (2) heavy coats of zinc rich primer in differing colors.

C. Slip Joint Linings/Sleeves: Provide stainless steel sleeve spacers and/or suitable bearing pads, as required, to insure free movement between surfaces where expansion and deflection movements are

intended. Provide "Eel Slip," "Nylatron" or high impact polystyrene shims or pads or equivalent plastic units of sizes and thicknesses (minimum 1/16" except 1/8" for "Eel Slip") recommended by the manufacturer to permanently prevent "freeze up" of joints. All sleeves, spacers, bracing pads and shims must be incombustible and rated by UL.

D. Flashing required within the system shall be 26 ga. stainless steel.

E. Flashing required to join the system to adjacent construction shall be 26 ga. stainless steel.

F. Insulated Aluminum Panels: Provide insulated aluminum faced Mapes-R panels of 1" thickness, with R Value of 40 as manufactured by Mapes Architectural Products or approved equal by the Architect. Panel shall be flat, with no deviation in any direction exceeding 1/16" in 2'-0", or 1/8" for the entire panel.

1. Face Sheets: Not less than 0.0249" thick and finished to match curtain wall faming.

2. Concealed Back Sheets: Aluminum or galvanized steel.

3. Stabilizer Sheets: 1/8" thick tempered hardboard.

4. Core Material: rigid mineral wool.

5. Edge Condition: Prepared for glazing into framing and either sealed or vented to the exterior only.

2.10 INSULATION AND FIRESAFING

A. Provide thermal and fire separation insulation where shown and where required. Use U.S. Gypsum Thermafiber CW 90 curtain wall insulation or approved equal with a minimum thickness of 4" (or thicker if required to meet specified thermal performance) and the foil vapor barrier (permeability not to exceed 0.020 Perms) at interior surface and all edges. Provide insulation and "fire wrap" at mullions and/or stiffeners as required to meet overall thermal and condensation resistance requirements and as required by Code.

B. Tape and seal all joints in vapor barrier and along edges and supports to insure continuous vapor barrier.

C. Apply insulation utilizing welded or screw applied impaling pins and retaining clips. Adhesive attachment will not be accepted.

D. Provide 5" thick (minimum) compacted four (4) PCF USG Thermafiber safing insulation at full perimeter at each floor level between floor edge and curtain wall to meet requirements of Building Code. Provide hourly rating as required by Code. Seal all edges with an approved fire resistant sealant to provide a continuous fire/smoke barrier.

E. Insulation and firesafing shall be suitably isolated/separated from direct contact with spandrel glass.

2.11 THERMAL BREAK

A. Provide high performance thermal break or thermally improved construction, complying with the requirements of these Specifications and which have been in service on comparable installations for no less than ten (10) years. Submit data to prove structural sufficiency over full exterior thermal range specified, and anticipated wind loading. In the event a structural thermal break is employed, manufacturer shall establish structural properties over full thermal range.

2.12 FABRICATION

A. General: Fabricate glazed aluminum curtain wall system according to Shop Drawings. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

C. Prepare components to receive concealed fasteners and anchor and connection devices.

D. Fabricate components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

E. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld before finishing components. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual."

G. Glazing Pockets: Provide minimum clearances for thickness and type of plastic sheet indicated according to plastic sheet manufacturer's recommendations.

H. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

I. Frame Units: Factory assemble frame units according to Shop Drawings to greatest extent possible. Rigidly secure non-movement joints. Seal joints watertight, unless otherwise indicated. Assemble components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

1. Install glazing according to approved Shop Drawings.

J. All machining, cutting and welding shall be done before finish is applied.

2.13 ALUMINUM FINISH

A. Superior-Performance Organic FEVE Fluoropolymer Powder Finish: Single-coat Fluoropolymer Powder finish complying with AAMA 2605 and containing 100 percent fluorinated ethylene vinyl ether (FEVE) resin. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Custom color and gloss as selected by the Architect; refer to paint colors as indicated on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of glazed aluminum curtain wall system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall system. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight, unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

D. Install framing members plumb and true in alignment with established lines and grades.

E. Install factory-assembled frame units plumb and true in alignment with established lines and grades.

F. Install column covers plumb and true in alignment with established lines and grades.

G. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings.

1. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

H. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

I. Install glazing according to approved Shop Drawings.

J. Install sealant according to approved Shop Drawings. Comply with requirements of Section 079200, "Joint Sealants."

K. Install firesafing in locations indicated. Comply with requirements of Section 078413, "Firestops and Smokeseals."

L. Erection Tolerances: Install glazed aluminum curtain wall system to comply with the following maximum tolerances:

1. Plumb: 1/16" in 10 feet; 1/8" in 40 feet.

2. Level: 1/16" in 20 feet; 1/8" in 40 feet.

3. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16"; where a reveal or protruding element separates aligned surfaces by less than 2", limit offset to 1/4".

4. Location: Limit variation from plane or location shown on Shop Drawings to 1/8" in 12 feet; 1/4" over total length.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing agency to perform testing indicated.

B. Static air infiltration test(s) as well as the static pressure water test(s) shall be performed on the greatest surface area prescribed by code to determine if curtain wall meets performance requirements specified herein under Article 1.4.

C. Test for water infiltration per AAMA 501.2. Test within the first 10% of work complete, area to be a minimum of 100 SF of wall and including a perimeter where CW adjoins masonry construction. Interior finishes must not interfere with observation of test area or be removed from test area.

1. This test (AAMA 501.2) shall be performed infield on new construction.

D. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure glazed aluminum curtain wall system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 087100

FINISH HARDWARE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

B. The required hardware items for doors are indicated in hardware sets shown herein. Should any opening be omitted, the contractor shall contact the Architect for the correct hardware.

1.2 RELATED WORK

A. Installation of finish hardware – Section 062000

B. Steel doors and frames – Section 081113

C. Wood doors – Section 081416

D. Painting & Finishing – Section 099000

1.3 SUBMITTALS

A. General: Submit the following in accordance with the provisions of the general contract documents.

B. Hardware Schedule: Submit three (3) copies of the hardware schedule. Follow Door and Hardware Institute (DHI) guide lines for scheduling. At the beginning of the schedule furnish an index, which list each door number with appropriate heading number and hardware set number. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other work. Furnish final schedule after samples, manufacturer's data sheets have been approved. HORIZONTAL SCHEDULES WILL NOT BE ACCEPTED.

C. Product Data: Submit three (3) copies of the manufacturer's data for each item of hardware. Include whatever information may be necessary to show compliance with requirements. Submission shall clearly identify item submitted. Facsimile documents or copies of facsimile documents will not be accepted.

D. Keying Schedule: A key schedule showing all key numbers and spaces to which each permits entry, shall be provided. Consult with OWNER and provide necessary assistance required for development of the schedule before submitting final key schedule. After final approval has been received, the schedule along with the key gathering envelopes containing keys for each lock endorsed with lock number and space designation shall be turned over to the OWNERS.

E. Samples: Prior to submittal of the final hardware schedule and prior to delivery of hardware, submit one (1) sample of each exposed hardware unit. Sample will be reviewed by the ARCHITECT for design, color and texture only. Compliance with other requirements is the exclusive responsibility of the CONTRACTOR. Samples approved by the ARCHITECT shall be turned over to the OWNER for attic stock.

F. Wiring Diagrams: Supplier shall furnish riser diagrams, wiring diagrams and point to point diagrams for all electrical hardware specified herein. These diagrams shall be included with the initial draft of the hardware schedule.

1.4 QUALITY ASSURANCE

A. Standards: All finish hardware shall conform to all of the following standards:

1. Testing Laboratories: Underwriters Laboratory (UL) and or Warnock Hersey Fire Laboratories Division: All fire rated doors shall have hardware assemblies approved by one of the listed laboratories. Panic hardware UL Listed only.

2. National Fire Protection Association: NFPA 80 and NFPA 101.

3. Builders Hardware Manufacturers Association (BHMA).

4. American National Standards Institute (ANSI).

5. American Disabilities Act (ADA).

C. Supplier: Finish hardware shall be furnished by those having a minimum of 5 years of builders hardware experience and shall have in their employ at least one AHC to interpret plans, detailed drawings and specifications.

1.5 PRODUCT HANDLING

A. Handle, store, distribute, protect and install in accordance with the manufacturers instructions. Deliver packaged material in original containers with seals unbroken and labels intact. Deliver assemblies completely identified and with adequate protection for storage, handling and installation.

B. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control the handling and installation of hardware which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses; both before and after installation.

1.6 PROJECT CONDITIONS

A. Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated and as necessary for proper installation and function. Deliver packaged hardware items to the proper locations for installation.

B. Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware.

1.7 WARRANTIES

A. The hardware manufacturers shall provide full replacement warranty as listed below. Replacement warranty shall not include any labor cost.

1.	Surface Closers	25 years.
2.	Locksets etc.	10 years
3.	Exit Devices	3 years
4.	Balance of hardware	1 year

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Hand of Door: The drawings show the swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door swing shown. Approval of the door and door hardware schedule does not relieve the contractor of the responsibility of providing the correctly handed door.

B. Base Metals: Produce hardware units of the basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness but in no case of lesser quality material.

C. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware, which has been prepared for self-tapping sheet metal screws.

D. Screws: Furnish screws for installation, with each hardware item. Finish exposed screws to match the hardware finish.

E. Tools for Maintenance: Furnish a complete set of specialized tools as needed, for the OWNERS continued maintenance, removal and replacement of hardware.

F. Concealed Fasteners: Provide concealed fasteners for hardware units which are exposed when the door is closed except to the extent no standard manufacturer's units are available with concealed fasteners. Use thru bolts only where necessary to adequately fasten hardware to the door.

2.2 HINGES

A. All hinges shall be full mortise five knuckle ball bearing type, template, with non-rising loose pins. All outswing doors shall have non-removable pins (NRP).

B. All hinges for 1-3/4" thick doors shall be 4-1/2" wide in the open position. For other thickness doors, and trim projections, hinges shall be of a width to permit unobstructed swing of the doors.

C. Size and weight of hinges shall conform to the following:

Up to 36" ----------4-1/2" Standard Weight
Over 36" to 43" ----------5" Heavy Weight
Over 43” ---------- Continuous Hinge PBB CG31

D. Quantity of hinges shall be provided to conform to the following:

Doors up to 60" in height ----------2 hinges
Doors 60" to 90" in height ----------3 hinges
Doors 90" and over ---------I hinge every 30" in height

E. All hinges shall be the products of one manufacturer.

2.3 LOCKSETS, LATCHSETS ETC.

A. Unless otherwise noted, all locksets and latchsets shall be heavy duty mortise type, and shall have the following features:

1. Curved lip strikes with proper lip lengths as required.
2. Wrought steel box strike.
3. Auxiliary deadlatching.

2.4 KEYS, KEYING AND CYLINDERS

A. Keys: All keys shall be nickel silver. Furnish a quantity of keys as follows.

1.	Master Keys	6 each per group
2.	Change Keys	3 each per cylinder
3.	Control Keys	3
4.	Construction Keys	3

B. Keying: All locks shall be construction keyed and great grand master keyed to the existing 6 pin Corbin Russwin grand master key system. The hardware supplier shall meet with the Owner to establish the keying requirements. All master keys shall be hand delivered to the Owner by the manufacturer or his representative.

C. Cylinders: All cylinders shall be furnished with visual key control.

2.5 DOOR CLOSING DEVICES

A. All door closers shall meet ANSI A156.4 Grade 1 requirements. All closers shall be barrier free. Furnish all required brackets, filler plates and any others items required to insure proper installation and operation.

B. All closers shall be installed so that closer bodies are positioned on room side of doors to and from corridors, i.e., in-swing doors shall be regular arm. Out-swing doors shall have a parallel arm. Regular arm shall be used in connecting doors between rooms.

PART 3 - EXECUTION

3.1 GENERAL

A. Approval: As soon as practical after award of Contract and before a hardware schedule is prepared, and before any hardware is ordered or delivered to the project, the CONTRACTOR shall submit to the ARCHITECT for his written approval, copies of sample list, listing each of the different items of builders hardware and catalog cuts of each item.

B. Templates: As soon as the hardware schedule is approved the hardware supplier shall furnish to the various fabricators, required templates for fabrication purposes. Templates shall be made available not more than (10) days after receipt of the approved hardware schedule.

C. Packaging and Marking: All hardware shall be shipped with proper fastenings for secure application. Each package of hardware shall be legibly marked indicating the part of the work for which it is intended. Markings shall correspond with the item numbers shown on the approved hardware schedule. Keys shall be

tagged within each package set and plainly marked on the face of the envelope with the key control number, door designation and all identification as necessary.

D. Delivery: Delivery shall be made to the project site to the attention of the GENERAL CONTRACTOR. Where delivery of special hardware is required at any fabricator's plant, the hardware supplier shall make such delivery.

3.2 INSTALLATION

A. Mount hardware units at heights noted in design drawings. Otherwise mount heights as recommended in "Recommended Locations for Builders Hardware" by BHMA.

B. Install each hardware unit in compliance with the manufacturer's recommendations.

3.3 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer. Replace units that cannot be adjusted.

B. Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance make a final check, and adjust all hardware items in such space or area. Adjust door control devices and compensate for final operation of heating and ventilating equipment.

C. Instruct OWNERS personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.4 HARDWARE SETS

A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards or practices, or to meet state and local codes or proper door operation shall be furnished whether or not specifically called out in the following listed groups.

B. Products shall be furnished as specified. Substitutions will not be permitted.

HARDWARE SET #1
Each to have:

2	Floor Closers	Dorma BTS80 series x US26D
2	Exit Devices	CRL-Blumcraft PA100F x US15
2	Master Keyed Cylinders	Corbin (to suit) x US15
2	Temporary Core	Corbin (to suit)
2	Permanent Core	Corbin (to match building standard) x 626
2	Floor Stops	Burns 524 x US15

HARDWARE SET # 2
Each to have:

2	Floor Closers	Dorma BTS80 series x US26D
2	Dummy Push & Pull	CRL-Blumcraft DH100F x US15

2	Floor Stops	Burns 524 x US15

HARDWARE SET #3
Each to have:

5	Concealed Hinges	Soss 418 x US26D
1	Dead Lock	Corbin 4017 x US15
1	Temporary Core	Corbin (to suit)
1	Permanent Core	Corbin (to match building standard) x 626
1	Edge Pull	Burns 613 x 630
1	Set Seals	(by Fry Reglet)

HARDWARE SET #4
Each to have:

	Hinges	Stanley (see description) x US15
1	Storeroom Lock	Corbin ML2057 x 114X US15
1	Temporary Core	Corbin (to suit)
1	Permanent Core	Corbin (to match building standard) x US26D
1	Surface Closer	LCN 4040XP-Cush x 689
1	Set Smoke seals	NGP 5050C @ jambs & head

HARDWARE SET #5
Each to have:

	Hinges	Stanley (see description) x US15
2	Exit Devices	Von Duprin 5547EO-F x US15
1	Master Keyed Cylinder	Corbin (to suit) x 626
1	Temporary Core	Corbin (to suit)
1	Permanent Core	Corbin (to match building standard) x 626
1	Set Smoke seals	NGP 5050C @ jambs & head
1	Set Astragal Seals	NGP 172NA

HARDWARE SET #5A
Each to have:

	Hinges	Stanley (see description) x US15
2	Exit Devices	Von Duprin 5547L x 12 x US15
2	Master Keyed Cylinder	Corbin (to suit) x 626
2	Temporary Core	Corbin (to suit)
2	Permanent Core	Corbin (to match building standard) x 626
1	Set Smoke seals	NGP 5050C @ jambs & head
1	Set Astragal Seals	NGP 172NA

END OF SECTION

SECTION 088000

GLASS AND GLAZING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the glass and glazing as shown on the drawings and/or specified herein, including but not limited to glazing of the following:

1. Doors.

2. Laminated safety glazing at Custom Steel Framed Interior Storefronts.

3. Glazed Aluminum Curtainwalls.

1.3 RELATED SECTIONS

A. Hollow metal doors and frames - Section 081113.

B. Custom Steel Framed Interior Storefronts – Section 084323.13.

C. Glazed curtain walls - Section 084413.

1.4 REFERENCES

A. Comply with the recommendations of the following references unless more stringent requirements are indicated herein.

1. IGMA Publications: IGMA Glazing Manual.

2. AAMA Publications: AAMA TIR-A7 Sloped Glazing Guidelines and Glass Design for Sloped Glazing.

3. LSGA Publications: LSGA Design Guide.

4. SIGMA Publications: TM-3000 Vertical Glazing Guidelines and TB-3001 Sloped Glazing Guidelines.

5. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201.

6. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E l52, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

7. Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested per ASTM E 163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

8. 16 CFR 1201, Safety Standards for Architectural Glazing, Sealed Insulating Glass Manufacturing Association.

9. ASTM C 920, Elastomeric Joint Sealant.

10. SAFETY ANSI Z97.1.

11. Fire Resistant ASTM E 152.

12. Insulating Glass Criteria - IGCC International Glass Cert. Council.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated on drawings and/or specified herein are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

   a. Specified Design Wind Loads: 140 PSF or greater if required by Code per ASCE-7.

2. Probability of Breakage for Vertical Glazing:

   a. 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
   b. 1 lite per 1000 for lites installed 15 degrees from the vertical land and under wind action.
   c. Load Duration: 60 seconds or less.

3. Maximum Lateral Deflection: For glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/100 times the short side length or 0.50", whichever is less.

4. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   a. Temperature Change (Range): 120 deg. F ambient; 180 deg F, material surfaces.

5. Thermal Solar Performance: See Article 2.2 herein.

C. Glass units shall be annealed, heat strengthened, fully tempered or laminated where required to meet wind and/or snow loads and safety glazing requirements, as shown, specified or recommended by the glass fabricator and as required by the prevailing Building Code.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, glazing instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements, including performance requirements.

B. Submit compatibility and adhesion test reports from sealant manufacturer indicating materials were tested for compatibility and adhesion with glazing sealant, as well as other glazing materials including insulation units.

C. Initial Selection Samples: Submit samples of each glass and glazing material showing complete range of colors, textures, and finishes available for each material used.

1. Submit complete range of samples of standard clear insulating glass.

D. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials; all samples shall bear the name of the manufacturer, brand name, thickness, and quality.

E. Calculations: Provide wind load charts, calculations, thermal stress analysis, and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied. Document shall be signed and sealed by a Professional Engineer licensed in the State of New York.

F. Test Reports: Provide certified reports for specified tests.

G. Warranties: Provide written warranties as specified herein.

1.7 QUALITY ASSURANCE

A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of five years experience in type of work required by this Section and which is acceptable to manufacturers of primary materials; and with a successful record of in-service installations similar in size and scope to this Project.

C. Glass Thickness: Glass thicknesses shown on drawings and/or specified herein are minimum thicknesses. Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated.

1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."

2. IGMA Publications: IGMA TM-3000, "Vertical Glazing Guidelines for Sealed Insulating Glass Units."

E. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

F. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

G. Windborne-Debris-Impact-Resistance Performance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone in which Project is located.

1. Large-Missile Test: For glazed openings located within 30 feet of grade.

2. Small-Missile Test: For glazed openings located more than 30 feet above grade.

H. Heat Strengthened, Tempered and Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Heat Strengthened, Tempered and Safety Glazing Labeling: Where heat strengthened, tempered and safety glazing are 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.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

I. Insulating Glass Certification Program: Permanently marked on spacers with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

2. Associated Laboratories, Inc.

3. Insulating Glass Manufacturers Alliance.

J. Manufacturer shall be ISO 9001-2000 Certified.

K. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies

1.8 TESTS

A. Preconstruction Sealant Test: Submit samples of materials to be used to glazing sealant manufacturer to determine sealant compatibility. Include samples of glass, gaskets, glazing materials, framing

members, and other components and accessories of glazing work. Test in accordance with ASTM C 794 to verify what type of primers (if any) are required to ensure sealant adhesion to substrates.

1. Submit minimum of nine pieces of each type and finish of framing member, and nine pieces of each type, class, kind, condition, and form of glass, including monolithic, laminated, and insulating glass for adhesion tests.

2. Provide manufacturer's written report and recommendations regarding proper installation.

1.9 PROJECT CONDITIONS

A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within limits established by manufacturers of materials and products used.

B. Temperature Limits: Install sealants only when temperatures are within limits recommended by sealant manufacturer, except, never install sealants when temperatures are below 40 deg. F.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and GANA Manual.

1. Protect materials from moisture, sunlight, excess heat, sparks and flame.

2. Sequence deliveries to avoid delays, but minimize on-site storage.

1.11 WARRANTIES

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Manufacturer's Special Project Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, within specified warranty period indicated below, replacements for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking or deterioration in metallic coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than five (5) years after date of substantial completion.

C. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure of the hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

1. Warranty Period: Manufacturer's standard but not less than ten (10) years after date of substantial completion.

D. Manufacturer's Special Project Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated glass manufacturer agreeing to replace laminated glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty period ten (10) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/FABRICATORS

A. All glass and glazing used at the exterior of the Project shall be manufactured by the same manufacturer. The same manufacturer and the same furnace shall be used for all tempered and heat strengthened glass used throughout the project. Acceptable manufacturers include the following:

1. Vitro Architectural Glass (Basis of Design)

2. Guardian Industries.

3. Pilkington.

4. AGC.

5. Viracon.

2.2 GLASS MATERIALS AND PRODUCTS

A. Clear Float Glass: ASTM C 1036, Type I (Transparent, Flat), Class 1 (Clear), Quality q3, minimum 1/4" thick.

B. Clear Tempered Glass: ASTM C 1048, Condition A (Uncoated), Type I (Transparent, Flat), Class 1 (Clear), Quality q3, Kind FT, minimum 1/4" thick. Tempered glass must be certified by SGCC to meet applicable standards. Tempered glass shall also conform to the following:

1. Length and Width: For 2.9 mm to 6.0 mm; +/-1.6 mm.

2. Diagonal: +/- 3.0 mm.

3. Edgework: Belt seaming or diamond wheels. 1.5 mm seam of upper and lower glass edges. No sharp edges.

4. Corners: No more than 3.0 mm from square.

5. Float Glass Defects: Must meet the requirements of ASTM C 1036. The most common defects are scratches, stones gaseous bubbles and edge chips. Tables in the glass standards have limits for size/quantity of defects.

6. Tempered glass shall have a minimum surface compression of 10,000 psi.

7. Tempered glass to be heat-treated by horizontal (roller hearth) process with inherent roller-wave distortion parallel to the bottom edge of the glass when installed.

8. Flatness Tolerances

a. Roller-Wave or Ripple: The deviation from flatness at any peak shall be targeted not exceed 0.003” as measured per peak to valley for 1/4” (6mm) thick glass.
b. Bow and Warp: The bow and warp tolerances shall not exceed 1/32” per linear foot.
c. Fully tempered glass shall be heat soaked to EN 14179-1:2005-European Heat Soaking Standard.

C. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer, conform to ASTM C 1172, and as follows:

1. Interlayer Color: Clear.

2. Interlayer Material: Provide Sentry Glass Plus by Dupont, Kuraray America, 0.030" thick at vertical applications, and 0.060" thick at sloped or horizontal applications. Use ionoplast-type (SGP) interlayer where laminated Glass edges will be exposed to direct wetting or relative humidity (RH) conditions greater than 60%.

3. Minimum thickness of 3/4".

4. Laminated glass shall be manufactured to filter out a minimum of 99.9% of all ultra-violet (UV) radiation.

D. Low 'E' Coated Glass: Provide high-performance, clear, metallic coating, equal to Solarban 60, as manufactured by Vitro Architectural Glass. Provide Low 'E' coating which has the following performance characteristics when applied to the No. 2 surface of 1" insulating units, both lites 1/4" clear:

1. Visible Transmittance: 70%.

2. Visible Reflectance 11%

3. Winter U-value 0.24

4. Solar Heat Gain Coefficient (SHGC) 0.39

E. Insulating Glass: Insulated glass composition shall consist of 1/4" clear exterior lite of tempered glass with Low E coating on No. 2 face, 1/2" air space and 5/16” Laminated clear interior lite with clear PVB interlayer filtering 99.9% of UV. glass. Provide factory assembled units of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space, complying with ASTM E 2190, and as follows:

1. Sealing System: Dual Seal.

2. Primary Sealant: Polyisobutylene.

3. Secondary Sealant: Silicone, General Electric IGS 3204 or IGS 3100, or Dow Corning 982.

a. For structurally glazed IG units, secondary seal shall conform to ASTM C 1249.

4. Primary and secondary seals shall not contain voids and must be continuously bonded to the glass structure.

5. Spacer: 1/2" Blackened stainless steel with welded, soldered, or bent corners, hollow tube types, filled with low nitrogen absorption desiccant.

6. Desiccant: Molecular sieve, silica gel, or blend of both.

7. Air Space Thickness: 1/2" Argon Gas.

8. Glass Thickness: 1/4" minimum.

9. Units shall be certified for compliance with seal classification "CBA" by the Insulating Glass Certification Council (IGCC) or by IGMA, and tested in accordance with the above ASTM Test Methods.

10. Insulating glass shall conform to the following tolerances:

    a. Length and Width: + 3.0 mm/ -2.0 mm.
    b. Diagonal: +/- 3.0 mm.
    c. Thickness: As agreed +/- 1.0 mm.
    d. Edge-Deletion of Coating: Minimum 8 mm wide. Width of deletion must be more than the width of the secondary seal. Silver layer(s) must be completely removed. Appearance must be uniform.
    e. Primary PIB Seal: Must be complete with no breaks. Appearance must be uniform. PIB bead must overlap coating. No visible bright line when glass is viewed in transmission. The width of the PIB bead shall be 4.0 mm + 3.0/ - 1.5 mm.
    f. Secondary Seal: Nominal 6 mm + 3.0/ - 1.5 mm. The minimum width of the secondary silicone seal for IG units that are glazed structurally must be determined according to ASTM C 1249. The secondary seal must be uniformly applied without bubbles, cavities or gaps. Avoid excess sealant that will need to be trimmed off later.

11. Additional requirements and properties for primary and secondary insulating glass seals and spacers:

    a. All glass units shall comply with IGMA Guidelines which limits the dimension of the visible edge seal encroachment into the vision area to be no greater than the “sightline infringement of 3mm (0.12”).
    b. Insulating glass unit hermetic seal to consist of butyl primary and silicone secondary seals with bent, welded, or soldered interpane spacer corners; keyed corners are not acceptable unless also soldered or welded. Spacers shall be aluminum or stainless steel. Locate spacer joint at the top or sides of the units, but in no instances at the sill. Design units to minimize the number of spacer joints. Provide solid keys, embedded in butyl sealant on all four sides, at spacer joints.
    c. Hermetic seals must be continuous and intimately bonded to both lites of glass. Provide primary seal of uniform depth with a nominal width of 1/8 to 3/16 in. Hermetic seals shall not be contaminated with debris, fingerprints, or other foreign matter and shall not contain voids or air pockets that decrease the width of the seal below the minimum widths listed in these Specifications, or that breach the seal. The width of the primary seal shall not be less than 1/16 in., and the total cumulative length of the primary seal between 1/16 in. and 1/8 in. shall be less than 12 in. in any one insulating glass unit. The primary seal shall not have a reduced thickness at the corners. An increased thickness of the primary seal at the corners is acceptable.
    d. Provide secondary seal of uniform depth with a nominal width of 1/4 in. Provide a total width of the primary and secondary seal of 1/2 in. Units shall meet SIGMA 65-7-2, latest edition. Units shall not contain breather or capillary tubes or similar penetrations.

F. Fire-Rated Glazing Material: Proprietary product in the form of clear flat sheets of 5/16" nominal thickness weighting 2.5 lb./sq. ft., and as follows:

1. Fire Protection Rating: As required by Code for the fire rated opening in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

2. Product: "FireLite Plus" by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.

2.3 GLAZING MATERIALS AND PRODUCTS

A. General: Provide sealants and gaskets with performance characteristics suitable for applications indicated. Ensure compatibility of glazing sealants with insulating glass sealants, with laminated glass interlayers, and with any other surfaces in contact.

B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A hardness of 50. Provide one of the following:

1. Dow Corning 795.

2. General Electric Silglaze N 2500 or Contractors SCS-1000.

3. Tremco Spectrem 2.

C. Weather Seal Sealant: Provide non-acid curing sealant with movement range ± 50%, ASTM C 719. Provide one of the following:

1. Dow Corning 795.

2. General Electric Silpruf.

3. Tremco Spectrem 2.

D. Backer Rod: Closed cell non-gassing polyethylene rod with rod diameter 25% wider than joint width.

E. Dense Elastomeric Compression Seal Gaskets: Provide molded or extruded neoprene or EPDM gaskets, Shore A hardness of 75±5 for hollow profile, and 60±5 for solid profiles, ASTM C 864.

F. Cellular, Elastomeric Preformed Gaskets: Provide extruded or molded closed cell, integral-skinned neoprene, Shore A 40±5, and 20% to 35% compression, ASTM C 509; Type II.

G. Preformed Glazing Tape: Provide solvent-free butyl-polyisobutylene rubber with 100% solids content complying with ASTM C1281 AAMA A 800 with integral continuous EPDM shim. Provide preformed glazing tape in extruded tape form. Provide Tremco "Polyshim II" or approved equal.

H. Setting Blocks: Provide 100% or silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants. Length to be not less than 4". Width for setting blocks to be 1/16" more than glass thickness and high enough to provide the lite recommended by glass manufacturer. When thickness of setting block exceeds 3/4" the glass manufacturer must be consulted for sizes and configuration. In a vented system, setting block shall be designed so as to not restrict the flow of water within the glazing rabbet to the weep holes.

1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.

2. Structural Silicone Glazing: Provide silicone setting blocks where structural silicone occurs at sills and at insulating units with silicone edge seals.

I. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55±5.

J. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.

K. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.

L. Mirror Adhesive: Palmer's "Mirro-Mastic", or approved equal; mastic must be compatible with mirror backing.

1. Clips: No. 4 finish Type 304 stainless steel.

2.4 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in field verified sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

C. Grind smooth and polish exposed glass edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine framing and glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Presence and functioning of weep system.

3. Minimum required face or edge clearances.

4. Effective sealing between joints of glass-framing members.

5. Compliance with these specifications.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GENERAL GLAZING STANDARDS

A. Install products using the recommendations from the manufacturer of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in the "GANA Glazing Manual".

B. Verify that Insulating Glass (IG) Unit secondary seal is compatible with glazing sealants.

C. Install glass in prepared glazing channels and other framing members.

D. Install setting blocks in rabbets as recommended by referenced glazing standards in GANA Glazing Manual" and "IGMA Glazing Guidelines".

E. Provide bite on glass, minimum edge and face clearances and glazing material tolerances recommended by "GANA Glazing Manual".

F. Provide weep system as recommended by "GANA Glazing Manual".

G. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

H. Distribute the weight of glass unit along the edge rather than the corner.

I. Comply with manufacturers and referenced industry standards on expansion joint and anchors; accommodating thermal movement; glass openings; use of setting blocks, edge, face, and bite clearances; use of glass spacers; edge blocks and installation of weep systems.

J. Protect glass edge damage during handling and installation.

K. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing or plaster.

L. Remove and replace glass that is broken, chipped cracked or damaged in any way.

3.4 GLAZING

A. Glazing channel dimensions, as indicated on Shop Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead. Install setting blocks at the one greater points of each lite along the horizontal mullion.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

K. Flush Glazing

1. If the butt joint in the metal framing is in the vertical direction, the glazier shall run the tape initially on the head and sill members going directly over this joint. Should the butt joint in the metal framing run horizontally, tapes must first be applied to the jambs so that it crosses over the joint.

2. Each tape section shall butt the adjoining tape and be united with a tool to eliminate any opening.

3. Do not overlap the adjoining length of tape or rubber shim as this will prevent full contact around the perimeter of glass.

L. Off-Set Glazing

1. Where the glazing legs are off-set, the difference in the rabbet width shall be compensated by employing different glazing tapes with different diameter shims. The difference in shim shall be equal to the size of the off-set. The thinner tape shall be positioned first on the glazing leg closest to the interior. The thicker tape shall be cut to the exact length of the dimension between the applied tapes, and installed on the outermost glazing leg.

2. Immediately prior to setting glass, paper backing shall be removed. Apply a toe bead of sealant 6" in each direction, from each corner.

3. Locate setting blocks in the sill member at quarter points, or if necessary to within 6" of each corner. Setting blocks must be set equal distance from center line of the glass and high enough to provide the recommended bite and edge clearances.

4. Set edge block according to glass manufacturer’s recommendations.

5. Set Glass: The glass shall be pressed firmly against the tape to achieve full contact.

6. In a vented system, apply a heel bead (air seal) of sealant around the perimeter of glass, between the sole of the I.G. unit and the base of the rabbet of the metal framing developing a positive bond to the unit and to the metal framing. The bead of the sealant shall be deep enough so that it will partially fill the channel to a depth of 1/4" between the glass edge and the base of the metal framing rabbet.

7. Interior stops shall be set, and glazing tape spline for the appropriate face clearance shall be rolled into place, compressing the glass to the shim within the glazing tape.

3.5 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant as recommended by glass manufacturer or glass frame manufacturer.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape where noted on approved shop drawings.

3.6 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

1. Exterior glazing gasket shall be set a minimum of 1/8” below exterior glazing stop to create a channel for sealant installation.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.8 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

F. Glass to be cleaned according to:

1. GANA Glass Information Bulletin GANA 01-0300 – “Proper Procedure for Cleaning Architectural Glass Products”.

2. GANA Glass Informational Bulletin GANA TD-02-0402 – “Heat Treated Glass Surfaces are Different”.

G. Do not use razor blades, scrapers or metal tools to clean glass.

END OF SECTION

SECTION 092900

GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the gypsum drywall as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Gypsum board work for partitions, ceilings, column enclosures, furring, and elsewhere where gypsum drywall work is shown on drawings.
2. Metal supports for gypsum drywall construction.
3. Acoustical insulation for gypsum drywall work.
4. Sealant for gypsum drywall work.
5. Concealed metal reinforcing for attachment of railings, and other items supported on drywall partitions and walls.
6. Taping and finishing of drywall joints.
7. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.
8. Gypsum wallboard cants at beams and other projections over 2" deep in elevator shafts where adjoining wall is of gypsum wallboard construction.
9. Gypsum shaftwall construction.
10. Bracing and connections.

1.3 RELATED SECTIONS

A. Interior Vapor-Permeable Air Barrier Membrane – Section 072710.

B. Hollow metal door frames - Section 081113.

C. Access doors - Section 083113.

D. Painting - Section 099000.

E. Rings for grilles, registers and light fixtures - Division 23 and 26.

1.4 QUALITY ASSURANCE

A. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:

1. The Gypsum Construction Handbook, latest edition, USG.

2. Construction Guide, latest edition, National Gypsum.

3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For"

4. ASTM C 475 "Standard Specification for Joint Treatment Materials for Gypsum Wallboard Construction"

5. ASTM C 645 "Standard Specification for Non-Structural Steel Framing Members"

6. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products"

7. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board"

8. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications"

9. ASTM C 954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness"

10. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Board"

11. ASTM C 1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"

12. ASTM C 1178 "Standard Specification for Glass Mat Water Resistant Gypsum Backing Board"

13. ASTM C 1278 "Standard Specification for Fiber-Reinforced Gypsum Panel"

14. ASTM C 1396 "Standard Specification for Gypsum Board"

15. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"

B. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.

C. System Design Load

1. Provide drywall shaft systems for elevators designed and tested by manufacturer to withstand a lateral loading (air pressure) of 10 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.

2. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.

a. Drywall assemblies with tile finish shall have a deflection limit of L/360.
b. Drywall assemblies with stone slab finish shall have a deflection limit of L/720.

3. Provide drywall ceiling assemblies designed, fabricated and installed to have a deflection not to exceed L/360.

D. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for vertical deflection within framing details.

E. Installer: Firm with not less than 5 years of successful experience in the installation of specified materials.

F. For projects located in New York City, Comply with New York City Official Compilation of the Rules of the City of New York regarding “Impact Resistant Stair and Elevator Enclosures” when such enclosures are of gypsum drywall construction.

G. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

1.5 SUBMITTALS

A. Submit shop drawing for each drywall partition, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work.

B. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.

C. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold resistant joint compound.

D. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

E. Evaluation Reports: Submit evaluation reports certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.

1.6 PRODUCT HANDLING AND PROTECTION

A. Deliver, store and handle drywall work materials to prevent damage. Deliver materials in their original, unopened containers or bundles, and store where protected from moisture, damage and from exposure to the elements. Store wallboard in flat stacks.

B. Protect wallboard from becoming wet.

C. Protect metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

1.7 ENVIRONMENTAL CONDITIONS

A. Provide and maintain minimum temperature of fifty-five (55) degrees F. and adequate ventilation to eliminate excessive moisture within the building in the area of the drywall work for at least twenty-four (24) hours, prior to, during and after installation of drywall work. Installation shall not start until windows are glazed and doors are installed, unless openings are temporarily closed. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up.

1.8 JOB MOCK-UP

A. At a suitable location, where directed by the Architect, lay up a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Architect to show stud spacing and attachments; after acceptance, complete assembly.

B. Adjust the finishing techniques as required to achieve the finish required by the Architect as described in this Section of these specifications.

C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.

D. All drywall work shall be equal in quality to approved mock-up.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: U.S. Gypsum Co., Georgia Pacific, CertainTeed Corporation, Certainteed, or National Gypsum Co. meeting specification requirements are acceptable.

1. All drywall products must be manufactured in North America.

B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by ClarkDietrich, Super Stud Building Products, Marino/Ware, or approved equal.

2.2 METAL SUPPORTS

A. Metal Floor and Ceiling Runners

1. Provide vinyl barrier track liner equal to ProTRAK liner or approved equal.

2. Drywall Track: Formed from 0.0312 inch (20 U.S. Std. gauge) (minimum unless otherwise noted or required by performance requirements) cold formed steel, width to suit shaped metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.

3. Deflection track or head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical

movement within connections. Minimum of 0.0312 (20 ga.) cold formed steel for clips, 25 ga. cold formed steel for deflection track.

a. Product: ClarkDietrich; [BlazeFrame DSL] [MaxTrak] Slotted Deflection Track As manufactured by the Steel Network, VertiClip or VertiTrack or equal made by Metal-Lite Inc.
b. FireTrak (including stud clips) by FireTrak Corp. or equal made by Metal-Lite Inc.

4. Shaft Wall "J" Type Runner: Formed from 0.0329 inch (20 U.S. Std. gauge) galvanized steel, 1" x 2-1/2" or 4" wide (to suit detail) x 2-1/4" (for shaft wall).

B. Metal Studs, Framing and Furring

1. C-Shaped Studs: Channel type with holes for passage of conduit formed from minimum 0.0312 inch (20 U.S. Std. gauge) (unless heavier gauge is required to meet deflection limits) cold formed steel, width as shown on drawings.

2. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.

a. Product: ClarkDietrich; Furring Channel, or comparable product.

3. "C-H," "CT," or "I" Type Stud: 1-1/2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.

a. Product: ClarkDietrich; CT Stud, or a comparable product.

4. Double "E" Type Stud or "J" Track with Holding Tabs: 1" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.

a. Product: ClarkDietrich; J-Tabbed Track, or a comparable product.

5. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions and other items supported on drywall partitions and walls.

6. Half Height Wall Supports: Pony Wall Lite by Clark Dietrich or approved equal, 16 gauge framing with 3/8” base plate designed by contractor based on deflection specified above.

C. Suspended Ceiling and Fascia Supports

1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.

2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.

3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.

4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.

5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.

D. Protective Coating: All cold-formed steel members shall have coating conforming to AISI S220; ASTM A 653, G60 or coating with equivalent corrosion resistance of ASTM A653/A653M, G60. Galvannealed products are not acceptable

2.3 GYPSUM WALLBOARD TYPES

A. Gypsum Wallboard: 1/2" thick and 5/8" thick as indicated on drawings, "Sheetrock" by USG, "Gold Bond" by National Gypsum, or "Regular Gypsum" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

B. Fire-Rated Gypsum Wallboard: 1/2" thick and 5/8" thick as indicated on drawings, "1/2" Sheetrock Firecode C" or 5/8" Sheetrock Ecosmart Firecode X by USG, "Gold Bond Fireshield" by National Gypsum, or "Type C" and "Type X" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

C. Water-Resistant Backing Board for Tile Finish: 5/8" thick, "DUROCK Glass Mat Tile Backerboard" by USG, "Dens-Shield Tile Backer Board" by Georgia Pacific, or "GlasRoc Tile Backer" by CertainTeed Corp. Cover joints with a pressure sensitive woven glass fiber tape equal to Durock Brand Tile Backer Tape.

D. Moisture/Mold-Resistant Gypsum Wallboard at locations listed below, unless otherwise shown on drawings: 1/2" thick and 5/8" thick as indicated on drawings, "Mold Tough Glass Mat" or "Mold Tough Glass Mat Firecode X" by U.S. Gypsum, "DensArmor Plus" by Georgia Pacific, "Mold Defense" and/or "GlasRoc Interior"or “GlasRoc Type X” by Certainteed, or "Gold Bond EXP Interior Extreme Gypsum Board" by National Gypsum, 48" wide, in maximum lengths available to minimize end-to-end butt joints. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C 1396, Section 6 or ASTM C 1658.

1. Interior faces of exterior walls of basements, cellars and other below grade rooms.

2. Walls and ceilings of spaces containing condensers, water tanks, water pumps and pressure reduction valves.

3. All perimeter walls and wet shafts.

E. Mold-Resistant Shaft Wall Liner: Solid gypsum board liner for shaft wall construction, 1" thick, 24" wide, as required to suit condition, by standard lengths as required, beveled edges. Provide "Sheetrock Brand Glass Mat Liner Panel Mold Tough" by USG, "DensGlass Shaftliner" by Georgia Pacific, "Gold Bond Brand EXP Extended Exposure Shaft Liner" by National Gypsum, or "GlasRoc Shaftliner" by CertainTeed Corp.

1. Liner board must have a rating 10 per ASTM D 3273 with a core that meets ASTM C 1396 Section 6.

F. Abuse-Resistant Wallboard: 5/8" thick "Sheetrock Brand Mold Tough AR" by USG, "Dens Armor Plus Abuse Resistant Panels" by Georgia-Pacific, "EXP Interior Extreme AR" or "Gold Bond Brand Hi-Abuse XP" by National Gypsum, or " Extreme Abuse" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

1. Board must achieve a Level 1 rating per ASTM C 1629.

G. Impact-Resistant Wallboard: 1/2" and 5/8" thick as indicated on drawings, "Sheetrock Brand Mold Tough VHI" by USG, "DensArmor Plus Impact-Resistant Panels" by Georgia-Pacific, "EXP Interior Extreme IR" or "Gold Bond Brand Hi-Impact XP" by National Gypsum, or " Extreme Impact" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.

H. Cement Board (for tile backer board in shower areas and wherever else scheduled): ½" thick "Durock Tile Backer Board" by USG, "Wonder Board Lite" by Custom Building Products, or approved equal.

I. Impact-Resistant Gypsum Drywall: ASTM C 1396, ASTM C 1278, core types as required by fire-resistance-rated assembly indicated, and with tapered edges.

1. Products: Subject to compliance with requirements, provide USG "Sheetrock Brand Mold Tough VHI" 5/8" thickness, by United States Gypsum Company, or " Extreme Impact" by CertainTeed Corp.

a. Locations: Including, but not limited to, stairwells, to satisfy NYC requirements.

J. Sustainable/Lightweight Gypsum Wallboard: ASTM C 1396, "Sheetrock Brand Ecosmart (Type ULIX)" or "Sheetrock Brand Ecosmart Mold Tough" by USG or “High Strength Fireshield Lite XP” by National Gypsum.

2.4 ACCESSORIES

A. Acoustical Insulation: Paper-less, non-combustible, semi-rigid mineral fiber mat, 2" thick, in walls (unless otherwise indicated), 3 lb./cu. ft. maximum density; Thermafiber "Thermafiber SAFB FF," Rockwool "Rockwool AFBevo" or approved equal.

B. Fasteners for Wallboard: USG Brand Screws; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wallboard. Lengths specified below under "Part 3 - Execution" Articles and as recommended by drywall manufacturer.

1. For Portland cement base boards, fasteners shall be equal to Durock Steel Screws by U.S. Gypsum.

C. Laminating Adhesive: "Sheetrock Brand Joint Compound."

D. Metal Trim - Corner Beads: For 90 degree External Corners - ClarkDietrich; 103 Deluxe Cornerbead or "Dur-A-Bead" No. 103, 30 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4", for 90 degree external corners.

E. Metal Trim - Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim."

F. Partition/Concrete Ceiling Trim: Trim-Tex Super Seal Tear Away or approved equal.

G. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; Setting Type (Durabond 90) or Lightweight Setting Type Joint Compound for taping and topping; and Ready Mix Compound for finishing.

1. For mold-resistant drywall, water resistant drywall, and tile backer board, use alkali resistant glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Acceptable joint compound is "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or approved equal meeting standards noted herein.

H. Control Joints: ClarkDietrich; #093 Control Joint or No. 0.093, USG. Within fire rated partitions provide FAS-093X

I. Acoustical Sealant: USG "Acoustical Sealant" or "Tremco Acoustical Caulking" of Tremco Mfg. Co., Masterseal NP520 by BASF or approved equal.

J. Neoprene Gaskets: Conform to ASTM D 1056.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where gypsum drywall is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. General

1. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.

2. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.

3. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed reinforcement shall span between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.

a. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.

B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of authorities having jurisdiction, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.

C. Acoustical Assemblies: Install acoustically-rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.

D. Sealant

1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.

2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical

sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.

3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.

E. Wallboard Application

1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 081113, "Steel Doors and Frames."

2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use water-resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.

3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.

4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.

5. Provide "Thermafiber" safing insulation meeting standards of Section 078413 at flutes of metal deck where partitions carry up to bottom of metal deck.

6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.

7. Where wallboard is to be applied to curved surfaces, dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.

8. Screw fasten wallboard with power-driven electric screw driver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.

9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.

F. Cementitious Backer Board

1. General: Furnish cementitious backer board in maximum available lengths. Install horizontally, with end joints over framing members.

2. Fastening: Secure cementitious backer board to each framing member with screws spaced not more than 12 inches on center and not closer than 1/2" from the edge. Install screws with a conventional screw gun so that the screw heads are flush with the surface of the board.

3. Joint Treatment: Fill space between edge of backer and receptor with dry-set Portland cement or latex-Portland cement mortar. Fill all horizontal and vertical joints and corners with dry-set Portland cement or latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.

G. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.

1. Corner Beads: Install specified corner beads in single lengths at all external corners, unless corner lengths exceed standard stock lengths.

2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.

3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.

H. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:

1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.

2. Construction changes within the plane of the partition or ceiling.

3. Shown on approved shop drawings.

4. Ceiling dimensions exceed thirty (30) feet in either direction.

5. Wings of "L," "U," and "T" shaped ceiling areas are joined.

6. Expansion or control joints occur in the structural elements of the building.

7. Shaftwall runs exceed 30' without interruption.

8. Partition or furring abuts a structural element or dissimilar wall or ceiling.

9. Partition or furring runs exceed 30' without interruption.

10. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.

I. Joint Treatment and Spackling

1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between ceilings and walls or partitions shall be filled with joint compound.

2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.3 FURRED WALLS AND PARTITIONS

A. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.

B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

3.4 METAL STUD PARTITIONS

A. Unless otherwise noted, steel framing members shall be installed in accordance with ASTM C 754.

B. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.

C. Stud Installation

1. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.

2. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.

3. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.

4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.

5. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing to vertical studs with sheet metal screws.

6. At jambs of door frames and borrowed light frames, install doubled-up studs (not back to back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.

7. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to-length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.

8. At control joints, in field of partition, install double-up studs (back to back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.

D. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.

E. Wallboard Installation - Single Layer Application (Screw Attached)

1. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged so as to occur on different studs.

2. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.

3. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.

4. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.

5. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.

F. Wallboard Installation - Double-Layer Application

1. General: See drawings for wallboard partition types required.

2. First Layer (Screw Attached): Install as described above for single layer application.

3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty-two (32) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.

4. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running

continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.

G. Wallboard Installation - Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and maintain tolerances as specified for screw attached wallboard.

H. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.

I. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by Architect.

J. Control Joints

1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.

2. Back by double framing members.

3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.

4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.

3.5 DRYWALL FASCIAS AND CEILINGS

A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.

B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.

C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.

F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.

1. Provide special furring where ducts are over two (2) feet wide.

G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board at each furring channel; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

3.6 SHAFT WALLS

A. Runner Installation: Use "J" metal runners at floor and ceiling, with the short leg toward finish side of wall. Securely attach runners to structural supports with power-driven fasteners at both ends and twenty-four (24) inches o.c.

B. Shaft Wall Liner: Cut shaft wall liner panels one (1) inch less from floor to ceiling height and erect vertically between J-runners.

C. C-H Studs: Cut metal studs 3/8" to not more than 1/2" less than floor to ceiling height and install between shaft wall liner panels so that panels are fitted snugly into the one (1) inch wide "H," "T," or "I" portion of the stud. Space studs twenty-four (24) inches o.c., unless otherwise indicated on drawings. Install full-length steel E-Studs or J-runners vertically at T-intersections, corners, door jambs, and columns. Install full length E-Studs or J-runners over shaft wall liner both sides of closure panels. Frame openings cut within a liner panel with J-Runner around perimeter. For openings, frame with vertical E-Stud or J-runner at edges, horizontal runner at head and sill, and reinforcing as shown on the drawings. Suitably frame all openings to maintain structural support for wall. Install floor-to-ceiling steel E-Studs or J-runners each side of elevator door frames to act as strut-studs. Attach strut-stud to floor and ceiling runners with two (2) 3/8" Type S screws, space twelve (12) inches o.c. Over metal doors, install a cut to length section of runner and attach to strut-studs with clip angles and 3/8" Type S Screws space twelve (12) inches o.c.

D. Wallboard Installation - Double Layer Installation: Erect gypsum wallboard base layer vertically or horizontally to meet fire rating on one side of studs with end joints staggered. Fasten base layer panels to studs with one (1) inch Type S screws twenty-four (24) inches o.c. Caulk perimeter of base layer panels. Apply gypsum wallboard face layer vertically over base layer with joints staggered and attached with 1-5/8" Type S screws staggered from those in base, spaced eight (8) inches o.c. and driven into studs.

E. Wallboard Installation (Where Both Sides of Shaft Wall are Finished): Apply gypsum wallboard face layers vertically both sides of studs. Stagger joints on opposite partition sides. Fasten panels with one (1) inch or two (2) inches Type S screws spaced eight (8) inches o.c. in field and along edges into studs.

F. Cants: Provide one (1) inch thick shaft wall liner, cut to suit condition, at beams and other projections wider than two (2) inches in elevator shafts. Cants shall slope seventy-five (75) degrees from the horizontal. Screw attach shaft wall liner to the vertical metal studs.

G. Support elevator hoistway door frames independently of drywall shaft framing system, or reinforce system in accordance with system manufacturer's instructions.

H. Where handrails are indicated for direct attachment to drywall shaft system, provide not less than a sixteen (16) ga. x eight (8) inches wide galvanized steel reinforcement strip, accurately positioned and secured to studs and concealed behind not less than one 1/2" thick course of gypsum board in the system.

I. Integrate stair hanger rods with drywall shaft system by locating cavity of system as required to enclose rods.

J. Horizontal Shaftwall Duct and Ceiling Assemblies: Provide I-stud cavity shaftwall system for horizontal duct protection consisting of I-studs 24" o.c. with 1" fire-rated shaft liner panels inserted in the stud tabs, and three layers of 1/2" firecode C gypsum board attached to the stud flanges opposite the shaft liner panels.

3.7 ERECTION AT COLUMN ENCLOSURES

A. Metal furring supports shall be provided under work of this Section, and shall be cut to lengths as necessary for tight fit such that spacing is not more than sixteen (16) inches o.c.

B. Board shall be fastened securely to supports with screws as specified. Place boards in position with minimum number of joints. Where free ends occur between supports, back-blocking or furring shall be required. Center abutting ends over supports. Correct work as necessary so that faces of boards are flush, smooth and true. Provide clips or cross furring for attachment as required.

C. All layers shall be screw attached to furring.

D. When column finish called for on drawings to be in the same plane as drywall finish layer, maintain even, level plane.

3.8 FINISHING

A. Taping: A thin, uniform layer of compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.

B. Filling: After initial coat of compound has hardened, additional compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.

C. After compound has hardened, a finishing coat of compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.

D. Fastener Depressions: Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.

E. Finishing Beads and Trim: Compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.

F. Except as otherwise noted, level of finish for surface exposed to view shall conform to Level 4 of ASTM C 840 and GA-214 of the Gypsum Association.

1. For drywall boards with fiberglass facing, provide Level 5 finish of ASTM C 840 and GA-214.

G. Drywall construction with defects of such character which will mar appearance of finished work, or which is otherwise defective, will be rejected and shall be removed and replaced at no expense to the Owner.

3.9 CLEANING AND ADJUSTMENT

A. At the completion of installation of the work, all rubbish shall be removed from the building leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building.

B. Work shall be left in clean condition ready for painting or wall covering. All work shall be as approved by Architect.

C. Cutting and Repairing: Include all cutting, fitting and repairing of the work included herein in connection with all mechanical trades and all other trades which come in conjunction with any part of the work, and leave all work complete and perfect after all trades have completed their work.

3.10 PROTECTION OF WORK

A. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

END OF SECTION

SECTION 096513

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient accessories, as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Rubber base.

2. Transition strips.

3. Accessories.

1.3 RELATED SECTIONS

A. Gypsum Drywall - Section 092900.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.5 SUBMITTALS

A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient base.

B. Samples

1. Submit six (6) inch long samples of base.

2. Submit full-size sample of stair tread & riser.

1.6 DELIVERY AND STORAGE

A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.

B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F. for at least forty-eight (48) hours before start of installation.

1.7 JOB CONDITIONS

A. Continuously heat spaces to receive base to a temperature of seventy (70) degrees F. for at least forty-eight (48) hours prior to installation, whenever project conditions are such that heating is required. Maintain seventy (70) degrees F. temperature continuously during and after installation as recommended by the manufacturer, but for not less than forty-eight (48) hours. Maintain a temperature of not less than fifty-five (55) degrees F. in areas where work is completed.

PART 2 PRODUCTS

2.1 RUBBER BASE

A. Provide four (4) inches high, 1/8" thick, continuous vinyl, cove base with pre-formed internal and external corner pieces, color as selected by the Architect. Base shall conform to ASTM F 1861, Type TV, Group 1 as manufactured by Tarkett-Johnsonite or approved equal by Burke Mercer, Marley Flexco, Armstrong, or approved equal.

2.2 ACCESSORIES

A. Transitions: provide Roppe rubber adapter and transitions, refer to the finish schedule on the drawings for additional information.

B. Adhesives: Waterproof, stabilized type, as recommended by the manufacturer for the type of service indicated.

C. Concrete Slab Primer: Non-staining type recommended by the tile manufacturer.

D. Leveling Compound: Latex/Portland cement flash patching and leveling compound equal to No. DSP-520 made by H.B. Fuller or No. 226 with 3701 admixture made by Laticrete or equal made by Mapei, or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where resilient base and accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Bases: In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc., without gaps at top or bulges at bottom, with tight joints and flush edges, with molded corner pieces at internal and external corners. Provide end stops adjacent to flush type door frames and where base does not terminate against an adjacent surface. Keep base in full contact with walls until adhesive sets.

3.3 CLEANING AND PROTECTION

A. Remove any excess adhesive or other surface blemishes from base using neutral type cleaners as recommended by the manufacturer.

END OF SECTION

SECTION 099000

PAINTING AND FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Prime painting unprimed surfaces to be painted under this Section.
2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
3. Painting all ferrous metal (except stainless steel) exposed to view.
4. Painting all galvanized ferrous metals exposed to view.
5. Painting interior concrete block exposed to view.
6. Painting gypsum drywall exposed to view.
7. Painting plaster surfaces.
8. Painting concrete floor.
9. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
10. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
11. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
12. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
13. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

1.3 RELATED SECTIONS

A. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.

B. Shop Coat on Machinery and Equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished, including, but not necessarily limited to, the following Sections. All items of equipment furnished with prime coat finish shall be finish painted under this Section.

1. Plumbing - Division 22.

2. Heating, ventilation and air conditioning - Division 23.

C. Color Coding of Mechanical Piping and Electrical Conduits - Divisions 22 and 26.

1. This Color Coding consists of an adhesive tape system and is in addition to painting of piping and conduits under this Section, as specified above.

1.4 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.

B. Factory-finished toilet partitions.

C. Factory-finished acoustical tile.

D. Non-ferrous metals, except for items specified and/or indicated to be painted.

E. Finished hardware, excepting hardware that is factory primed.

F. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

1.5 QUALITY ASSURANCE

A. Job Mock-Up

1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Architect. Paint mock-ups to include door and frame assembly.

2. These applications when approved will establish the quality and workmanship for the work of this Section.

3. Repaint individual areas which are not approved, as determined by the Architect, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.

B. Qualification of Painters: Use only qualified painters for the mixing and application of paint on exposed surfaces.

C. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Architect in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing codes and ordinances.

1.6 SUBMITTALS

A. Materials List

1. Before any paint materials are delivered to the job site, submit to the Architect a complete list of all materials proposed to be furnished and installed under this portion of the work.

2. This shall in no way be construed as permitting substitution of materials for those specified or accepted for this work by the Architect.

B. Samples

1. Accompanying the materials list, submit to the Architect copies of the full range of colors available in each of the proposed products.

2. Upon direction of the Architect, prepare and deliver to the Architect two (2) identical sets of Samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.

C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.

D. Close out Submittal

1. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or plant manufacturer/supplier shall furnish a coating maintenance manual such as Sherwin Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, MSDS, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.7 PRODUCT HANDLING

A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

B. Protection

1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.

2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

3. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 EXTRA STOCK

A. Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling approximately ten (10) percent of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

1.9 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.1 PAINT MANUFACTURERS

A. Except as otherwise noted, provide the painting products listed for all required painting made by one of the manufacturers listed in the paint schedule (Section 2.4). These companies are Benjamin Moore, The Pittsburgh Paints Company (PITT), PPG Paints (PPG) distributed by The Pittsburgh Paints Company, and Sherwin Williams (S-W). Comply with number of coats and required minimum mil thicknesses as specified herein.

2.2 MATERIALS

A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only to recommended limits.

B. Colors and Glosses: All colors and glosses shall be as selected by the Architect. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Architect. Color schedule (with gloss) shall be furnished by the Architect.

C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.

D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.

E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.

F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.

G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.

H. Heat Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

A. The various surfaces shall be painted or finished as specified below in Article 2.4. However, the Architect reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the Owner.

B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.

C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.

D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.

E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.

F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.

G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Architect prior to application of the coating.

2.4 SCHEDULE OF FINISHES

A. Interior Ferrous Metal

Satin Finish/Latex

Primer:	Benj. Moore Ultra Spec HP Acrylic Metal Primer (HP04)
	PITT- Pitt Tech Plus DTM Acrylic Primer 90-1912
	S-W Pro-Industrial Pro-Cryl Universal Primer B66-3100 Series
First Coat:	Benj. Moore Ultra Spec-HP DTM Acrylic Low Luster (HP25)
	PITT- Pitt-Tech WB EP DTM Acrylic Satin 90-1710
	S-W Pro Industrial Acrylic Eg-Shel, B66-660 Series
Second Coat:	Benj. Moore Ultra Spec-HP DTM Acrylic Low Luster (HP25)
	PITT- Pitt-Tech WB EP DTM Acrylic Satin 90-1710
	S-W Pro Industrial Acrylic Eg-Shel, B66-660 Series

a. Total DFT not less than: 3.9 mils

Semi-Gloss Finish/Latex
Primer: Benj. Moore Ultra Spec-HP Acrylic Metal Primer (HP04)
PITT- Pitt Tech Plus DTM Acrylic Primer 90-1912
S-W Pro-Industrial Pro-Cryl Universal Primer B66-3100 Series
First Coat: Benj. Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29)
PITT- Pitt-Tech WB EP DTM Acrylic Semi-Gloss 90-1610
S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
Second Coat: Benj. Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29)
PITT- Pitt-Tech WB EP DTM Acrylic Semi-Gloss 90-1610
S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
a. Total DFT not less than: 4.0 mils

B. Interior Concrete Block

Flat Finish/Vinyl Acrylic Latex over Filler
Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PITT-Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150
First Coat: Benj. Moore Ultra Spec 500 Flat, T535
PITT- Pure Performance Latex Flat, 9-1 series
S-W Super Paint Latex Flat, A86 series
Second Coat: Benj. Moore Ultra Spec 500 Flat, T535
PITT- Pure Performance Latex Flat, 9-1 series
S-W Super Paint Latex Flat, A86 series
a. Total DFT not less than: 10.7 mils

Eggshell Finish/Vinyl Acrylic Latex Over Filler
Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PITT- Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150
First Coat: Benj. Moore Ultra Spec 500 Latex Eggshell, T538
PITT- Pure Performance Latex Eggshell, 9-3 series
S-W Super Paint Latex Eg-Shel, A87 Series
Second Coat: Benj. Moore Ultra Spec 500 Latex Eggshell, T538
PITT- Pure Performance Latex Eggshell, 9-3 series
S-W Super Paint Latex Eg-Shel, A87 Series
a. Total DFT not less than: 10.9 mils

Semi-Gloss Finish/Vinyl Acrylic Latex over Filler
Block Filler: Benj. Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
PITT- Speedhide HI Fill Latex Block Filler 6-15XI
S-W Pro Industrial Heavy-Duty Block Filler, B42-150
First Coat: Benj. Moore Ultra Spec 500 Latex Semi-Gloss, T546
PITT- Pure Performance Latex Semi-Gloss Latex, 9-5 series
S-W Super Paint Latex Semi-Gloss, A88 series
Second Coat: Benj. Moore Ultra Spec 500 Latex Semi-Gloss, T546
PITT- Pure Performance Latex Semi-Gloss, 9-5 series
S-W Super Paint Latex Semi-Gloss, A88 series
a. Total DFT not less than: 10.7 mils

C. Interior Drywall

Flat Finish/Vinyl Acrylic Latex
Primer: Benj. Moore Ultra Spec 500 Interior Latex Primer (N534)
PITT- Speedhide Zero Interior Latex Primer 6-4900XI
S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
First Coat: Benj. Benj. Moore Ultra Spec 500 Flat, T535
PITT- Pure Performance Latex Flat, 9-1 series
S-W Super Paint Latex Flat, A86 series
Second Coat: Benj. Benj. Moore Ultra Spec 500 Flat, T535
PITT- Pure Performance Latex Flat, 9-1 series
S-W Super Paint Latex Flat, A86 series
a. Total DFT not less than: 3.6 mils

Matte Finish / Scuff Resistant Latex
Primer: Benjamin Moore Ultra Spec 500 Interior Latex Primer (N534)
First Coat : Benjamin Moore Scuff X Latex Matte Finish (N484)
Second Coat : Benjamin Moore Scuff X Latex Matte Finish (N484)
a. Total DFT not less than 4.6 mils

Matte Finish/Scuff & Stain Resistant
Primer: Pitt Speedhide Zero Interior Latex Primer 6-4900XI
First Coat: Pitt-Ultralast Interior Latex Matte 13-210
Second Coat: Pitt-Ultralast Interior Latex Matte 13-210

Eggshell Finish/ Scuff Resistant Latex
Primer: Benjamin Moore Ultra Spec 500 Interior Latex Primer (N534)
First Coat: Benjamin Moore Scuff-X Latex Eggshell (485)
Second Coat: Benjamin Moore Scuff-X Latex Eggshell (485)
a. Total DFT not less than 4.6 mils

Eggshell Finish/Vinyl Acrylic Latex
Primer: Benj. Moore Ultra Spec 500 Interior Latex Primer (N534)
PITT- Speedhide Zero Interior Latex Primer 6-4900XI
S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
First Coat: Benj. Moore Ultra Spec 500 Latex Eggshell, T538
PITT- Pure Performance Latex Eggshell, 9-3 series
S-W Super Paint Latex Eg-Shel, A87 Series
Second Coat: Benj. Moore Ultra Spec 500 Latex Eggshell, T538
PITT- Pure Performance Latex Eggshell, 9-3 series
S-W Super Paint Latex Eg-Shel, A87 Series
b. Total DFT not less than: 3.8 mils

Eggshell Finish/Scuff and Stain Resistant Acrylic Latex
Primer: PITT Speedhide Zero Interior Latex Primer 6-4900XI
First Coat PITT- UltraLast Interior Latex Paint + Primer Eggshell 13-310
Second Coat PITT_ UltraLast Interior Latex Paint + Primer Eggshell 13-310

D. Interior Painted Wood

Satin Finish/Latex
Primer: Benj. Moore Ultra Spec 500 Latex Primer (N534)
S-W Multi-Purpose Latex Primer/Sealer B51 Series
First Coat: Benj. Moore Ultra Spec 500 Latex Satin (T545)
S-W Super Paint Latex Semi-Gloss, A88 Series
Second Coat: Ben. Moore Ultra Spec 500 (T545)
S-W Super Paint Latex Semi-Gloss, A88 Series
a. Total DFT not less than: 4.0 mils

Semi-Gloss Finish/Latex
Primer: Benj. Moore Ultra Spec 500 Latex Primer (N534)
PITT- Seal Grip Int./Ext. Acrylic Primer/Sealer 17-921XI
S-W Multi-Purpose Latex Primer/Sealer B51 Series
First Coat: Benj. Moore Ultra Spec 500 Semi-Gloss (T546)
PITT- Pure Performance Int Latex Semi-Gloss, 9-5 Series
S-W Super Paint Int Latex Semi-Gloss, A88 Series
Second Coat: Benj. Moore Ultra Spec 500 Latex Semi-Gloss (T546)
PITT- Pure Performance Latex Semi-Gloss, 9-5 Series
S-W Super Paint Latex Semi-Gloss, A88 Series
a. Total DFT not less than: 3.8 mils

E. Primer for Fiberglass Faced Drywall:

1 coat Benjamin Moore 046 Fresh Start Acrylic Superior Primer
1 coat PITT- Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer 17-921XI
1 coat Pratt & Lambert "Suprime" Interior Latex Enamel Undercoater Z1013/F1013
1 coat Sherwin Williams "Builders Solution."

F. Interior Drywall to Receive Wallcovering

Primer: 1 coat "Shield Z Mold and Mildew Proof Commercial Wallcovering Primer" made by Zinsser
1 coat Multi-Purpose Interior/Exterior B51-450 by Sherwin Williams

G. Concrete Floor: Light Industrial Epoxy- (No trucks/forklifts)

Primer: Benj. Moore HP Concrete & Metal Epoxy Primer, HP1550
PPG Flooring 100% Solids 912 LV Epoxy Primer
First Coat: Benj. Moore HP Waterborne Epoxy, HP4400
PITT Aquapon WB EP Ultra Low VOC Water Based Semi-Gloss or Gloss Epoxy, 98-51E Series
Second Coat: Benj. Moore HP Waterborne Epoxy, HP4400
PITT Aquapon WB EP Ultra Low VOC Water Based Semi-Gloss or Gloss Epoxy, 98-51E Series
**Non-Slip Additives: broadcasted into the first coat of epoxy finish.
Non-Slip Aggregate: Corotech V630 Anti-Slip Aggregate
Non-Slip: Add PITT Amercoat 886 Anti-Slip Additive (pumice)

2.5 EXISTING SURFACES TO BE PAINTED

A. Existing surfaces shall be painted in accordance with schedule given in Article 2.4 herein except that first or prime coat may be eliminated where existing paint is sound. Where existing paint must be removed down to base material, provide first or prime coat as specified.

2.6 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW

A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.

B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.

C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.

D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.

E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.

F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.

G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.

H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Architect in writing.

B. The Contractor shall furnish the Architect a schedule showing when he expects to have completed the respective coats of paint for the various areas and surfaces. This schedule shall be kept current as the job progresses.

C. The Contractor shall protect his work at all times, and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall

remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.

D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.

E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.

H. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.

I. All suction spots or "hot spots" in plaster after the application of the first coat shall be touched up before applying the second coat.

J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.3 PREPARATION OF SURFACES

A. Existing Surfaces: Clean existing surfaces requiring paint or finishing, remove all loose and flaking paint or finish and sand surface smooth as required to receive new paint or finish. No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, Contractor shall be required to sand smooth and re-finish until surface meets with Architect's approval.

B. General

1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be perfectly dry, clean and smooth.

2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.

3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

C. Metal Surfaces

1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.

2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.

    a. Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to ensure that this cleaning method is followed.

3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.

4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.

5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.

D. Plaster Surfaces: Scrape off all plaster nibs or other projections and sand smooth or finish to match adjoining surface texture. Cut out all scratches, cracks, holes, depressions and similar voids and fill with non-shrinking grout, spackles, patching plaster or other approved patching material; allow to dry, refill if necessary, then sand smooth (or refinish) to provide a flush, smooth surface of the same texture as the adjacent plaster surface.

    1. Allow at least 28 days, from installation of final plaster coat, before starting work.

E. Gypsum Drywall Surfaces: Scrape off all projections and splatters, spackles all holes or depressions, including taped and spackled joints, sand smooth. Conform to standards established in Section 092900, "Gypsum Drywall."

F. Wood Surfaces: Sand to remove all roughness, loose edges, slivers, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.

G. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids not filled under the "Masonry" Section, with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.

H. Testing for Moisture Content: Contractor shall test all plaster, masonry, and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.

I. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

A. Mix and prepare painting materials in strict accordance with the manufacturer’s directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. General

1. Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.

2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper, or rub surfaces with pumice stone, where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.

3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.

   a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.

5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.

6. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.

7. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.

8. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.

9. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

B. Scheduling Painting

1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

E. “Touching-Up” of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To “touch-up,” the Contractor shall use the factory finished material manufacturer’s recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.7 CLEAN UP

A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.

B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

SECTION 104416

FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the fire extinguishers and cabinets as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

A. Gypsum drywall - Section 092900.

B. Fire suppression systems - Division 22.

C. Fire hose cabinets and valve cabinets - Division 22.

1.4 QUALITY ASSURANCE

A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.

B. Samples: Submit samples, 6" square, of each required finish. Prepare samples on metal of same gauge as metal to be used in the work. Where normal color variations are to be expected, include 2 or more units in each sample showing the limits of such variations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following:

1. J.L. Industries.

2. Larsen's Mfg. Co.

3. Potter Roemer.

2.2 EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

B. Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

C. Multi-Purpose Dry Chemical Type: UL rated 2A-10B:C, 5 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS

A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher specified, in manufacturer's standard enamel finish; color to match extinguisher.

2.4 CABINETS

A. Type and Style: Fire extinguisher cabinets shall be metal, semi recessed, with plexiglass panel, sized to fit within the partition or wall depth. Provide fire rated cabinets within fire rated partitions.

B. Color: Fire extinguisher cabinets shall be factory pre-finished with baked enamel or clear metal finish in the colors selected by the Architect from the standard range of colors of the selected manufacturer.

C. Design is based on "Model G-2409-5R" of Larsen's Mfg. Co. Other manufacturers noted herein may substitute their equivalent cabinet upon acceptance by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where fire extinguishers and cabinets are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install items included in this Section in locations indicated and at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

B. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by the Architect.

3.3 IDENTIFICATION

A. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk-screen process or die cut lettering. Provide lettering on door as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

B. Identify bracket-mounted extinguishers with red letter decals spelling 'FIRE EXTINGUISHER' applied to wall surface. Letter size, style and location as selected by the Architect.

3.4 SERVICE

A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

END OF SECTION

SECTION 122413

WINDOW SHADES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the window shades as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Manually-operated window shades and enclosures.

2. Field measurements of as-built conditions.

3. Accessories and hardware required for complete installation and operation.

1.3 RELATED SECTIONS

A. Gypsum drywall – Section 092900.

B. Electrical - Division 26.

1.4 QUALITY ASSURANCE

A. Provide assemblies which are complete assemblies produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.

B. Provide materials in colors as selected by the Architect from manufacturer's standard colors.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

B. Shop Drawings: Submit floor layout and elevations, indicating location of all window treatments, mechanism details, enclosures, trim, , type and size of each unit, type and location of controls. Shop drawings must also show seaming of shade fabric. Submit large scale shop drawings showing details of installation and relation to adjoining construction and conditions.

C. Samples: Submit full size sample of each shade and enclosure type for Architect's acceptance.

D. Mock-Up

1. Install each type of shade assembly on one complete column bay for Architect's acceptance of installation details, workmanship and operation.

2. Approved mock-up shall be used as the standard for installation of work under this Section, and no further installation work shall proceed before Architect's acceptance of the mock-up.

1.6 WARRANTY

A. Manufacturer’s standard non-depreciating 25-year limited warranty covering all hardware, motors, motor control system and shade cloth.

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect shades from damage, soiling and deterioration during transit, storage and handling to, until Owner's acceptance.

PART 2 PRODUCTS

2.1 MANUALLY OPERATED SHADES

A. Provide manually operated shade system equal to "Mechoshade/5 System," made by the Mecho-Shade Corp. or approved equal made by WT Shade, Sol-R-Veil Inc., Draper, Rollease Acmeda Contract Series 1 or approved equal conforming to standards specified herein.

B. Shade system shall be pre-engineered overrunning clutch design that disengages to 90% during the raising and lowering of the shade. The brake can stand a pull force of 40 lb. in the stop position or sized as required for shade weight, requiring. Requires no adjustment. Self-lubricating hub on to which the brake system is mounted includes an articulated brake assembly which assures smooth, non-jerky operation in raising and lowering the shades. System shall include the following components:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing mounting hardware from opening and without requiring end or center supports to be removed.

2. Provide shade hardware that allows for removal and remounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

3. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.

4. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.

5. Provide shade hardware system that allow for operation of multiple shade bands (multi-banded shades) by a single chain operator. Connectors shall be offset to assure alignment from the first to the last shade band.

6. Provide shade hardware constructed of minimum 1/8" thick plated steel or heavier as required to support 150% of the full weight of each shade.

7. Drive Bracket/ Brake Assembly:

a. MechoShade Drive Bracket M5, WT Shade SoloMount, or equal by other manufacturers noted herein.

b. Rollease Acmeda chain driven clutch operating system of self-lubricating, uv stabilized fiberglass reinforced nylon construction and tempered high carbon steel internal springs, designed for smooth, trouble-free operation, precise control, and uniform aesthetics. Galaxy geared or spring boost counter balance system to achieve < 6 lbs. constant pull forcesDrive Chain: #10 qualified stainless steel chain rated to 90 lb.
c. Minimum Breaking Strength: Nickel plate chain shall not be accepted.

C. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

1. Hem Pockets and Hem Weights: Fabric hem pocket with RF welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be the same, for all shades within one room.

2. Shade Band and Shade Roller Attachment:

a. Provide extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without deflection. Provide for positive mechanical engagement with drive/ brake mechanism.
b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable/ replaceable with a snap-on/snap-off spline mounting, without having to remove shade roller from shade brackets.
c. Mounting spline shall not require use of adhesives, adhesive tapes, staples and/or rivets.

D. Enclosures and Trims shall be clear anodzied, Mechoshade5 system or approved equal.

E. Finishes: Unless otherwise noted, all exposed aluminum parts have an anodized finish. Steel parts are either nickel plated, satin finish, or have been bonderized prior to painting with a baked, enamel finish.

F. Side Channels: Provide standard "blackout" side channels where black-out shades are required. Channels shall be extruded aluminum, with a black anodized finish, color selected by the Architect.

2.2 SHADE CLOTH

A. Shade cloth shall be "Eco-Veil" group, 1350 Series of weave, color and optical properties as selected by the Architect made by MechoShade, or Ambient Screen 5% (PVC Free) by Rollease Acmeda Contract or equal by other manufacturers noted herein.

B. Where black-out shades are indicated, shade cloth shall be "Equinox 0100 Series" opaque acrylic black-out shade cloth made by MechoShade with black out shade side and sill channels, or Rollease Acmeda Contract Shade Cloth Sierra Sol Mesa, or equal by other manufacturers noted herein; color selected by the Architect.

2.3 FABRICATION

A. The shade and the fabric shall hang flat without buckling or distortion. The edge, when trimmed, shall hang straight without curling or raveling. An unguided roller shade cloth shall roll true and straight, without tracking sideways more than +/- 1/8" in either direction due to warp distortion or weave design. Shades shall fill window openings from head to sill and jamb to jamb.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where window treatments are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION: GENERAL

A. Coordinate with the work of other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the indicated design and the installation recommendations of the manufacturer as approved by the Architect.

C. Upon completion of the installation, put all components through at least ten (10) complete cycles of operation, adjusting as necessary to achieve optimum operation.

3.3 INSTALLATION OF MANUAL ROLLER SHADES

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions and located so shade band is not closer than 2" to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturers written instructions.

3.4 PROTECTION AND CLEANING

A. Protect installed units to ensure proper operating condition, without damage or blemishes. Repair or replace damaged units as directed by the Architect.

END OF SECTION

HISTORY GALLERY RENOVATION
FASHION INSTITUTE OF TECHNOLOGY

BID SET SPECIFICATIONS VOLUME II
April 28, 2026

SAMUEL ANDERSON ARCHITECTS
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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. This Section is to be coordinated with and complementary to the General Conditions, all contract documents, wherever applicable to Mechanical and Electrical Work.

B. Where items of the General Conditions are repeated in this Section of the Specifications, it is intended to qualify or to call particular attention to them; it is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated herein.

C. This Section applies equally and specifically to all Contractors and Subcontractors supplying labor and/or equipment and/or materials as required under the Heating, Ventilating and Air Conditioning, Plumbing, Sprinkler and Electrical Sections of the Specifications.

1.02 DEFINITIONS

A. "The Contractor" or "Each Contractor" means specifically, the Contractor or Subcontractor working under his respective Section (Heating, Ventilating and Air Conditioning, Plumbing, Sprinkler or Electrical) of this Specification.

B. "Provide" means to supply, erect, install, and connect up in complete readiness for regular operation, the particular work referred to.

C. "Furnish" means to supply and deliver to the job.

D. "Piping" includes, in addition to pipe, all fittings, valves, hangers, and other accessories related to such piping.

E. "Concealed" means hidden from sight as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.

F. "Exposed" means "not concealed" as defined above. Work in trenches, crawl spaces, and tunnels shall be considered "exposed" unless otherwise specifically noted. Work located in mechanical rooms, accessible attics, open storage rooms, janitor’s closets, on the roof or anywhere outdoors shall be considered “exposed”.

G. "Approved equal" means any equipment or material which, in the opinion of the Architect, is equal in quality, durability, appearance, strength, design, performance, physical dimensions, and arrangement to the equipment or material specified, and will function adequately in accordance with the general design.

H. "Governmental" means all municipal, state and federal governmental agencies.

I. Where any device or part of equipment is herein referred to in the singular number (such as "the pump"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the Drawings.

J. "HVAC" means Heating, Ventilating and Air Conditioning.

K. "Plumbing Contractor" means the Contractor doing Plumbing and Fire Protection Work including Sprinkler Work.

1.03 CODES AND STANDARDS

A. NY State Building Code, Fire Code, Mechanical Code, Plumbing Code, Fuel Gas Code, Energy Conservation Construction Code

B. New Jersey Uniform Construction Code (UCC)

C. NFPA National Fire Protection Association

D. ASME American Society of Mechanical Engineers

E. ANSI American National Standards Institute

F. ASTM American Society for Testing Materials

G. AWWA American Water Works Association

H. IBR Institute of Boiler and Radiator Manufacturers

I. NEMA National Electrical Manufacturers Association

J. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers

K. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.

L. ARI Air Conditioning and Refrigeration Institute

M. UL Underwriters' Laboratories

N. AMCA Air Movement Control Association

O. AABC Associated Air Balance Council

P. Local Water Company Rules and Regulations

Q. National Electric Code

1.04 INTENT

A. It is the intention of the Specifications and Drawings to call for finished work, tested, and ready for operation. All materials, equipment, and apparatus shall be new and of first-class quality.

B. Any apparatus, appliance, material, or work not shown on Drawings, but mentioned in the Specifications, or vice versa, or any incidental accessories, or minor details not shown but necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense to the Owner.

1.05 DRAWINGS

A. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement of equipment, ducts, conduits, piping, and fixtures.

B. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions

and results must be determined at the project and shall have the approval of the Architect before being installed. Do not scale Drawings.

C. Follow Drawings in laying out work and check Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom and space conditions appear inadequate, Architect shall be notified before proceeding with installation.

D. If directed by the Architect, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

E. Piping or ductwork connected to equipment may require different size connection than indicated on the Drawings. The Contractor shall provide transition pieces as required at the equipment.

1.06 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. Any questions or disagreements arising as to the true intent of this Specification or the Drawings or the kind and quality of work required thereby shall be decided by the Architect, whose interpretations thereof shall be final, conclusive, and binding on all parties.

B. **In case of disagreement between Drawings and Specifications, or within either document itself, the better quality, greater quantity or more costly work shall be included in the Bid Price and the matter referred to the Architect's attention for decision and/or adjustment prior to the Contractor's submission of their Bid. If such ambiguity is identified by the Contractor during construction (after bid period), then the Architect shall be consulted merely to decide on the proper technical approach; the more costly work's value shall be included**.

C. Maintain an awareness to avoid space conflict with other trades.

D. Purchase the equipment and material required in accordance with field measurements taken at the proper time during the construction progress.

1.07 VISITING THE SITE

A. Before submitting the final proposal, examine the site of the proposed work to determine the existing conditions that may affect the work, as this Section will be held responsible for any assumptions in regard.

1.08 EQUIPMENT AND MATERIALS

A. The proposal and bid must cover all items on the Drawings and in the Specifications exactly as drawn and specified.

B. All pipe, fittings and valves shall be manufactured in the United States of America.

C. All proposed substitutions of equipment of other manufacturers than those specified shall be attached to the base bid in an itemized list. Directly opposite each item indicate the amount to be added to or deducted from the base bid if the proposal is accepted. Failure to furnish such an itemized list will be interpreted to mean that it is agreed to provide all items exactly as drawn and specified. The information given in the above itemized list will in no way affect the determination of low bidder.

D. Substitutions of material and equipment of makes other than specifically named on the Drawings and in the Specifications and as provided for in the above paragraph will be approved for the following reasons only:

E. The material or equipment proposed for substitution is equal to or superior to that specified; and that the material or equipment called for on the Drawings or in the Specifications cannot be delivered to the job in time to complete the work in proper sequence to the work of other trades, due to conditions beyond control.

F. To receive consideration, requests for substitutions must be accompanied by documentary proof of equality and difference in delivery, if any, in the form of certified quotations from suppliers of both specified and proposed equipment.

G. The words "or approved equal" shall be understood to apply only to those items of equipment and material listed under the paragraph "List of Approved Manufacturers" or as otherwise indicated on the Drawings or in the Specifications.

H. Within ten (10) working days after the acceptance of the proposal, and prior to the submission of any shop drawings for review, a complete list of manufacturers shall be submitted to the Architect of all equipment and materials proposed for the work. No reviews will be rendered on shop drawings submitted before the complete list of manufacturers is reviewed.

I. If material or equipment is installed before the Contractor obtained "No Objections" comment from Architect, and/or in the opinion of the Architect the material or equipment does not meet the intent of the Drawings and Specifications, the removal and replacement shall be made at no extra cost to the Owner.

J. The materials, workmanship, design, and arrangement of all work installed under the Contract shall be subject to the approval of the Architect.

K. If material or equipment is installed before the Contractor obtained "No Objections" comment from the Architect, trade installing same shall be liable for the removal and replacement at no extra charge to the Owner if, in the opinion of the Architect, the material or equipment does not meet the intent of the Drawings and Specifications.

L. The words "or approved equal" are understood to follow:
1. The name of any manufacturer, vendor, equipment or materials.
2. Any trade name, plate number, or catalog number.
3. Any detailed description used to define equipment or material; except where otherwise indicated on the Drawings or in the Specifications.
4. It is the intent of these Specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "or approved equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claim that the substituted item meets the performance requirements with lesser construction (such as lesser heat exchange surface, etc.) Performance as delineated in schedules and in the Specifications shall be interpreted as minimum performance.

M. All equipment and materials required for installation under these Specifications shall be new and without blemish or defect. All electrical equipment shall bear labels attesting to Underwriters' Laboratories approval. Where no specific indication as to the type or quality of the material or equipment is indicated, a first-class standard article shall be furnished.

N. Where it is proposed to use an item of equipment other than that specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring, or of any other part of the mechanical, electrical, or architectural layout, all such redesign, and all new drawings and detailing

required therefore shall, with the review of the Architect and subsequent comments by the Architect "No Exception" or "Exception as Noted" on the shop drawings, be prepared at no additional cost to the Owner.

O. Where such deviation from contract documents requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the Drawings, furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring, and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

P. All equipment of one type (such as fan, coils, etc.) shall be the product of the same manufacturer.

Q. Note that the comments "No Exception" or "Exception as Noted" marked on the shop drawings or other information submitted in accordance with the requirements herein before specified does not assure that the Engineer, Architect, or any other Owner's representative attests to the dimensional accuracy or dimensional suitability of the material or equipment involved or the mechanical performance of equipment. Comments on the shop drawings does not invalidate the Plans and Specifications if the shop drawings are in conflict with the Plans and Specifications.

1.09 SHOP DRAWINGS AND SUBMITTALS

A. Prior to delivery to job site, but sufficiently in advance of requirements necessary to allow Architect ample time for review, submit copies (as stated in "General Conditions") of shop drawings of all equipment, materials, piping, sleeves, conduit, ductwork, and wiring diagrams, and further obtain written comments "No Exception" or "Exception as Noted" for same from the Architect, before installing any of these items.

B. All shop drawings shall be prepared using AutoCAD. Manually drafted shop drawings are prohibited. If a Contractor is incapable of developing CAD drawings in-house, then they shall engage the services of an external drafting service in order to do so. The cost for such service shall be borne by the Contractor and included as part of their bid. Shop drawing submittals shall be on paper as described herein. While shop drawings are being developed and revised throughout the construction process, the Contractor shall continually update the CAD files. As construction approaches completion, these shop drawing CAD files shall be developed by the Contractor into “As-Built” drawings. As part of standard project close-out documents, in addition to providing conventional paper copies of As-Built Shop Drawings, the Contractor must also provide CD’s containing electronic AutoCAD versions of same.

C. Shop drawings shall consist of manufacturer's certified scale drawings, cuts, or catalogs, including descriptive literature and complete certified characteristics of equipment, showing dimensions, capacity, code requirements, motor and drive testing, as indicated on the Drawings or Specifications.

D. Certified performance curves for all pumping and fan equipment shall be submitted for review.

E. Shop drawings submitted with insufficient information shall be rejected without review.

F. All shop drawings and submittals shall be sent electronically in PDF format. Other electronic file formats will be rejected without review.

G. Samples of materials or equipment, when requested by the Architect, shall be submitted for review.

H. Provide a detailed Transmittal with all shop drawings, via email. Any Transmittal, Shop drawing, sample, specification, etc. which is not labeled with all of the following information shall be rejected without review:
   1. Project name
   2. Project location

3. Contractor's name and address, Subcontractor's name and address
4. Applicable section and article number of specifications
5. Contractor's approval stamp and signature
6. Submission number
7. Specific service for which material is to be used.

I. Catalogs, pamphlets, or other documents submitted to describe items on which review is being requested, shall be specific and shall include clear identification in such catalog, pamphlet, etc., of item submitted, with identification clearly made in ink and highlighted. Data of a general nature such as tabulated charts will not be accepted and will be rejected without review.

J. Shop drawings indicating an unsuitable manufacturer shall be rejected without review.

K. The HVAC Subcontractor shall prepare ductwork shop drawings at ⅜"=1'-0" scale and submit to the Architect for their approval to prepare the coordination drawings as called for in paragraph 1.14. Ductwork shop drawings shall be drawn with double line ductwork and shall indicate the elevation above finished floor of all ducts, location and height of building structure (beams, etc.), lengths of fabrication pieces and fittings. Show new and existing work. Shop drawings submitted shall be ready for sheet metal fabrication.

L. The comments "No Exception" or "Exceptions as Noted" rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not in any way relieve responsibility, or necessity, of furnishing material or performing work as required by the Contract Drawings and Specifications.

M. "EXCEPTIONS, AS NOTED" means, unless otherwise noted on the drawings to approved for construction, fabrication and/or manufacture subject the provision that the work shall be carried out in compliance with all annotations and/or corrections indicated on the shop drawings and in accordance with the requirements of the Contract Documents. If also marked "RESUBMIT", "EXCEPTIONS AS NOTED" is invalid and a corrected submittal of the drawing is required.

N. If a shop drawing is resubmitted and does not comply with all of the comments indicated on the previous submission(s), and does not reflect specific reasons for such non-compliance, it shall be rejected without review.

O. Label resubmitted shop drawings with a stamp indicating the submittal number, for example: SECOND SUBMISSION; THIRD SUBMISSION, etc. and send separate transmittals for each item being submitted so that one transmittal does not cover more than one specific item or group of items from one manufacturer.

P. Failure to submit shop drawings in ample time for checking shall not entitle an extension of Contract time, and no claim for extension by reason of such default will be allowed.

Q. Prior to submission of shop drawings, thoroughly check each shop drawing, reject those not conforming to the Specifications, and indicate (by signature) that the shop drawings submitted meet Contract requirements. Deviations and/or exceptions to the contract documents should be clearly noted as being deviations and/or exceptions. The Contractor will later be required to correct such deviation and/or exceptions at his own expense, if they have not been noted and approved on the shop drawing.

R. All shop drawings showing routing of ductwork, piping and conduit, shall be not less than ⅜" = 1'-0" scale.

S. Incorporate a numbering system to help keep track of shop drawing submittals as follows:
1. H or M ..... HVAC shop drawings
2. P ..... Plumbing shop drawings

3. FP.....Sprinkler / Standpipe shop drawings
4. E .....Electrical and Fire Alarm shop drawings

T. Concurrent numbers shall follow the prefix letter. Example: H-1, H-2, etc. In addition, shop drawings requiring resubmission should bear the number of the original submission and bear a suffix as follows: H-1A (second submission), H-1B (third submission), etc.

U. Before request for acceptance and final payment for the work, write a letter to the Architect stating that all shop drawings are brought to a condition "No Exception" or "Exception as Noted". Any outstanding shop drawings must be cleared with the Engineer.

1.10 RECORD DRAWINGS

A. The Contractor shall furnish, coordinate, produce and distribute record drawings as stated within the General Conditions of the Contract.

B. During construction keep an accurate record of all deviations between the work as shown on the Drawings and that which is actually installed.

C. On certain projects where Record Drawings must be on Mylar, secure from the Architect, a complete set of Drawings and note thereon all changes. Make a complete record of all changes and revisions in the original design which exist in the complete work. Furnishing of these transparencies and preparing these Record Drawings shall be at no additional cost to the Owner. When all revisions showing the work as finally installed are made, the corrected Mylar transparencies shall be submitted for review by the Architect. After review of the Record Drawings by the Architect, provide the Owner with one set of black-line prints and Mylar transparencies, at no additional cost to the Owner.

D. Where record drawings are CAD type, provide CD’s containing AutoCAD files of these drawings to the Architect, the Engineer and the Owner.

1.11 LAWS, ORDINANCES, PERMITS AND FEES

A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees, and other costs in connection with the work; file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required Certificates of Inspection for the work and deliver to the Architect before request for acceptance and final payment for the work. File for and obtain all required equipment use permits, Special Inspections, submission of fire alarm as-built drawings, backflow prevention device (BFP) sign-offs, boiler and domestic hot water heater filings with DEP and all other required filings.

B. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings, (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on Drawings and/or specified.

C. All materials furnished and all work installed shall comply with the rules and recommendations of the National Fire Protection Association, with all requirements of local utility companies, with the recommendations of the fire insurance rating organization having jurisdiction, and with the requirements of all governmental departments having jurisdiction.

D. Include in the bid, without extra cost to the Owner, retaining the service of a licensed professional engineer to obtain equipment use permits, filing of sprinkler drawings with hydraulic calculations, DEP BFP sign-off, preparation of fire alarm as-built drawings, testing of all fire and fire smoke dampers, and approvals and all other required filings**.**

1.12 INDEMNIFICATION

A. Pay all royalties and defend all suits or claims for infringement of any patent rights and save the Owner harmless from loss on account thereof.

B. If process or article specified is an infringement of a patent, promptly notify the Architect in writing, and any necessary changes shall be as provided in the Contract for changes in the work. If the Contractor performs any work specified knowing it to be an infringement of patent, he shall bear all costs arising therefrom.

C. Take out all necessary insurance, free of extra charge, and agree to indemnify and save harmless the party contracting for services against loss or expense, by reason of the liability imposed by law upon such party for damages because of bodily injuries, including death at any time resulting therefrom, accidentally sustained by any person or persons or on account of damage to property arising out of or in consequence of the performance of this Contract, whether such injuries to persons or damage to property are due or claimed to be due to any negligence in the performance of the Contract, the party contracting for services, employees or agents, or any other person.

1.13 ORGANIZATION OF WORK

A. The work throughout shall be executed in the best and most thorough manner under the direction of and to the satisfaction of the Engineers, Owners and Architects, who will jointly interpret the meaning of the Drawings and Specifications, and shall have the power to reject any work and materials which, in their judgment, are not in full accordance therewith.

B. The work called for under this Contract shall be carried on simultaneously with the work of other trades in a manner such as not to delay the overall progress of the work. Furnish promptly to other trades involved at the project, all information and measurements relating to the work which they may require. Cooperate with them in order to secure the harmony necessary in the interest of the project as a whole.

C. Furnish and install all work as expeditiously as possible in order to meet all construction schedules.

D. Keep a competent superintendent in charge of the work at all times. Such superintendent shall be replaced if deemed unsatisfactory to the Owner.

E. Upon award of contract, consult with the Architect and negotiate with subcontractors and manufacturers, and within thirty (30) days submit a preliminary list of major equipment for approval, complete with name of manufacturer, dates of purchase orders, and delivery dates to the site. Also submit within thirty (30) days, a preliminary schedule of installation of the various systems. This list shall be revised monthly and resubmitted. The second submittal shall contain the names of manufacturers of scheduled equipment (with names, addresses, and telephone numbers of local representatives).

F. Maintain a complete file of shop drawings at all times available to the Owner's representative.

G. Every facility shall be provided to permit inspection of the work by the Owner's representative during the course of construction.

H. Where items of equipment and/or materials are indicated in the Specifications as being furnished by other trades for installation, assume responsibility for the unloading of such equipment and/or materials from the delivery trucks, and for providing safe storage for same as required pending installation.

I. Where the work is to be installed in close proximity to work of other trades, or where there is evidence that the work is to interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment.

J. If so directed by the Architect, prepare composite working drawings and sections at a suitable scale not less than ⅜" = 1'-0" clearly showing how the work is to be installed in relation to the work of other trades. If the installation is made before coordinating with other trades, make all necessary changes in the work without extra charge to the Owner.

K. Before submitting shop drawings for sleeves, piping and ductwork, the Heating, Ventilating and Air Conditioning Subcontractor shall prepare a combined ⅜" = 1'-0" scale shop drawing for piping and ductwork indicating location of piping and ductwork with dimensions for each floor and Mechanical Rooms. A digital version of these shop drawings shall be given to the Electrical Contractor. The Electrical Contractor shall indicate the location of all lighting fixtures and conduit runs on these shop drawings. The Electrical Contractor shall provide a digital version of the updated shop drawings, with lighting fixtures and conduit runs indicated to the Plumbing Contractor. The Plumbing and Sprinkler Contractor shall indicate his piping on these digital shop drawings.

L. The Heating, Ventilating and Air Conditioning Contractor shall arrange a Coordination Meeting for each floor and Mechanical Equipment Room with Plumbing and Electrical Contractors under the supervision of the General Contractor. After coordination, each Contractor shall digitally sign the a copy. The Heating, Ventilating and Air Conditioning Contractor shall submit these drawings to the Architect for review and he shall call any conflicts that could not be resolved in the coordination meetings, and/or deviation from original design, to the Architect's attention. After receiving written review from the Architect, each Contractor shall prepare the shop drawings as required under the paragraph "Shop Drawings" in the Specifications.

1.14 PROTECTION OF WORK AND PROPERTY

A. Maintain and protect all equipment, materials and tools from loss or damage from all causes until final acceptance by the Owner.

B. Assume responsibility for the protection of any finished work or other trades from damage or defacement by the operations and remedy any such injury or damages.

1.15 TEMPORARY OPENINGS

A. Ascertain from examination of the Architectural Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under the Contract and notify the Architect accordingly. In the event of failure to give sufficient notice to the Architect in time to arrange for these openings during construction, assume all costs of providing such openings thereafter.

1.16 SHUTDOWNS

A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such regular time or at overtime when designated by the Owner at no additional cost to the Owner.

B. The Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

C. Work shall be arranged for continuous performance, including overtime, when approved by the Owner, if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.17 ACCESS DOORS IN FINISHED CONSTRUCTION

A. Install all work so that all parts required are readily accessible for inspection, operation, maintenance and repair. Minor deviations from the Drawings may be made to accomplish this, but changes of magnitude shall not be made without prior written review from the Architect.

B. Wherever mechanisms requiring access for maintenance, reading of instruments, or for operation are concealed in the structure and wherever else indicated on the Drawings, supply access doors of sizes necessary to provide ready access to the concealed items. Group together valves, controls, dampers, traps, expansion joints, cleanouts, gauges, switches, and other equipment requiring access in walls and furred spaces to reduce the number of access doors.

C. Access doors shall be Milcor Style A, B or K, L or M, as manufactured by Inland Steel Products Co. or approved equal. Minimum access door shall be 12" x 12". For installation in plastered wall or ceiling, provide Style "K" or "L" as required. For installation in masonry walls, provide Style "M". For installation in acoustical tile surfaces, provide Style "AT". For installation in acoustical plaster surfaces provide Style "AP". Fire resistive access doors for suspended dry wall ceiling shall be Style ATC's. Provide fire rated access doors at fire rated shafts, stairwells, corridors and at all other walls with Fire Rating.

D. Provide 24" x 24" access door for each duct or pipe shaft. Provide at least one (1) per floor, or as indicated on the drawings. Provide 18” x 24” access door in each outside air and exhaust air plenum.

E. All plumbing, electric and heating and ventilating access doors etc., shall be provided with Corbin #2722-1/2 master keyed cylinder locks. These locks shall be supplied and installed by the respective Contractor. These cylinder locks shall be purchased through the General Contractor's subcontractor for hardware after submission and review of the panel schedule as hereinafter specified.

F. Prepare a schedule showing location of all panels, cabinets, etc. to receive the Corbin lock. This schedule shall designate, by building and room number, the panel or cabinet location and shall be submitted to the Architect. This schedule is required for use in preparation of keying information. Locks shall not be purchased prior to review of this schedule.

G. Access doors for fire and smoke dampers shall be permanently identified on the exterior by a label having letters not less than 0.5 inch in height and reading: **SMOKE DAMPER or FIRE DAMPER or FIRE/SMOKE DAMPER**. This shall include ceiling tiles which provide access to these dampers.

1.18 SCAFFOLDING, RIGGING, HOISTING

A. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of all equipment and materials furnished under this Section of the Specifications, and remove same from premises when no longer required.

B. In the event that supplementary bracing of the basic building structure is required to assure a secure rigging procedure and a secure route for the equipment being handled, assume full responsibility for such supplementary bracing.

1.19 BASES AND SUPPORTS

A. Provide all bases and supports not part of the building structure of required size, type and strength, as approved by the Architect, for all equipment and materials furnished by him. All equipment, bases, and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

B. The Section furnishing the equipment shall provide not less than six-inch high concrete bases for all pumps, refrigeration machines, compressors, fans, humidifier units, air handlers, boilers, etc. and rotating machinery. Bases shall extend six inches beyond machinery base in all directions, with top edge chamfered. Provide ½" x 6" steel dowels into floors to anchor bases. Provide anchor bolts set in pipe sleeves, two sizes larger than anchor bolts for securing machinery. After anchor bolts are aligned with equipment bases, fill sleeves with concrete and allow to set.

C. Concrete pads shall also be provided below any floor-mounted duct support, pipe support and electrical panel support (including switchboards, power panels, starters, VFDs, pull boxes, etc.). Provide six inch high concrete pads below the mounting feet of any of the above duct, pipe or equipment support legs. Provide connection hardware (anchor bolts) as described above for rotating equipment.

D. Concrete bases are specified under other Sections of the Specification. Each Contractor shall furnish dimensioned drawings to the General Contractor. Steel dowels, sleeves and anchor bolts shall be furnished and set by the Contractor.

E. New concrete pads shall be doweled into the existing concrete with ½" rods at corners, drilled 6" deep and grouted. An epoxy bonding agent shall be applied between the old and new concrete. Concrete shall be 3000 psi reinforced with one middle layer 4 x 4 - w2.9 x w2.9.

1.20 SLEEVES, PIPE AND CONDUIT INSERTS AND ANCHOR BOLTS

A. Provide and assume responsibility for the location and maintenance in proper position of all sleeves, inserts, and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done without additional cost to the Owner.

B. All pipes and conduits passing through all walls or partitions shall be provided with sleeves having an internal diameter larger than the outside diameter of the pipe or insulation enclosing the pipe or conduit. Sleeves through masonry walls and partitions shall be Schedule 40 black steel pipe. Sleeves through non-masonry partitions may be 22 gauge galvanized steel sheet metal, set flush with finished surfaces of partitions.

C. Sleeves through foundation walls shall be James B. Clow & Sons № F-1430 or F-1435 cast iron wall sleeve with intermediate integral flange. Sleeves shall be set with ends flush with each face of wall. The space between sleeve and pipe shall be packed with a mechanical rubber seal, such as "Link Seal" manufactured by Thunderline Corp., (VICO) and then with oakum to within 2" of each face of the wall. The remaining space shall be packed and made watertight with a waterproof compound.

D. Sleeves through concrete floors shall be Schedule 40 black steel pipe and extending 1" above finished floors. The open sleeve space shall be packed with non-combustible materials.

E. Inserts shall be preset concrete inserts with steel reinforced rods through the insert and both ends hooked over the reinforced mesh. Inserts shall be of individual type of malleable iron construction with accommodation for removable nuts and threaded rods up to ¾" diameter, permitting lateral adjustment,

except as otherwise noted. Individual inserts shall be Grinnell Fig. 279 up to 5" pipe and conduit, Fig. 282, 6" and up to 8" pipe and conduit, Fig. 152 above 8" and up to 12" pipe and conduit. For figures 282 and 152, they shall come with an opening at the tip to allow reinforcing rods up to ½" diameter to be passed through the insert body. Rods shall extend a minimum of 4" on either side of the insert. Pipes larger than 12" shall be suspended from steel members only.

F. In general, all piping and conduit shall be supported from structural steel building members only or approved malleable steel inserts imbedded in concrete pours. Concentrated loads up to 200 lbs. may use inserts in concrete in buildings having poured concrete floors whose thickness is 6" or more. All other loads shall be supported from steel building members. Inserts shall not be located in any corrugated deck flute as ceiling tabs nor within 2 feet in any direction from ceiling tabs. Inserts shall not be spaced closer than 4 feet on center in all directions.

G. Where layout revisions are required, and are approved after concrete deck is poured, piping conduit 3" and smaller may be supported at Intermediate Points by Phillips' ¾" expansion bolts with lead shields, provided main supports are welded to structural steel and are not more than twenty feet on centers

H. Piping and conduit 3" and smaller shall be supported from existing slab by "Phillips" ¾ expansion bolts with lead shields. Piping 4" and larger shall be supported by means of 4" x 4" x ⅜" clip knee angle with ¾" expansion bolt in shear and supporting rod at 90° from another bolt or using two expansion bolts per hanging post - pipes 8" and larger shall be supported from steel building members. In concrete buildings, add supplementary steel tied into the concrete structural members. Support such piping, conduits and ductwork from the supplementary steel.

I. Provide sleeves for pipes passing through roofs. Sleeves passing through roofs shall be as detailed on drawings extending min. 12" above finished roof. All pipes passing through roof shall be minimum of 10" from walls or other construction to permit proper flashing. Provide counter flashing.

J. Where sleeves pass through waterproofed floors, they shall be IPS brass pipe sleeves of the required diameter, brazed at the bottom to 18" x 18", 16-ounce copper flashing for bond with waterproofing. The tops of the sleeves shall extend 1" above finished floor.

K. No ductwork, piping, conduit or equipment shall be supported from corrugated decking construction. For this area provide supplementary steel to support ductwork, piping, conduit or equipment. Supplemental steel members shall be welded to building structural steel.

L. All hangers, rods and supports shall be installed prior to construction fireproofing.

M. The required fire resistance rating of floor or floor/ceiling assemblies and walls shall be maintained where a penetration is made for electrical, mechanical, plumbing pipes, conduits, ducts and systems. Fire stopping shall be provided at openings around vents, pipes, ducts, conduits at floor levels and walls with non-combustible materials. For openings around pipes and conduits and/or sleeves, 3M product Caulk CP 25 and Putty 303 or approved equal shall be provided.

N. Owner shall retain the services of a NYS Licensed Professional Engineer and under his direction shall inspect the existing spray or fire proofing of existing structural members exposed during the renovation. Provide a report of deficiencies.

1.21 ESCUTCHEONS

A. Provide escutcheons on pipes wherever they pass through ceilings, walls, or partitions.

B. Escutcheons or pipes passing through outside walls shall be Ritter Pattern and Casting Co., № 1, solid, cast brass, flat type secured to pipe with set screw.

C. Escutcheons for pipes passing through floors shall be Ritter Pattern and Casting Co., № 36A, split-hinged, cast brass type, designed to fit pipe on one end and cover sleeve projecting through floor on the other end.

D. Escutcheons for pipes passing through interior walls, partitions, and ceilings shall be Ritter Pattern and Casting Co., № 3A, split-hinged, cast brass chromium plated type.

1.22 MANUFACTURERS' IDENTIFICATION

A. Manufacturer's nameplate, name or trademark, shall be permanently affixed to all equipment and material furnished under this Specification. Where such equipment is in a finished occupied space, the nameplate shall be in a concealed but accessible location. The nameplate of a Subcontractor or Distributor will not be acceptable.

1.23 EQUIPMENT NAMEPLATES

A. Provide for each item of equipment, including panelboards, disconnects, breakers, starters, switches, and all control devices, pumps, fans, compressors, boilers, etc., a permanently attached nameplate made of black surface, white core laminated plastic with incised letters. Subcontractor furnishing equipment shall provide nameplate. Pneumatic, electric and mechanically actuated gauges shall have a brief, but complete description of their function. Stating the air pressure or voltage range alone is not acceptable. Nameplates shall be a minimum of 3" long by 1½" wide and shall bear the equipment name and item number (tag number) in ½" high white letters as designated in the equipment schedule. Nameplates shall be attached to their respective equipment by screws or rivets.

1.24 TAGS AND CHARTS

A. Furnish and attach to each valve as hereinafter specified, a 1½" diameter brass tag with ½" indented numerals filled with durable black compound. Tags shall be securely attached to stems of valves with chain and "S" hooks.

B. Valve charts shall consist of schematic drawings of piping layouts, showing and identifying each valve and describing the function. Upon completion of the work, one (1) copy of each chart, sealed to rigid backboard with clear lacquer placed under glass and framed, shall be hung in a conspicuous location in the main equipment room, unless otherwise directed by the Architect. Two (2) additional unmounted copies in 8½" x 11" leather ring binders shall be delivered to the Architect. Also furnish three (3) copies of schematic flow chart with corresponding valve numbers noted on chart.

C. Provide tags for the following valves:
1. Zone control, bypass, shut-off, check and balancing valves.
2. Building and area shut-off and balancing valves.
3. Control, by-pass, shut-off, balancing and drain valves for major pieces of equipment such as boilers, domestic hot water heaters, heat exchangers, refrigeration machines, pumps, heating, ventilating and air conditioning units, cooling towers, etc.
4. System drain valves, safety and relief valves. Vacuum breakers.

D. Tags on control valves shall bear the valve tag numbers shown on the ATC shop drawings. These shall be brass 1¼” diameter tags, with ½” indented numerals filled with durable black compound. Tags shall be securely attached to steams of valves with chain and “S” hooks.

1.25 IDENTIFICATION

A. Identification shall be in accordance with "Scheme for Identification of Piping System ANSI A13.1" and OSHA safety color regulation.

B. For uninsulated piping up to 3" diameter or insulated piping where OD of insulation is up to 3", markers shall be snap-on type as manufactured by Craftmark, Fort Worth, TX or Seton Nameplate Corp., New Haven, CT (Setmark System), or Bunting Stamp Co. Inc., Pittsburgh, PA or approved equal. Markers shall completely encircle the pipe with a substantial overlap and shall be tight to the OD with no gaps. No adhesive shall be used. They shall be manufactured of U.L. approved, self-extinguishing plastic. When the pipe, including insulation (if any), is 4 inches diameter and larger, markers shall be strap-on type and shall be installed using stainless steel bands. For piping located outdoors, all markers shall be strap-on type for all pipe diameters, and straps shall be of stainless steel. Markers for medical gas piping shall be snap-on type, with Nylon band ties installed as a further measure to prevent loss.

C. In addition to the pipe marker, for insulated piping, the pipe **size** shall be stenciled onto the insulation just before the marker.

D. All pipe and duct markers must include flow direction arrows.

E. Provide identification for piping, ductwork and electrical conduits.

F. All piping and ductwork shall be labeled, whether concealed above ceilings or exposed. Labels shall be installed at intervals no greater than 15 feet (unless noted otherwise) and shall be installed after every turn or elbow, and in every room. Where concealed above ceilings, a minimum of one (1) label shall occur above each room. Due to various above ceiling visual obstructions, the Engineer reserves the right to request additional labels in order to ensure visibility, at no additional cost to the Owner.

G. Pipe shall be lettered and valves tagged in accordance with the schedule below. Lettering shall be located near each valve and branch connection and at intervals of not over 20 feet (10 feet on fire lines, and at least once in each room and in each story traversed for medical gas piping*) on straight runs of pipe. Provide flow arrows on all piping and ductwork labels. Adjacent to the legend, stencil the size of the pipe, conduit or ductwork. Letter Colors are as follows: Yellow with black letters, green with black letters, blue with black letters and red with black letters.

LABEL AND VALVE TAG SCHEDULE			
Service	Label Designation	Color	Tag Designation
Cold Water	Cold Water	Green	C.W.
Hot Water (Plumbing)	Hot Water-Deg. F	Yellow	H.W.-Deg. F
Hot Water Circulating (Plumbing)	Hot Water Cir.	Yellow	H.W.C.
Fire Standpipe	Fire Standpipe	Red	FSP
Sprinkler	Sprinkler	Red	SP
Condenser Water Supply	Condenser Water	Green	C.W.S.
Condenser Water Return	Condenser Water Ret.	Green	C.W.R.
Chilled Water Supply	Chilled Water	Green	CHWS

LABEL AND VALVE TAG SCHEDULE			
Service	Label Designation	Color	Tag Designation
Chilled Water Ret.	Chilled Water Return	Green	CHWR
Refrigerant Suction	Refrigerant Suction	Green	RS
Refrigerant Liquid	Refrigerant Liquid	Green	RL
Refrigerant Hot Gas	Refrigerant Hot Gas	Green	RHG
Air Conditioning Drain	Air Conditioning Drain	Green	----
Safety Valve Discharge	Safety V. Disch.	Yellow	S.V.D.
Relief Vent	Relief V.	Yellow	----
Heating Water Supply	Heat. Water Sup.	Green	H.W.S.
Heating Water Return	Heat. Water Ret.	Green	H.W.R.
Air-Conditioned Supply Air	A.C. Supply Air	Green	----
Return Air	R.A.	Green	----
General Exhaust Air	General E.A.	Yellow	----
Toilet Exhaust Air	Toilet E.A.	Yellow	----
Lab Exhaust Air	Lab E.A.	Yellow	----
Fume Hood Exhaust Air	Fume Hood E.A.	Yellow	----
Outside Air	O.A.	Green	----
Mixed Air	M.A.	Green	----
Dual Temperature Water Supply	Dual Temp Water Sup.	Green	D.T.W.S.
Dual Temperature Water Return	Dual Temp Water Ret.	Green	D.T.W.R.
Reheat Hot Water Supply	Reheat HW Sup.	Green	RH.H.W.S.
Reheat Hot Water Return	Reheat HW Ret.	Green	RH.H.W.R.

H. Tanks, pumps, fans and other equipment shall be labeled to show the number, if any, and service.

I. Exposed conduits for alarm and communication systems shall be banded at intervals of not over 10 feet. Bands shall be of the following colors:

1. Fire Alarm System ..... Red
2. Waterflow and Sprinkler Supervisory System..... Red & Yellow
3. Security System..... Blue & Yellow
4. Mechanical & Electrical Supervisory System ..... Green & Blue
5. Telephone System.....Green & Yellow

J. HIGH VOLTAGE" in black letters two inches high, stenciled at 10-foot intervals over a continuous painted orange background.

K. Except where other means of identification are specified, electric cabinets, switchboards, motor control centers, transformers, system control boards, disconnecting switches, remote control switches, individual motor starters and motor control pushbutton stations shall be stenciled to show the service and number, if any, of the equipment controlled, as appropriate. Panelboards and other electrical equipment located in finished areas, such as offices, shall have the identification placed on the inside of the cabinet doors.

L. Cabinets housing 460Y/265 Volt panelboards shall have "460/265 volt" stenciled in 2-inch high yellow letters on the inside of the cabinet doors.

M. Cabinet housing emergency lighting panelboards shall have the word "EMERGENCY" stenciled in 2-inch high red letters on the outside of the cabinet, in addition to other lettering required above.

N. The bolted covers of housings for disconnecting switches or links in bus ducts between network transformers and switchboards shall be lettered to identify the equipment within.

O. Serial numbers shall be stenciled on the tanks and covers of transformers having their nameplates attached to the high voltage switch chamber covers.

P. Signs for Equipment Controlled through the BAS: For all fans, pumps and other motor driven equipment with start/stop control through the BAS provide a red surface, white core laminated plastic sign with incised letters, permanently mounted on the equipment indicating, “**Warning. This Equipment Is Started and Stopped Automatically from the Building Automation System**.”

1.26 COORDINATION OF MECHANICAL AND ELECTRICAL EQUIPMENT LOCATIONS

A. The space equal to the width and depth plus 6” on either side of the electrical equipment and extending to a height of 6 feet above the equipment or the structural ceiling, whichever is lower, shall be dedicated to the electrical installation and shall not contain piping ducts or other equipment foreign to the electrical installation. Electrical equipment shall include switchboards, panelboards and motor control centers.

B. Examine the drawings, and in cooperation with the Electrical Work confirm the final location of all electrical equipment to be installed in the vicinity of piping and ductwork. Plan and arrange all overhead piping no closer than three feet, and ductwork no closer than one foot from a vertical line to electric switchboards, panelboards, motor control centers or similar equipment.

C. Where the installation of piping or ductwork does not comply with the requirements of foregoing paragraphs, where feasible, the piping and ductwork shall be relocated. Installation of a barrier between piping and ductwork and electrical equipment below will be considered if located more than six feet above the electrical equipment. Refer to NEC Article 110. If piping ductwork and foreign equipment cannot be located outside of the space dedicated to electrical installation, a drip pan as described below can be considered to protect the electrical equipment from condensation, leaks or breaks, but shall be approved by the Engineer after the Contractor has demonstrated that piping, ductwork and/or equipment cannot be installed to avoid this space.

D. Provide galvanized steel gutters as follows:
   1. Provide a gutter of 18 gauge galvanized steel under every pipe and roof drain which is within 2'-0" (two feet) of being vertically over any motor, transformer, electrical controllers, switchboards, panelboards, generator or the like.
   2. Also provide drip pans below any drain piping located above the ceiling in food preparation or storage areas. In such areas, if piping also runs vertical through the floor slab above, then fully

enclose the vertical portion with an extension of said drip pan and fully seal this enclosure to the underside of the floor slab above.

3. Each gutter shall be made watertight, properly suspended; and carefully pitched to a convenient point for draining. Provide a ¾ inch drain, to nearest floor drain or slopsink.
4. In lieu of such separate gutters, a continuous protecting sheet of similar construction, adequately supported and braced, properly rimmed, pitched and drained, may be provided over any such motor, and extending 3'-0" in all directions beyond the motor, over which such piping has to run.

1.27 CONDENSATE DISPOSAL

A. Evaporators and Cooling Coils: Condensate drain systems shall be provided for equipment and appliances containing evaporators or cooling coils. Condensate drain systems shall be designed, constructed and installed with the following:

1. Condensate Disposal: Condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to an approved place of disposal. Such piping shall maintain a minimum horizontal slope in the direction of discharge of to less than ⅛ unit vertical in 12 units horizontal (1% slope). Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.
2. Drain Pipe Materials and Sizes: Components of the condensate disposal system shall be copper pipe or tubing as specified in the piping section of this specification. All components shall be selected for the pressure and temperature rating of the installation. Condensate waste and drain line size shall be not less than ¾" (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with the following:

CONDENSATE DRAIN SIZING	
Equipment Capacity	**Minimum Condensate Pipe Diameter**
Up to 90 tons of refrigeration	1¼"
Over 90 tons to 125 tons of refrigeration	1½"
Over 125 tons to 250 tons of refrigeration	2"

3. Auxiliary and Secondary Drain Systems: Where damage to any building components could occur as a result of overflow from the equipment primary condensate removal system, the following auxiliary protection methods shall be provided for each cooling coil or fuel-fired appliances that produces condensate:
   A water-level detection device shall be provided that will shut off the equipment served in the event that the primary drain is blocked. The device shall be installed in the primary drain line, the overflow drain line, or in the equipment-supplied drain pan, located at a point higher than the primary drain line connection and below the overflow rim of such pan.
   Exception: Fuel-fired appliances that automatically shut down operation in the event of a stoppage in the condensate drainage system.
   a. Water-Level Monitoring Devices: On down-flow units and all other coils that do not have a secondary drain or provisions to install a secondary or auxiliary drain pan, a water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the equipment served in the event that the primary drain becomes restricted. Devices installed in the drain line shall not be permitted.
4. Traps: Condensate drains shall be trapped as required by the equipment or appliance manufacturer.

1.28 TOOLS

A. All special tools for proper operation and maintenance of the equipment shall be delivered to the Owner's representative and a receipt requested for same at no additional cost to the Owner.

1.29 QUIET OPERATION

A. All equipment and material shall operate under all conditions of load without any sound or vibration which in the opinion of the Architect is objectionable. Where sound or vibration conditions arise which are considered objectionable by the Architect, eliminate same in a manner reviewed by the Architect.

1.30 RUBBISH REMOVAL

A. See to it that the project is at all times maintained free of all rubbish, rubble, waste material, packaging materials, etc. accumulating as a result of his work. Assume responsibility for the cleaning up of packaging removed from materials and equipment furnished by other trades for the installation. Note that final acceptance of the work is contingent upon the project being free of all excess and waste materials resulting from the work.

B. Clean all parts of the building exterior spaces and adjacent roads, sidewalks, and pavement, free from material and debris resulting from the execution of the work. Debris resulting from interior construction shall be neatly stacked on each floor near elevators, material hoists and rubbish chutes, as directed by the Architect or his representative. Debris resulting from exterior construction shall be similarly stacked. All debris so stacked will be removed under other Sections. Excess material will not be permitted to accumulate either on the interior, exterior or on sidewalk.

1.31 CLEANING, PIPING, DUCTS AND EQUIPMENT

A. Clean all piping, ducts, and equipment of all foreign substances inside and out before being placed in operation.

B. If any part of a system should be stopped by foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired when the system is reconnected at no additional cost to the Owner.

C. During construction, properly cap all pipes and equipment nozzles so as to prevent the entrance of sand, dirt, etc.

1.32 DELIVERY OF MATERIAL

A. Deliver the material and store same in spaces indicated by the Architect and assume full responsibility for damage to structure caused by any overloading of the material.

1.33 CUTTING AND PATCHING (IN EXISTING CONSTRUCTION)

A. All cutting and patching shall be done under another Section. Furnish the sizes and locations of all chases and openings required for the installation for his work before the walls, floors and partitions are built.

B. As a general rule, chases, shafts and wall openings as shown on the Drawings will be provided for most of the ducts and piping, but promptly arrange with the Construction Supervisor for additional openings should any be required for the work.

C. Provide the labor and materials for all work included under the Contract or Subcontract in ample time and sufficient quantities so that all of the work of the Contract or Subcontract may be installed in proper sequence to avoid unnecessary cutting of the floors and walls.

D. Any cutting and patching required due to the failure to comply with the above provisions, shall be done at no extra cost to Owner. Such cutting and patching shall be done under Division One, as approved by the Architect.

E. Where existing piping or ductwork insulation are damaged by the requirements of the work, replace all damaged insulation to match existing.

F. Refer to Paragraph: "Sleeves, Inserts and Anchor Bolts" for additional requirements.

G. Prior to performing any core drilling or cutting of existing floor or roof slabs, Contractor shall perform a scan of the slab using ground penetrating radar (GPR) to confirm that there are no existing conduits or pipes in area of core drill or cutting of slab.

1.34 ALTERATIONS

A. When new work and alterations render equipment, piping and ductwork useless, such equipment, piping and ductwork when exposed to view, shall be removed and connections thereof to lines or ducts remaining shall be properly capped or plugged and left in construction. If construction, such as hung ceiling, furred beam, chase, etc., is opened up and removed during the course of the construction, the useless pipe and ducts therein shall be treated as though exposed to view. When required to accommodate new work, useless piping and ductwork concealed in construction shall be treated as though exposed to view.

B. When existing piping and duct systems, at points of connection to new work or in rerouting are found defective, such defective portions shall be removed and replaced with new materials without cost to the Owner.

C. Provide temporary supports where required.

D. Where alterations reveal piping, ductwork, conduit circuits, wiring, and accessories that must necessarily remain in service, same shall be rerouted, replaced or altered as required to make same completely concealed in the new work at no additional cost to the Owner.

E. Where existing piping or ductwork insulation is damaged by the requirements of the work, replace all damaged insulation to match existing.

F. Cutting in existing building shall be done by each Contractor as reviewed by the Architect. Rough patching shall be done by each Contractor. Finish patching, ceiling construction removal, new ceiling in existing building will be done under another Section.

1.35 PAINTING

A. All finish painting of MEP/FP work shall be provided as specified below.

B. Painting Schedule
1. No on-site painting is required on the following items unless specifically indicated otherwise:
    a. Stainless steel or aluminum sheet metal.
    b. Stainless steel piping.
    c. Piping or ductwork to be insulated.

d. Insulation on piping or ductwork in unfinished spaces or concealed.
e. Insulated piping covered with stainless steel, aluminum or all service jacketing, unless otherwise specified.
f. Insulated piping in walk-in and non-walk-in tunnels.
g. Mechanical equipment with a factory applied baked-on enamel finish, not specified to be insulated or provided with an enameled steel insulated jacket.
h. Insulated equipment or smokestacks specified or noted on the Drawings to be covered with stainless steel or aluminum sheet metal jacketing.
i. Factory fabricated multi-wall metal smoke flue piping.
j. Concealed piping.

2. Paint the following:
   a. Uninsulated Black Steel Piping:
      1) Exposed in Finished Rooms or Finished Spaces: 1 coat of primer and 2 coats of latex semi-gloss enamel.
      2) Exposed in Unfinished Rooms, or Unfinished Spaces, or in Pipe Shafts: 1 coat of primer and 2 coats of finish.
      3) Exposed Exterior to a Building: 1 coat of primer and 2 coats of exterior acrylic latex gloss enamel.
   b. Uninsulated Galvanized, Cast Iron, Brass or Copper Piping:
      1) Exposed in Finished Rooms or Finished Spaces: 1 coat of primer and 2 coats of latex semi-gloss enamel.
      2) Exposed Exterior to a Building: 1 coat of primer and 2 coats of exterior acrylic latex gloss enamel.
      3) Exposed in Unfinished Rooms or Unfinished Spaces: 1 coat of primer and 2 coats of finish.
   c. Piping in floor trenches after fabrication: primer and finish.
   d. Uninsulated Mechanical Equipment:
      1) Furnished with a Factory Applied Prime Coat Finish: 2 coats of acrylic latex semi-gloss enamel. No primer required.
   e. Vessels, Tanks, and Like Equipment Specified to be Insulated: l coat of corrosion resistant paint, prior to the application of insulation.
   f. Uninsulated Exposed Iron and Steel Surfaces of Boilers, Including the Steel Casing, Buck Stays, Boiler Fronts, Castings, Smoke Pipes, Breeching and the Exposed Surfaces of all Other Iron or Steel Installed in Conjunction with Boiler Work: 1 coat of primer and 2 coats of heat resistant enamel.
   g. Insulated exposed piping in Mechanical Rooms, Boiler Plants, Chiller Plants and Generator Rooms (except on segments of pipe which are clad in aluminum).
   h. Hangers, Supports and Accessories:
      1) Exposed: Paint to match adjacent piping, pipe insulation or ductwork insulation.
      2) All black steel or iron pipe hangers, rods, inserts, brackets and accessories for supporting piping systems and duct systems: 1 coat of primer and 2 coats of latex semi-gloss enamel. Paint black steel hanger rods, threaded on the job site, with a primer immediately after installation.
      3) Metal Fabrications in Finished Spaces: Paint over shop coat with 2 coats of alkyd gloss enamel.
   i. Sheet Metal Work:
      1) Exposed Black Iron, Galvanized Iron, and Aluminum, including Hangers for Insulated and Uninsulated Ductwork, in Finished Rooms, Finished Spaces or Exterior to a Building: 1 coat of primer and 2 coats of latex semi-gloss enamel.
      2) Jacketing on Exposed Insulated Ductwork in Finished Rooms and Finished Spaces: 2 coats of latex semi-gloss enamel. No primer required.

j. Uninsulated Exposed Valves, Flanges, Unions and Irregular Surfaces in Piping Systems Installed in Finished Rooms or Finished Spaces: 1 coat of primer and 1 coat of black heat resistant enamel.
k. Convector enclosures shall be painted at the factory as specified in Section 15835: Convectors.
l. Underground pipe, ducts and conduits - two coats of black asphaltum paint (except when constructed using a pre-engineered underground insulation system with poly jacketing.

C. Color Coding:
1. Apply finish paints of colors indicated opposite the various items listed below where such items are installed in Mechanical Equipment Rooms, Machine Rooms, Boiler Rooms, Penthouse Mechanical Equipment Rooms:
2. Piping, Exposed - Bare and Insulated on Unfinished Spaces and Rooms:
3. Piping Not Listed Above: Color code by classification as follows:
a. Fire Protection ..... Red
b. Dangerous Materials ..... Yellow or Orange
c. Safe Materials ..... Green
d. Valuable Materials ..... Purple
4. Ductwork: Grey.
5. Equipment - Bare and Insulated (Except Factory Painted): Grey.

D. The inside of all ductwork where visible through openings shall be painted with two prime coats of flat black paint.

E. Nameplates on all equipment shall be cleaned and left free of paint. Where equipment is to be painted, the Contractor shall carefully mask of all equipment nameplates and data tags prior to application of paint. Such masking shall be removed after paint has dried.

F. All flashing shall be painted with two coats of waterproof black asphaltum varnish.

1.36 LUBRICATION

A. Assume responsibility that all rotating equipment is properly lubricated as soon as it is connected by the Electrical Subcontractor before operation of this equipment is started. Assume responsibility for any damage to any equipment that is turned on without previously having been oiled or greased when connected up.

1.37 TESTS

A. All piping, wiring, and equipment shall be tested as specified under the various sections of the work. Labor, materials, instruments and power required for testing shall be furnished under the particular Section of the Specifications.

B. Tests shall be performed satisfaction of the Architect. The Architect will be present at such test, when he deems necessary and such other parties as may have legal jurisdiction.

C. Pressure tests shall be applied to piping only before connection of equipment and installation of insulation. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their rating.

D. All defective work shall be promptly repaired or replaced, and the tests shall be repeated until the particular system and component parts thereof receive the review of the Architect.

E. Any damages resulting from tests shall be repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the Architect.

F. The duration of tests shall be as determined by all authorities having jurisdiction, but in no case less than the time prescribed in each Section of the Specifications.

G. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated with and depends upon the operation of other equipment, systems and controls for proper operation, functioning, and performance, the latter shall be operated simultaneously with the equipment or system being tested.

H. The electrical work shall include providing any assistance (such as removal of switchboard and panelboard trims and covers, pull and junction box covers, etc.) deemed necessary by the Architect to check compliance with the Drawings and Specifications.

1.38 OPERATING INSTRUCTIONS

A. Two months prior to the completion of all work and the final inspection of the installation by the Owner, complete Instruction Manual, bound in booklet form and suitably indexed, shall be submitted to the Architect for review. All written material contained in the manual shall be typewritten or printed.

B. The Manual shall contain the following items:

Table of Contents (Plumbing, HVAC and Electrical)

I. Introduction - Explanation of Manual and its use.

II. Description of Systems

1. Complete schematic drawings of all systems.
2. Functional and sequential description of all systems.
3. Relationship of system where applicable to the supervisory data system.

III. Systems Operation

1. Start-up procedures.
2. Shut-down procedures.
3. Reset and adjustment and balancing procedures.
4. Seasonal operation.
5. All posted instruction charts.

IV. Maintenance

1. Cleaning and replacement - lines, components, filters, strainers, ducts, fans, etc.
2. Lubrication.
3. Charging and filling.
4. Purging and draining.
5. Systems trouble shooting charts.
6. Instruments checking and calibration.
7. Procedures for checking out functions with remote (Supervisory Data Console) indication and control.
8. Recommended list of spare parts.

V. Listing of Manufacturers

VI. Manufacturer's Data (Where multiple model, type and size listings are included, clearly and conspicuously indicate those that are pertinent to this installation).

1. Description - Literature, drawings, illustrations, certified performance charts, technical data, etc.
2. Operation.
3. Maintenance - including complete trouble-shooting charts.
4. Parts List.
5. Names, addresses and telephone numbers of local recommended repair and service companies.
6. Guarantee data.
7. Model No. and Serial No. of all equipment.

1.39 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide training on the operation and maintenance for equipment, as indicated within the equipment specification. If not indicated within the equipment specification section, provide the following training:
1. Automatic Temperature Controls: One (1) day within one (1) year of the Owner's acceptance.
2. Humidifier, Inline Fan, and other miscellaneous: four (4) hours.
3. Custom AHU Units: One (1) day.
a. All training shall be by factory authorized representatives, fully trained in the systems and the equipment operation and maintenance.

1.40 GUARANTEE

A. The Contractor guarantees by his acceptance of the Contract that all work installed will be free from any and all defects and that all apparatus will develop capacities and characteristics specified, and that if during a period of one year from date of completion and acceptance of work, one (1) entire heating and cooling season. He shall immediately replace, repair, or otherwise correct the defect or deficiency, including parts, labor and travel time, without cost to the Owner within a reasonable time. Notify the Architect in writing of the time required to do work. For heating systems, the guarantee period must include one continuous heating season from November 1st to May 1st. For cooling systems, the guarantee period must include one continuous cooling season from May 1st to November 1st.

B. Replace or repair to the satisfaction of the Owner any and all damage done to the building or its contents or to the work of other trades in consequence of work performed in fulfilling guarantee.

C. This Article is general in nature and will not waive stipulations of other claims which specify guarantee periods in excess of one (1) year.

D. In the event default on this Guarantee, the Owner may have such work done as required and charge the cost to the Contractor.

E. The date of acceptance shall be the date of final payment by the Owner or notice of acceptance by the Owner, whichever is later.

1.41 OPERATION PRIOR TO COMPLETION

A. The Owner may require operation of parts or all of the installation for the beneficial occupancy prior to final completion and acceptance of the building.

B. The operation shall not be construed to mean acceptance of the work by the Engineer for the Owner. The Owner will furnish supervisory personnel to direct operation of the entire system and the Contractor shall continue to assume this responsibility until final acceptance.

1.42 INSTALLATION OF MOTORS AND CONTROL EQUIPMENT

A. The Electrical Contractor shall furnish and install power wiring for all electrical devices, individual motor starters furnished to him at the job site by other trades.

B. The HVAC Contractor shall provide all wiring for the Automatic Temperature Controls, Combustion Control, Burner and Boiler Control, and condenser water treatment controls, except as otherwise specified herein. This shall include low voltage wiring and 120 VAC power wiring unless electrical drawings show 120 VAC feed for the ATC panels.

C. The Electrical Contractor shall, except where otherwise noted, provide wiring for all Plumbing and Sprinkler Control and Alarm Systems. The Plumbing Contractor shall provide all devices in connection with same.

D. The Electrical Contractor shall provide all low voltage wiring and 120 VAC power to all auto smoke and combination fire/smoke dampers, which shall be controlled from the Fire Alarm Panel.

E. For single phase motors which are not interlocked with other motors and which have temperature control or motor control devices in the power circuit, furnishing of control devices, installation and wiring shall be by the Electrical Contractor.

F. For all HVAC 3-phase motors or HVAC equipment, temperature control wiring, motor control wiring and associated interlocks shall be provided by the HVAC Contractor, including the installation of all control devices. For all plumbing and sprinkler 3-phase motors, equipment control wiring, motor control wiring and associated interlocks shall be provided by the electrical Contractor, including the installation of all control devices.

G. All wiring between fire/smoke dampers and fire alarm panel shall be by the Electrical Contractor. All wiring between the fire alarm panel and air handling equipment for automatic fire alarm shutdown shall be by the Electrical Contractor. All wiring for operation of smoke purge fan and associated floor dampers shall be by the Electrical Contractor.

H. Electrically operated equipment supplied by other trades, which are to be installed and wired by the Electrical Contractor, shall be delivered with detailed instructions for their installation and wiring in sufficient time and proper sequence to meet the work schedule.

I. Each contractor shall furnish all electrical motors, starters and other motor control devices for motor driven equipment required for the work. In his work, the Electrical Contractor shall provide the code required disconnect switches for all motors, except where otherwise noted. The setting of all motors, required for mechanical equipment, including unmounted motors, shall be done as part of the mechanical work.

J. If a motor is replaced (even with the same horsepower) a new starter shall be provided for that motor.

K. Equipment which includes a group of electrical control devices mounted in a single enclosure or on a common base with equipment, shall be supplied completely wired as a unit with terminal boxes or leads ready for external wiring.

L. All electrical items furnished and/or installed as part of the mechanical work shall conform to NEMA Standards, to the requirements of the National Fire Protection Association, and to the requirements of any local authority having jurisdiction. Any field modifications required to ensure such conformance shall be included as part of the mechanical work.

M. The furnishing of floor mounted motor starting equipment shall include the purchase and delivery of channel sills for mounting.

N. Whether or not shown on the drawings, the Electrical Contractor shall furnish and install a local disconnect switch at each motor which is not in sight from the controller location.

O. The supplying of any and all "field instruction" diagrams deemed necessary by the Architect for the complete delineation of electrical wiring for mechanical equipment shall be included as part of the mechanical work.

P. The drawings describing the electrical or the mechanical work may include explanatory wiring diagrams indicating the function intended for the motor control circuits of certain motors. The "field instructions" wiring diagrams required as part of the mechanical work shall conform to these intended functions.

Q. Electric power required for control circuits shall be taken by the HVAC Contractor (Subcontractor) from the electric circuits in the junction boxes left by the Electrical Contractor (Subcontractor) for ATC use as indicated on the electrical drawings. Where junction boxes are not indicated on the electrical drawings, the HVAC Contractor (Subcontractor) shall run power wiring to the nearest electrical panel with spare circuits and provide required circuit breaker. The ATC Contractor (Subcontractor) shall provide and wire all required transformers for the ATC system.

R. The HVAC Contractor (Subcontractor) shall coordinate the control systems with unit ventilator and VAV terminal box manufacturers. The HVAC Contractor (Subcontractor) shall provide all necessary control equipment which is not provided by the unit manufacturer to complete the sequence of operation as specified herein. The HVAC Contractor (Subcontractor) shall provide all field wiring.

1.43 ELECTRIC MOTORS

A. Each Contractor shall provide all electric motors required for driving all motor driven equipment required to be furnished under his Section of the Specification.

B. All motors shall be designed for 3-phase, 60 cycle alternating current operation with 200 volts across the motor terminals, except that, unless otherwise specified herein, all motors ⅓ HP and smaller shall be designed for single phase, 60 cycle alternating current at 120 volts across the terminals. Before ordering motors, ascertain the actual voltages and other current characteristics that will be available and permissible for each motor. Report the same in writing to the Architect and obtain approval before ordering motors. The designation of current characteristics in these Specifications does not relieve the responsibility for ascertaining the actual conditions of electric service available for each motor or for the proper operation of all motors under the actual conditions.

C. The speed, horsepower, type and other essential data for each motor, if not given under paragraphs describing the various motor driven apparatus, or in schedules on the drawings shall be obtained from the manufacturer of the respective apparatus and shall be submitted to the Architect for his review. All two speed motors shall be single winding type.

D. All motors shall be built in accordance with the latest rules of NEMA, of the Institute of Electrical and Electronic Engineers and also as hereinafter specified.

E. Motors ½ HP and larger shall have Class F insulation. All motors shall be rated for continuous duty and shall be designed for temperature rises not to exceed 55°C for fully enclosed type, 55°C for splashproof types and 40°C for all other motors excepting as otherwise specified herein. Motors shall be capable of withstanding momentary overloads of fifty (50%) without injurious heating. They shall operate without excessive heating, flashing or sparking under any conditions within the specified capacity of load and speed. All motors shall operate quietly and shall be replaced if, in the Architect's opinion, they do not do so. All motors which are in the airstream of air conditioning units, shall be totally enclosed type.

F. Motors ½ HP and larger shall have ball or roller bearings with pressure grease lubrication, except where otherwise noted.

G. Direct connected motors shall be furnished without an adjustable base. All motors connected to driven equipment by belt shall be furnished with adjustable sliding bases, except fractional motors with slotted mounting holes.

H. All motor leads shall be permanently identified and supplied with connectors.

I. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed, voltage, phase and current characteristics.

J. The insulation resistance between stator conductors and frames of motors at the time of final inspection shall be not less than one-half megohm.

K. All motors shall be of the proper type for the duty and shall have sufficient torque to start and run the equipment to which they are connected and starting currents and running currents shall not exceed the limits imposed by the laws or rules and regulations of the public authorities having jurisdiction or of the electrical utility company. All motors shall have sufficient horsepower capacity and rated duty to operate the apparatus to which they are connected so as to give the speeds and performances specified, but the horsepower shall be in no case less than that stated herein or shown on the drawings. A schedule giving the characteristics of the motors proposed for each type of service shall be submitted to the Architect for approval.

L. The maximum full load speed of each direct connected motor shall be suitable for the equipment it drives.

M. Except where V-belt drive is specified, the fan wheels for ventilating fans shall be mounted on the motor shafts, which shall be designed for this duty.

N. All motors except motors furnished as an integral part of equipment and factory installed on the equipment, shall be of same manufacture.

O. Polyphase motors shall be squirrel cage induction high efficiency energy saver type, suitable for the starting torque and current requirements.

P. Single phase motors shall be of the capacitor start induction run or split phase type as required for proper operation of the driven equipment.

Q. Where used with VFD equipment, motor shall be rated for inverter service without excessive noise, vibration, hum or damage.

R. All motors operated on variable frequency drives (VFD) shall be equipped with a maintenance-free, conductive microfiber, shaft grounding ring with a minimum of two rows of circumferential microfibers to discharge electric shaft currents within the motor and/or its bearings. Motors up to 100 HP shall be provided with a minimum of one shaft grounding ring installed either on the drive end or non-drive end.

Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided by the motor manufacturer or Contractor and shall be installed in accordance with the manufacturer's recommendations.

S. The efficiency of energy efficient motors shall be verified in accordance with NEMA standard MG1-12.53a. Submittals and shop drawings for all equipment shall state the motor efficiency and shall meet or exceed that listed in the table below. Minimum acceptable efficiency shall be as follows:

Minimum Electric Motor Efficiencies							
Open Drip-Proof (ODP)				Totally Enclosed Fan Cooled (TEFC)			
Motor Size (hp)	Speed (rpm)			Motor Size (hp)	Speed (rpm)		
	1200	1800	3600		1200	1800	3600
1	82.5%	85.5%	77.0%	1	82.5%	85.5%	77.0%
1.5	86.5%	86.5%	84.0%	1.5	87.5%	86.5%	84.0%
2	87.5%	86.5%	85.5%	2	88.5%	86.5%	85.5%
3	88.5%	89.5%	85.5%	3	89.5%	89.5%	86.5%
5	89.5%	89.5%	86.5%	5	89.5%	89.5%	88.5%
7.5	90.2%	91.0%	88.5%	7.5	91.0%	91.7%	89.5%
10	91.7%	91.7%	89.5%	10	91.0%	91.7%	90.2%
15	91.7%	93.0%	90.2%	15	91.7%	92.4%	91.0%
20	92.4%	93.0%	91.0%	20	91.7%	93.0%	91.0%
25	93.0%	93.6%	91.7%	25	93.0%	93.6%	91.7%
30	93.6%	94.1%	91.7%	30	93.0%	93.6%	91.7%
40	94.1%	94.1%	92.4%	40	94.1%	94.1%	92.4%
50	94.1%	94.5%	93.0%	50	94.1%	94.5%	93.0%
60	94.5%	95.0%	93.6%	60	94.5%	95.0%	93.6%
75	94.5%	95.0%	93.6%	75	94.5%	95.4%	93.6%
100	95.0%	95.4%	93.6%	100	95.0%	95.4%	94.1%
125	95.0%	95.4%	94.1%	125	95.0%	95.4%	95.0%
150	95.4%	95.8%	94.1%	150	95.8%	95.8%	95.0%
200	95.4%	95.8%	95.0%	200	95.8%	96.2%	95.4%

1.44 INDIVIDUAL MOTOR STARTERS

A. For single-phase motors ⅓ HP or smaller, starters shall be manual, 120 volts, single-pole or 240 volts, 2-pole with thermal overload protection and pilot light. Where interlocking or automatic control (other than for unit and cabinet heaters) is required, starters shall be combination circuit breaker and magnetic starter with pilot light.

B. For 3-phase motors ½ HP and over, starters shall be full-voltage combination circuit breaker and magnetic across-the-line contactor, rated 208 or 480 volts, 3-pole. All magnetic starters shall have three thermal overloads.

C. Unless otherwise specified, motors 25 HP and over, rated 200 volts and motors 50 HP and over, rated 460 volts shall be furnished with reduced voltage starters of the autotransformer closed transition type.

D. For motors requiring electric interlocks, or automatic control features, starters shall be equipped with the necessary auxiliary relays and contacts to provide the control features desired. All starters shall be provided with "hand-off-auto" twist type switches mounted in cover.

E. Electrical Control Devices
1. Allen-Bradley® Electrical Control Devices are the basis of design,
2. The electrical control devices shall include:
   a. Pilot Devices
   b. Relays and Timers
   c. Miniature Circuit Breakers
   d. Terminal Blocks and Fuse Blocks
   e. Alarms and Signals
   f. Power Supplies
   g. Panel-mounted disconnect switches.
3. The electrical control devices shall be interoperable with standard electrical equipment.

F. Pilot Devices
1. 30.5 MM Push Buttons, Selector Switches and Pilot Lights
   a. 30.5 mm push buttons, selector switches and pilot lights shall be Allen-Bradley heavy industrial Type 4/13 watertight/oiltight metal [Bulletin 800T].
   b. 30.5 mm push buttons, selector switches and pilot lights shall provide EN/IEC 60529 IP66/65 degree of protection.
   c. 30.5 mm push buttons, selector switches and pilot lights shall have electrical ratings of:
      1) Dielectric strength – 2200V for 1 minute [or 300V for 1 minute (Logic Reed)]
      2) Electrical design life cycles – 10,000,000 at max. rated load [200,000 at max rated load (Logic Reed)]
   d. 30.5 mm push buttons, selector switches and pilot lights shall have an operating range of -40 to 131°F (-40 to 55°C).
   e. Illuminated devices shall offer universal LED that accepts 12 to 130 VAC/VDC voltage input.
   f. 30.5 mm push buttons shall have a diaphragm seal for protection from liquids, particles, and corrosive agents.
   g. 30.5 mm selector switches shall incorporate a positive detent to prevent the switch from hanging up between positions.
2. Potentiometer Devices
   a. 30.5 mm potentiometer devices shall be Allen-Bradley heavy industrial Type 4/13 watertight/oiltight metal [Bulletin 800T].
   b. Potentiometer devices shall be rated for 300 VAC/VDC, 2 W maximum (6 VDC minimum):
      1) Mechanical design life – Min. 25,000 cycles
      2) Rotational torque – 3 to 12 in-oz
      3) Stopping torque – Min. 12 in-lb
   c. Potentiometer devices shall have single-turn operation, 312 degree rotation.
   d. Potentiometer devices shall be finger safe.
3. Control Stations
   a. Control stations shall provide Allen-Bradley heavy industrial 30.5 mm push button(s) or selector switch with appropriate contact action, button/lever type and color/legend marking. Devices shall be Type 4/13 watertight/oiltight metal [Bulletin 800T].
   b. Control stations shall be constructed of diecast aluminum.

G. Relays And Timers

1. Relays – Time Delay
   a. Allen-Bradley time delay relays [Bulletin 700-HT] shall mount on tube-type bases with pin-style socket mounting.
   b. Time delay relays shall have 10A, B300, DPDT contact ratings and coil voltages as shown on drawings.
   c. Time delay relays shall have adjustable timing ranges [or fixed timing ranges to avoid tampering]. Timing ranges shall be as shown on drawings.
2. Relays – General Purpose
   a. Allen-Bradley general purpose relays [Bulletin 700-HA] shall have tube-base/Octal 8-pin [or 11-pin] terminals and ON/OFF flag indicators.
   b. General purpose relay contacts shall be silver nickel [or silver nickel bifurcated or gold-plated bifurcated] and have 10A, B300, DPDT [or 3PDT] ratings. Coil voltages shall be as shown on drawings.
   c. General purpose relays shall have an electrical schematic on the faceplate, a clear cover for visual inspection and snap-in marker ability.
   d. General purpose relays shall have LED status indicators, push-to-test and manual override.
3. Relays – Miniature
   a. Allen-Bradley miniature relays [Bulletin 700-HC] shall be square-base, 4-pole, plug-in type with blade-style terminals and ON/OFF flag indicators.
   b. Miniature relay contacts shall be silver nickel [or gold-plated silver nickel] and have 7A [or 10A], DPDT [or 4PDT] ratings. Coil voltages shall be as shown on drawings.
   c. Miniature relays shall have an electrical schematic on the faceplate and a clear cover for visual inspection.
   d. Miniature relays shall have LED status indicators and push-to-test button with incorporated manual override lever.
4. Relays – Industrial-Type
   a. Allen-Bradley industrial-type relays [Bulletin 700-P] shall be ruggedly constructed (10 million operation mechanical life), 2-pole [or 4-pole, 8-pole, 12-pole], configured N.O./N.C. as shown on drawings, and panel- [or strip-, DIN rail-] mounted.
   b. Industrial-type relays shall be finger-safe.
   c. Industrial-type relay contacts shall be silver nickel with a double-break and bifurcated design and 10A, A600 rating for AC [5A, P600 rating for DC].
   d. Accessories shall include adder decks, time delay, latching, surge suppressors and/or mounting strip.
5. Timers – Solid-State
   a. Allen-Bradley solid-state timers [Bulletin 700-FS] shall be DIN rail-mounted.
   b. The solid-state timer contacts shall be available as SPDT or DPDT, 8A.
   c. Solid-state timers shall be available with On-Delay, Off-Delay, On- and Off-Delay, One-Shot and Flasher operating modes as required on the drawings.
   d. Solid-state timers shall have coil surge protection and adjustable timing ranges of 0.05 seconds to 60 hours as shown on drawings.
6. Timers – Programmable
   a. Allen-Bradley programmable timers [Bulletin 700-HX] shall be digital timing relays with LCD display and shall be socket- [or panel-] mounted.
   b. Programmable timer contacts shall be SPDT, rated 5A, B300.
   c. Programmable timer panel surface shall offer Type 4X/IP66 protection.
   d. Programmable timers shall be configurable for Signal On-Delay, Power On-Delay, Off-Delay, Repeat Cycle, One-Shot and Cumulative operating modes as required on the drawings.
   e. Programmable timers shall have timing ranges of 0.000 seconds to 9999 hours, depending on selected mode and as shown on drawings.

H. Miniature Circuit Breakers

1. Miniature circuit breakers shall be Allen-Bradley Circuit Breakers [Bulletin 1489-M].
2. Miniature circuit breakers shall be thermal-magnetic, current-limiting type, sized as specified on the drawings:
   a. 0.5A to 63A current rating
   b. 1-, 2- or 3-pole
   c. Type C or Type D tripping characteristic
3. Miniature circuit breakers shall be UL Listed (E197878), CSA Certified (259391), CE Marked, VDE and CCC Certified and RoHS Compliant. Standards compliances shall include:
   a. UL 489
   b. CSA C22.2, No. 5.1
   c. EN 60947-2
   d. GB 14048.2
4. Miniature circuit breakers shall be rated for:
   a. Voltage – Max. 480Y/277 VAC (UL/CSA); U_e 230/400 VAC (IEC)
   b. Interrupting capacity – 10 kA (UL/CSA); 15 kA (IEC)
5. Housing shall satisfy Insulation Group II/RAL 7035, shall have IP20 finger-safe design, shall be suitable for DIN rail mounting and shall include status indicator window and scratch- and solvent-resistant printing.
6. Miniature circuit breakers shall support reversible line and load connections and shall have dual terminals that:
   a. Connect up to 4 wires, or 2 wires and a bus bar.
   b. Clamp from both sides.
   c. Have a unique design that directs wires into openings to prevent wiring misses.
7. Miniature circuit breakers shall be compatible with UL 508 Listed bus bars, auxiliary contacts, signal contacts, shunt trips and toggle-mount lockout attachments.

I. Terminal Blocks And Fuse Blocks
1. Terminal Blocks – Control, #22 to #8 AWG
   a. Control terminal blocks shall be Allen-Bradley screw-type, feed-through [Bulletin 1492-J].
   b. Control terminal blocks shall be certified:
      1) UR/CSA – #22 to #8 AWG wire range, 50A maximum current, 600 VAC/VDC voltage rating
      2) IEC – 6 mm^2 wire range, 41A maximum current, 800 VAC/VDC voltage rating
      3) ATEX – 6 mm^2 (#20 to #10 AWG) wire range, 36A maximum current, 550 VAC/VDC voltage rating
   c. Control terminal blocks shall have a snap-in card marking system.
2. Terminal Blocks – Power
   a. Power terminal blocks shall be Allen-Bradley [Bulletin 1492-PD]:
      1) Open-style power distribution block with aluminum or copper connectors – 3-pole [or 1-pole], rated at 600 VAC/VDC, 175 to 760A
   b. Power terminal blocks shall be certified by UR, CSA and CE.
   c. Wire ranges and tightening torques shall be labeled on the block.
   d. Power terminal blocks shall have a write-on marking surface or marker retention feature.
3. Fuse Blocks
   a. Allen-Bradley fuse block kits [Bulletin 1491] shall be used for protection of transformers and control circuits capable of delivering no more than 200,000 RMS symmetrical amps, 600V maximum.
   b. Fuse block kits shall be 1-pole, 2-pole or 3-pole.
   c. Each pole shall have a fuse cover.

J. Alarms and Signals
1. Alarm Horn

a. The alarm horn shall be an Allen-Bradley High Performance Electronic Horn [Bulletin 855H] and shall have up to 4 stages and low current consumption.
b. The alarm horn shall have a UV-stable plastic housing and non-moving parts.
c. The alarm horn shall have an on-board microphone, 45 alarm tones selectable by DIP switch and fine volume control via potentiometer.
d. The alarm horn shall allow synchronized output in multi-horn installations and shall have the ability to replicate content to other devices (master/slave).

2. Alarm Beacon
   a. The alarm beacon shall be an Allen-Bradley [Bulletin 855B] with high-intensity, minimum 5-Joule Xenon, minimum 20-Watt Halogen or LED illumination as required on the drawings.
   b. The alarm beacon shall have polycarbonate housing and lens, available in square or round configuration, and Type 4/4X/13, IP65/IP66 ingress rating as required on the drawings.
   c. Flashing frequency shall be 1 Hz.
   d. Alarm beacon lens colors shall be red, green, amber, blue, yellow or clear as required on the drawings.
3. Alarm Light Tower
   a. The alarm light tower shall consist of Allen-Bradley Control Tower™ Stack Lights [Bulletin 854J or K], stacked 1 [or 2, 3, 4, 5] module(s) high and shall be surface- [or vertical-, quick-release-, pole-] mounted.
   b. The alarm light tower shall be 40 mm [or 60 mm] size and the terminal block shall be top-mounted on the base.
   c. The light modules shall be Type 4/4X/13, IP65 and are:
      1) LED (steady, flashing or strobe)
   d. The alarm light tower shall include a continuous (or pulsing) piezo [or transducer] sound module.
   e. The alarm light tower shall have a DeviceNet base.
4. Signal Alarm (Panel Mount)
   a. The signal alarm shall be an Allen-Bradley Panel Mount Signaling Alarm [Bulletin 855P] in a 30 mm [or 45 mm, 65 mm] size, that mounts in a standard 22.5 mm hole.
   b. The signal alarm shall have polycarbonate base and lens.
   c. The signal alarm shall be combination sounder and LED
   d. The signal alarm shall be rear-securing and finger-safe.

K. Power Supplies
1. Control Power Transformer
   a. The control power transformer shall be an Allen-Bradley Global Control Transformer [Bulletin 1497], single-phase and sized as shown on drawings.
   b. The control power transformer shall be epoxy encapsulated and shall offer EN 60-529 finger-safe protection.
   c. The control transformer shall have a dual primary and secondary fuse block, pre-wired and top-mounted.
2. 24 VDC Power Supplies
   a. 24 VDC power supplies shall be Allen-Bradley [Bulletin 1606-XL] with active or passive PFC choke and input as shown in drawings [or auto-select input].
   b. 24 VDC power supplies shall have low inrush current, and power supplies with greater than 100-Watt output shall incorporate a minimum 120% Power Burst design.
   c. 24 VDC power supplies shall have NEC Class 2 “Limited Power” output.
3. UPS
   a. The UPS shall be an Allen-Bradley Industrial Uninterruptible Power Supply [Bulletin 1609-B/D] with 120 VAC input voltage and output power as shown on drawings.
   b. The UPS shall be back-of-panel- [or DIN rail-] mounted.
   c. The UPS shall provide:

1) Surge protection to 380 Joules
2) Overload protection, resulting in delayed shutdown at 110 to 130% and immediate shutdown at 130%
3) Protection against output short on line – over-current protection from premises branch circuit
4) Protection against output short on battery, resulting in shutdown
5) Thermal protection

d. The UPS shall have USB communications and software, integrated remote on/off and dry I/O contacts.
e. The UPS shall have EtherNet/IP communications, expandable battery capacity and/or pure sine wave output.
f. The UPS shall perform to 40°C [50°C, with hi-temp battery].

L. **Disconnect/breakers shall be external flange mounted type, all metal construction with painted handle, lockable, similar to Allen Bradley Model 1494F-M1-412**. Plastic switches and twist type disconnects and breakers shall not be used.

M. In addition to any auxiliary contacts required for interlocking purposes, each magnetic starter shall be equipped with one normally open auxiliary control circuit contact either for "sealing in" or as a spare for future use.

N. Indicating lights shall be transformer or series resistor type. There shall be one red light for each single speed motor to indicate when motor is running. For multiple speed motors one indicating light for each speed shall be provided.

O. The starter disconnecting means shall be circuit breakers. The external operating handle shall clearly indicate "ON" or "OFF" position of the switch and shall be interlocked with the door to require throwing the handle to the "OFF" position to open the door. The handle shall be arranged for locking both the door closed and the disconnect in the "OFF" position with up to 3 padlocks. Provide defeat device in cover to permit opening door in "ON" position.

P. Circuit breakers in combination starter units shall be of the magnetic trip type with an adjustable trip setting for selecting instantaneous trip points of fault protection (motor circuit protector). Field adjustment of the instantaneous trip shall be performed by the Electrical Contractor. Select the trip setting at approximately 10 times the motor nameplate full-load current. If the circuit breaker trips on starting, incrementally increase the settings. In no case shall the trip setting exceed 13 times the motor full-load current.

Q. Overload heaters shall be furnished for all starters and shall be sized in range of 115 to 125 percent of full load current. The motor starters shall be shipped with the overload heaters inside the compartment but not installed. The Electrical Contractor shall verify the ratings of the heater coils based on the motor nameplate data before installing the overloads. The Contractor supplying the starter shall replace any improperly selected heaters.

R. A transformer shall be supplied in each starter unit for 120 volt control voltage. Transformer capacity shall be adequate to supply the holding coil requirements plus the solenoids, e-p switches, relays and other devices required to be controlled from the starter. A fuse shall be supplied in one secondary terminal of the control transformer. The other terminal shall be grounded to the housing of the starter. Fuses shall be also provided in the transformer primary leads per the National Electrical Code.

S. All enclosures shall be NEMA Type 1 steel with hinged cover for general purpose indoor application, unless otherwise indicated. Enclosures shall be arranged for equipment or wall mounting. Weather resistant

NEMA 3R steel enclosures shall be provided for all outdoor starters. All devices mounted on the outside of all enclosures shall be NEMA 4.

T. Each starter shall be clearly identified by engraved nameplates after installation. The nameplates shall be plastic black plates with ½" high white letters and shall be securely fastened to starter with mounting screws made of non-corrosive metals.

U. Stainless steel flush mounted starter and enclosures shall be provided for all starters located in the kitchen and dishwasher areas.

V. All starters, except those furnished as an integral part of equipment and factory installed on the equipment, shall be of the same manufacturer.

W. Starters shall be as manufactured by Westinghouse, General Electric, Square D, Eaton/Cutler-Hammer, or Allen-Bradley.

X. Shop drawings shall be provided with dimensions, ratings, wiring diagrams and schedule of nameplates for approval prior to fabrication.

Y. If a motor is replaced (even with the same horsepower), a new starter shall be provided for that motor.

1.45 SEMI-FINAL AND FINAL SITE VISITS FOR OBSERVATION

A. As the project approaches completion, the Engineer and Architect, at their discretion shall determine a period of time in which they shall perform a Semi-Final Site Visit to observe the Mechanical and Electrical installation. At the conclusion of this Semi-Final Site Visit, a Semi-Final Punchlist shall be issued to the appropriate Contractor for the deficiencies in the work of his trade. Complete all work and perform all corrective measures as required by the Semi-Final Punchlist. After this corrective and completion work has been accomplished, in writing, advise the Architect and the Engineer that every item on the Semi-Final Punchlist has been completed. After the Architect and Engineer make a Final Site Visit to observe the Mechanical and Electrical installation and make a Punchlist, a similar letter of Compliance shall be forwarded through the appropriate channels.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.01 INSTALLATION OF EQUIPMENT

A. The Contractor shall be responsible for the installation of all equipment in accordance with the Manufacturer's Installation/Operation & Maintenance Manuals and instructions. If other requirements of this Specification contradict what is stated in the Manufacturer's instructions, the matter shall be brought to the attention of the Architect and Engineer for clarification. Any and all of the Manufacturer's requirements for utilities (electrical power and control wiring, piped water, drain, gas, fuel oil, steam, condensate, etc.), ducted supply or exhaust air, mounting and support shall be provided by the Contractor, regardless of how, or whether or not stated elsewhere in the Contract/Bid Documents.

END OF SECTION

SECTION 01 91 13

COMMISSIONING-GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The purpose of the commissioning process is to provide the Owner/Operator of the facility with a high level of assurance that the mechanical and electrical systems have been installed in the prescribed manner and operate within the performance guidelines set in the design intent. The Commissioning Authority shall provide the Owner with an unbiased objective view of the system=s installation, operation, and performance. This process is not to take away or reduce the responsibility of the design professionals or installing contractors to provide a finished product. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems to beneficial use by the owner. The Commissioning Authority will be a member of the construction team, cooperating and coordinating all commissioning activities with the design professionals, construction manager, contractors, subcontractors, manufacturers and equipment suppliers.

1.02 SCOPE

A. The functions and responsibility of the Commissioning Authority shall include:
1. Responsibility: The primary point of responsibility is to inform the Owner on the status, integration, and performance of systems to be commissioned within the facility.
2. Information: The Commissioning Authority shall function as a catalyst and initiator to disseminate information and assist the design and construction teams in the completion of the construction process for the commissioned scope of work. This shall include system completeness, performance, and adequacy to meet the intended performance standards of each system. Services include construction observation, spot testing, supervision of verification and functional performance testing, and providing performance and operating information to the responsible parties, e.g., contractors, design professionals, and the Owner.
3. Quality Assurance: Assist the responsible parties to maintain a high-quality level of installation and system performance.
4. Observation of tests: Commissioning Authority shall observe, coordinate and supervise testing as required to ensure system performance meets the design intent parameters.
5. Documentation of tests: Commissioning Authority shall document the results of the performance testing directly and/or ensure that all testing is documented by the appropriate technicians. The Commissioning Authority shall provide standard forms to be used by all parties for consistency of approach and type of information to be recorded.
6. Resolution of disputes: The Commissioning Authority is to remain an independent party present on the project with specific knowledge of the project. Should disputes arise, the Commissioning Authority shall perform research to determine the scope and extent of the problem and educate the involved parties as to the nature and extent of the problem. This shall include technical and financial aspects of the dispute, including assistance to help identify who the responsible parties are to implement corrective action. The Owner/Architect shall preside over resolution of the problem.
7. Deficiencies: Provision of technical expertise to oversee and verify the correction of deficiencies found during the commissioning process.
8. Acceptance: The Commissioning Authority shall determine and advise the Owner of the date of acceptance for each component and system for start of the warranty period.

9. Provision of technical expertise to review and edit operating and maintenance descriptions by system.

B. The Commissioning Agency is referred to as an independent contractor in this Division and shall work under a separate contract directly for the Owner.

C. The Commissioning Agency shall not be financially, associated with any of the contractors on this project to avoid potential conflicts of interest.

1.03 SYSTEMS TO BE INCLUDED IN COMMISSIONING PROCESS

The following pieces of equipment and systems shall be subject to commissioning:

A. HVAC
1. Pumps
2. Air Handling Units
3. VFD
4. Piping System
5. Ductwork System
6. TAB
7. Controls

1.04 COORDINATION

A. The Commissioning Authority shall receive directly from the design professional(s) a copy of all the construction documents, addenda, change orders, and appropriate approved submittals and shop drawings of all the equipment or system to be commissioned.

B. The Commissioning Authority shall disseminate written information and documents to all responsible parties relative to the nature and extent of the communication.

C. The Commissioning Authority is primarily responsible to the Owner, and as such, shall regularly apprise the Owner of progress, pending problems and/or disputes, and shall provide regular status reports on progress with each system to be commissioned. Any potential change in the contractual and/or financial obligations of the Owner (credits, change orders, schedule change, etc.) shall be identified and quantified as soon as possible.

D. The Commissioning Authority shall coordinate the schedule of commissioning activities with the construction schedule. It is possible that some procedures will be implemented before the entire system is completed.

1.05 SCHEDULE

A. Commissioning of systems shall proceed per the criteria established in the specific sections that follow, with activities to be performed on a timely basis. The Commissioning Authority shall be available to respond promptly to avoid construction delays.

B. Start-up and testing of systems may proceed prior to final completion of systems to expedite progress. However, the Commissioning Authority shall not supervise standard, regular testing and checkout services that are the primary responsibility of the contractor/vendor in advance of their commissioning testing and checkout.

C. Problems observed shall be addressed immediately, responsible parties notified, and actions to correct deficiencies coordinated in a timely manner.

D. Contractor schedules and scheduling is the responsibility of the CM. The Commissioning Authority shall provide commissioning scheduling information to the CM for review and planning activities.

1.06 RELATED WORK SPECIFIED ELSEWHERE

A. Commissioning requires support from the Contractors. The commissioning process does not relieve any Contractors from their obligations to complete all portions of work in a satisfactory and timely manner.

B. Refer to Section 23 08 00 of Division 23 regarding roles and responsibilities relative to the commissioning process.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. All industry standard test equipment required for performing the specified tests shall be available at the project site. Any proprietary vendor specific test equipment shall be provided by that vendor or manufacturer.

B. Any portable or hand-held setup / calibration devices required to initialize the control system shall be made available by the control vendor (at no cost) to the Commissioning Authority.

C. The instrumentation shall meet the following standards:
1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required.
2. Be calibrated at the manufacturer recommended intervals with calibration tags permanently affixed to the instrument.
3. Be maintained in good repair and operating condition throughout the duration of use on this project.
4. Be immediately re-calibrated or repaired if dropped and/or damaged in any way during use on this project.

PART 3 - EXECUTION

3.01 COMMISSIONING PLAN AND SCHEDULE

A. The Commissioning Authority shall develop and submit a schedule for the commissioning process which shall be integrated with the construction schedule. Included shall be the required work by all team members (Commissioning Authority, design team, contractors, and the Owner). Overlay with the construction schedule, and include time for test and balance, verification, and functional performance testing.

3.02 CONSTRUCTION OBSERVATION

A. This is an additional and separate activity from that provided by the design team. Construction observation is required as part of the commissioning and coordination process to be provided by the Commissioning Authority.

3.03 TEST AND BALANCE

A. Air balance shall be accomplished by an independent test and balance firm. The Commissioning Authority shall spot check this work to verify accuracy of results.

3.04 VERIFICATION AND FUNCTIONAL PERFORMANCE TEST PROCEDURES AND ACCEPTANCE PROCEDURES

A. Personnel experienced in the technical aspects of each system to be commissioned shall implement and document the commissioning procedure to be used outlined in the Checklists. Verification checklist and functional performance checklist shall be provided for each system and shall be reviewed by the appropriate design engineers for technical depth, clarity of documentation and completeness. Special emphasis shall be placed on testing procedures that shall conclusively determine actual system performance and compliance with the design intent.

B. The Commissioning Authority shall determine the acceptance procedures for each commissioned system within Division 23 discipline. The acceptance procedures shall incorporate the commissioning standards and successful testing results as referred to throughout Division 23 specifications.

C. The appropriate contractor and vendor(s) shall be informed of what test are to be performed and the expected results. Whereas some test results and interpretations may not become evident until the actual test are performed, all parties shall have a reasonable understanding of the requirements.

D. Acceptance procedures shall confirm the performance of systems to the extent of the design intent. When a system is accepted, the Owner shall be assured that the system is complete, works as intended, is correctly documented, and operator training has been performed.

3.05 SOFTWARE DOCUMENTATION REVIEW

A. Review detailed software documentation for all DDC control systems related to the commissioned equipment and systems. This includes review of vendor documentation, their programming approach, and the specific software routines applied to this project. Discrepancies in programming approaches and/or sequences shall be reported and coordinated in order to provide the Owner with the most appropriate, simple, and straightforward approach to software routines.

3.06 OPERATING AND MAINTENANCE (O&M) MANUALS

A. The Commissioning Authority shall review the draft form of the O&M manuals related to the commissioned equipment and system and provided by the Division 23 Contractor. The review process shell verify that O&M instructions meet specifications and are included for all equipment furnished by the contractor, and that the instructions and wiring diagrams are specific (edited where necessary) to the actual equipment provided for this project. Published literature shall be specifically tailored to the provided equipment, indicating required operation and maintenance procedures, parts lists, assembly/disassembly, diagrams emergency telephone numbers, and related information. The Contractor shall incorporate the standard technical literature into system specific formats for this facility as designed and as actually installed. The resulting O&M Information shall be system specific, concise, to

the point, and tailored specifically to this facility. The Commissioning Authority shall review and edit these documents as necessary for final corrections by the contractor.

B. The O&M manual review, and coordination efforts shall be completed prior to Owner training sessions, as these documents are to be utilized in the training sessions.

3.07 TRAINING

Schedule and coordinate training sessions for the Owner's staff for each system to be commissioned. Training shall be in a classroom setting with the appropriate schematics, handouts, and visual/audio training aids on-site with equipment.

A. The Commissioning Authority organizes, schedules, and directs the training sessions.

B. The appropriate installing contractors shall provide training on all the major systems per specifications, including aspects, peculiarities specific to this project.

C. The equipment vendors shall provide training on the specifics of each major equipment item subject to commissioning including philosophy, troubleshooting, and repair techniques.

D. The automatic control vendor shall provide training on the control system per their specification section.

3.08 RECORD DRAWINGS

A. The Commissioning Authority shall review the as-built contract documents to verify incorporation of both design changes and as-built construction details. Discrepancies noted shall be corrected by the appropriate party.

3.09 EXCLUSIONS

A. Responsibility for construction means and methods: The Commissioning Authority is not responsible for construction means, methods, job safety, or any construction management functions on the job site.

B. Hands-on work by the Commissioning Authority: The contractors shall provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring equipment and systems into, a fully operational state. The Commissioning Authority shall coordinate and observe these procedures (and may make minor adjustments), but shall not perform construction or technician services other than verification of testing, adjusting, balancing, and control functions.

END OF SECTION

SECTION 21 00 00

GENERAL REQUIREMENTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. Division 21 of the specifications requires the furnishing and installing of all items, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include, but are not limited to, materials, labor, supervision, supplies, equipment, transportation, rigging, storage, utilities, and all required permits and licenses.

B. Before submittal of bid, examine all drawings, specifications, addenda, alternates, special conditions, and all other bidding documents of all sections of this project, verify all governing conditions at the site, and become fully informed as to the extent and character of the work required, as well as its relation to other work in the building. Submittal of a bid is an agreement to all requirements of the Contract Documents, and no consideration will be granted for any claimed misunderstanding thereof.

C. Submittal of a bid is a representation by the bidder that it is qualified in all respects properly to perform the work for which it is bidding and has experience with similar work. Bidders are deemed to be aware, on the basis of their background and experience, materials which may be required in their responsibilities, even though unspecified.

1.2 ABBREVIATIONS

ADA	Americans with Disabilities Act
AGA	American Gas Association
AHJ	Authority Having Jurisdiction
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ASA	Acoustical Society of America
ASME	American Society of Mechanical Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
BSA	New York City Board of Standards & Appeals
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
EPA	Environmental Protection Agency
ETL	Electric Testing Laboratory
FM	Factory Mutual
IEEE	Institute of Electrical and Electronic Engineers
IRI	Industrial Risk Insurers
MSDS	Materials Safety Data Sheet

MSS	Manufacturers' Standardization Society Standards.
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code (NFPA 70)
NEMA	National Electrical Manufacturers Association
NETA	National Electrical Testing Agency
NFPA	National Fire Protection Association
NUSIG	National Uniform Seismic Installation Guidelines
NYCEC	New York City Electrical Code
NYCMC	New York City Mechanical Code
OSHA	Occupational Safety Health Administration.
OTCR	New York City Office of Technical Certifications and Research
PDI	Plumbing and Drainage Institute
TEMA	Tubular Exchangers Manufacturers Association
UL	Underwriters Laboratories

1.3 DEFINITIONS

A. For purposes of these specifications the following definitions apply:

1. ARCHITECT: The Architect of record.

2. ENGINEER: The Engineer of record.

3. CONTRACTOR: The individual, partnership or corporation to whom has been awarded the contract for providing the fire protection work.

4. SUBCONTRACTOR: The individual, partnership or corporation to whom has been awarded the contract for providing assistance to the Contractors work.

5. GENERAL CONTRACTOR: An individual or group that contracts with another organization or individual (Owner) for the construction of a building or other structure. They may or may not do any actual construction of a portion of the project.

6. CONSTRUCTION MANAGER: An individual or group that contracts with another organization or individual (Owner) for the scheduling and coordination of all design and construction processes, including the selection, hiring and oversight of specialty Trade Contractors, for a building or other structure.

7. PROVIDE: To "furnish" and "install".

8. INSTALL: To join; unite; fasten; link; attach; set up or otherwise connect together; complete, tested and ready for normal satisfactory operation.

9. FURNISH: To supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application.

10. AS DIRECTED: As directed by the Architect or the Engineer.

11. CONCEALED: Embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings or accessible raised floor cavities.

12. SUBMIT: Submit to the Architect and/or the Engineer for review.

13. FINISHED SPACES: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

14. EXPOSED: Exposed to view.

15. SUPPLY: To purchase, procure, acquire, and deliver complete with related accessories.

16. WORK: Includes labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.

17. PIPING: Includes pipe, tube, fittings, flanges, valves, controls, strainer, hangers, supports, unions, traps, drains, insulation, and all related accessories.

18. WIRING: Includes raceway, fittings, wire, boxes, and all related accessories.

19. INDICATED: As shown or noted on the drawings or specifications.

1.4 RELATED DOCUMENTS

A. The General Conditions and Supplementary Conditions accompanying these specifications are hereby made a part of the requirements for the work under this section of the specifications.

B. No General Conditions and/or Supplementary General Conditions clause referring to the work of this section shall be considered waived unless specifically stated herein.

C. Refer to Owner's "Commissioning Requirements" for the scope of work related to systems furnished and installed under Division 21.

1.5 REFERENCE STANDARDS

A. Comply with the currently enforced versions of all applicable laws, rules, regulations, codes and ordinances of New York City and shall be BSA approved or have an OTCR approval. Modifications required by the Authorities Having Jurisdiction shall be made without additional cost to the Owner.

1. Secure and pay for necessary approvals, permits, inspections, carting, legal dumping, etc., and deliver the official records of the granting of permits to the Owner without additional cost to the Owner.

2. The drawings have been filed. Contractor shall pay all fees to obtain release of approved plans and shall complete and file all forms, tabulations, plans, etc., required for Special Inspections.

3. Where so required by the Building Code of the City of New York, the Owner shall employ the services of a Special Inspector to perform inspections of materials, installations, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

B. All equipment, materials, and methods to be furnished and/or installed by this division shall comply with all applicable requirements of laws, codes, ordinances, legislation, standards, etc., of all federal, state, and local authorities, whether indicated on the Contract Documents or not.

C. Where Contract Drawing and specification requirements are in excess of rules, regulations and code requirements, and are permitted under the code, the Contract Drawings and specifications shall govern. In the event of a conflict between the Contract Documents and the applicable laws, rules, regulations, codes, and ordinances of federal, state, and local Authorities Having Jurisdiction, the latter shall govern.

D. Where alterations to and/or deviations from the Contract Drawings and specifications are required by the Authorities listed above, report the requirements to the Architect and secure his written approval before starting the required modifications.

E. Pay royalties or fees required in connection with the use of patented devices, or systems, and save the Owner, the Engineer and the Construction Manager harmless from any claims or lawsuits arising from such use and indemnify each thereof against attorneys' fees in connection therewith.

1.6 QUALITY ASSURANCE

A. All materials and equipment shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products of the type specified herein. The manufacturer shall have been in continuous operation in the manufacture of the products specified for a minimum of ten (10) years.

B. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

C. Make every effort to furnish all equipment of any equipment type (such as pumps, hot water heaters, storage tanks, etc.) from one manufacturer.

D. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A "Materials Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

E. All adhesives specified herein or utilized in the manufacture of equipment or components which are specified herein shall meet or exceed the volatile organic compound (VOC) limits of South Coast Air Quality Management District Rule No. 1168.

F. All sealants specified herein or utilized in the manufacture of equipment or components which are specified herein shall meet or exceed Bay Area Resources Board Reg. 8, Rule 51. Submit as part of the shop drawing process for review by the Engineer and/or Owner, supporting documentation which demonstrates conformance with these requirements.

G. In the event that products, materials and/or processes are not available that do not contain asbestos, PCB's, VOC's formaldehyde formulations, hazardous materials or may result in hazardous out-gassing as determined by the manufacturer a "Materials Safety Data Sheet", as

described above, shall be submitted as part of the shop drawing process for review by the Engineer and/or Owner.

H. Furnish all equipment, materials and accessories new and free from defects.

1.7 ENGINEERING REFERENCE POINTS

A. The Construction Manager shall provide benchmarks, monuments, and other reference points on the job which will be available for this Contractor's use.

B. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

1.8 INDEMNIFICATION

A. Covenant and agree that this Contractor and his Subcontractors and his and their agents, servants and employees will provide and maintain a safe place to work and that he and they will comply with all laws and regulations of any governmental Authority Having Jurisdiction thereof.

B. This Contractor agrees to indemnify, defend and hold harmless the Owner, Owner's agents and Engineer from and against any liability, loss, damage or expense, including attorneys' fees, arising from a failure or alleged failure on the part of this Contractor, his Subcontractors and his and their agents, servants and employees to provide and maintain a safe place to work or to comply with all laws and regulations of any governmental Authority Having Jurisdiction thereof.

C. This Contractor agrees to indemnify, defend and hold harmless the Owner, Owner's agents and Engineer from and against any liability, loss, damage or expense, including attorneys' fees, arising from a failure or alleged failure on the part of this Contractor, his Subcontractors and his and their agents, servants and employees to discharge the obligations assumed by him or them in the performance of the work, including any act or omission allegedly resulting in death or personal injury or property damage, or due to improper construction, construction techniques, or the use of improper or inappropriate material or tools.

1.9 COMPLETE PERFORMANCE OF WORK

A. Work shall be executed in strict accordance with the best practice of the trades in a thorough, workmanlike manner by competent, skilled technicians and trade personnel.

B. This Contractor shall provide a competent, experienced, full-time Superintendent who is authorized to make decisions on behalf of the Contractor.

C. All labor, materials, apparatus, and appliances essential to the complete and proper functioning of the systems described and/or indicated herein, or which may be reasonably implied as essential, whether mentioned in the Contract Drawings and specifications or not, shall be provided by the Contractor. The entire installation shall be ready in every respect for the satisfactory and efficient operation when completed.

D. In cases of doubt as to the work intended, or in the event of need for explanation thereof, request supplementary written instructions in the form of a Request for Information (RFI) from the Architect and/or Engineer.

E. Coordinate the work specified herein and shown on the Contract Drawings with all other trades.

F. Be responsible for material and workmanship until completion and final acceptance. Replace any of same which may be damaged, lost or stolen, without additional cost to Owner. Guard the building and its contents against damage by this Contractor, his employees or Subcontractors, and make good any damage free of charge.

G.

H. Where, due to union regulations or trade agreements, any of the work shown on the drawings or specified herein is not considered this trade's work, subcontract the work in question, but assume full responsibility for the complete installation. Except for such changes as may be specifically approved by the Architects and Consulting Engineers, in accordance with alternates or options stated hereinafter, all work must be in full accordance with the intent of the plans and specifications, complete in every way and ready for satisfactory and efficient operation when delivered to the Owner.

I. Provide signs required by the Authorities Having Jurisdiction.

J. Provide all rigging required for complete installation and furnish drawings showing necessary points of support, reactions and supplementary bracing. This shall be submitted for approval by the Owner. Should any shoring be required, provide same after Owner's approval.

K. Become thoroughly acquainted with the work involved, obtain and verify at the building all measurements necessary for the proper installation of work. Furnish to other Contractors any information relating to work of this division necessary for the proper installation of their contracts. Coordinate with other Contractors for finish adjacent to work of this section and arrange to have visible portions of the work (such as access doors, escutcheons, etc.) fit in with the finish in a manner satisfactory to the Architects.

L. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

M. Wherever this Contractor's work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to ensure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items (valves, dampers, pull boxes, etc.) in an approved manner in order that the other trades may know where to install such items such as access doors, panels, etc.

N. Provide required supports and hangers for piping and equipment, so that loading will not exceed allowable loadings of structure. Submittal of a bid shall be deemed a representation that the Contractor submitting such bid has ascertained allowable loadings and has included in his estimates the costs associated with furnishing required supports.

O. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this section shall be coordinated through the Construction Manager and approved by the Structural Engineer. All such drilling, cutting and reinforcing costs shall be borne by this Contractor.

P. At the conclusion of each day's work, clean up and stockpile on site, at a location designated by the Construction Manager, all rubbish, debris and trash, which may have accumulated during the day as a result of work of this Contractor and of his presence on the job.

Q. Due to the nature of the alteration work, which requires the building to be kept operable at all times, except for those floors being actively altered, this Contractor shall coordinate his activities with the Construction Manager and the building Owner. Any interruption of building services must be done at the convenience of the building Owner. If temporary connections to maintain services are required or if the work must be performed after hours, this work shall be so arranged with all parties involved.

R. If this Contractor must perform work in occupied areas, he shall make arrangements with the Construction Manager and the Owner as to the time and method by which this work shall be performed. He shall arrange for all adjacent areas to be properly protected against damage, dirt and dust.

1.10 DESCRIPTION OF BID DOCUMENTS

A. Specifications, in general, describe quality and type of materials and equipment.

B. The drawings show the various systems schematically, no added compensation shall be permitted for variations due to field conditions.

C. Where disagreements occur between the plans and the specifications or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the Base Bid.

D. Work not shown on the drawings but called for in the specifications, or vice versa, shall be provided by the Contractor without additional expense to the Owner.

E. Where a variance occurs between the drawings and specifications, or within either document itself, the Contractor shall request through the Construction Manager, clarification in writing from the Architect on which item and manner in which the work shall be installed.

F. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

G. Equipment shown on the drawings with particular manufacturers identified has been coordinated for structural penetrations, electrical connection, operating and service (maintenance) requirements, and physical size with regard to the space where the equipment is shown. If they comply with the project specifications, these and the other specified manufacturers of this equipment will be acceptable contingent on the Contractor providing a complete installation and maintaining full responsibility to provide, at no additional cost, any modifications to the structure or electrical service that are required to properly install, operate, and service the equipment being used. These modifications shall not include additional area for equipment unless approved by the Architect.

1. The Contractor shall note these changes on the equipment submittal and shall show all differences in equipment being supplied from that shown on the drawings. Failure of the Contractor to provide this information with the submittal will indicate that the

submitted equipment meets or exceeds the equipment shown on the drawings in performance and is physically no larger in housing size.

a. Failure of the Contractor to comply with the above and any discrepancies found shall result in the Contractor providing equipment equal to that specified at the Contractor's expense.

1.11 SUBMITTALS

A. No part of the work shall be started in the shop or in the field until the Architect and/or Engineer have reviewed the shop drawings and samples for that portion of the work. Thereafter, the work shall be executed in accordance with the Contract Documents and the indicated status of the reviewed shop drawing.

B. All shop drawings and samples shall be identified as follows:

1. Date of submittal.

2. Title of project (including floor and room designations).

3. Name of Contractor and date of his approval.

4. Name of Subcontractor or supplier and date of submittal to Contractor.

5. Number of submission.

6. Any qualification(s), departure(s) or deviation(s) from the requirements of the Contract Documents.

7. Federal specification, FM Approval, OTCR number, UL Listing, or ASTM number or any local listing or approval where required.

8. Such additional information as may be required by the specifications for the particular material being furnished.

9. When the submitted materials modify components, styles, etc., on the same drawing, or alternate or options available for the intended material, the material shall be appropriately annotated in a manner to avoid any misunderstanding of the submission.

C. Shop drawings and samples shall be submitted for review sufficiently in advance of the scheduled start of the work in the shop or in the field to allow ample time, in consideration of the number and complexity of the drawings in the submittal, for the Architect and/or Engineer to make an orderly review. No extension of the time to complete the work shall be granted to the Contractor by reason of his failure in this respect.

D. The Contractor shall carefully check shop drawings and samples, including those received by him from Subcontractors and manufacturers, for accuracy, completeness of required information, and conformance with the Contract Documents. Shop drawings found to be inaccurate, incomplete or not in conformance with the Contract Documents shall be corrected before being submitted to the Architect and/or Engineer for review.

E. Within three (3) weeks after award of the Contract, the Contractor shall submit for the Architect's and/or Engineer's review, a list of the manufacturers and Subcontractors whose products and services he proposes to use for the work. Proposed substitutions for material and equipment required by the Contract Documents shall be submitted to the Architect and/or Engineer for review during this period. Submittals proposing or requesting substitutions shall be expressly identified as such in a letter of transmittal, with the reasons for requesting the substitution stated. Submittals for this purpose shall be complete in every respect, shall conform to all the information requirements for shop drawing and sample submittals, and shall include, at no cost to the Owner, the necessary revisions to other related work required by the Contract Documents. The judgment of the Architect and/or Engineer with respect to the adequacy and acceptability of a proposed substitution shall be final and binding on the Contractor and shall not be subject to question in any other place. After the expiration of this period, substitutions for material or equipment shall not be proposed or requested in shop drawing and sample submittals, and the Contractor shall be required to execute the work in accordance with the provisions of the Contract Documents.

F. Within six (6) weeks after award of the Contract, the Contractor shall submit a schedule listing all shop drawings and samples with the projected date that each item will be submitted to the Architect and/or Engineer for review.

G. Shop drawings and RFI's related to commissioning items shall be copied to the Commissioning Authority.

H. Prior to Final Acceptance, the following data shall be furnished in accordance with the Conditions of the Construction Contract, Division 01 Specifications, and Division 21 Specifications, and shall include, but not be limited to:

1. Record Drawings.

2. Operating and Maintenance Books.

3. Contract or Coordination Drawings.

1.12 SHOP DRAWINGS

A. The term "shop drawings" shall include layout, detail, and assembly drawings, diagrams, schedules, catalog sheets, printed descriptive matter, and tabular and graphical presentations of operating and performance data that describe work required by the Contract Documents. Catalogs and catalog sheets shall be clearly annotated indicating the specific items being proposed.

B. In addition, during the installation period, submit detailed shop layout drawings for each floor of the project, including all the Mechanical Equipment Rooms, showing equipment and piping work and other distribution services described herein, including locations and sizes of all openings in cellular steel floor decks, walls and floors. Shop drawings with multiple parts shall be submitted as a package. Shop drawings will be 3/8 inch equal to 1 ft. 0 in. scale. Piping shop drawings shall also indicate the point loading and spacing of each hanger and the method of support. Drawings shall include full coordinated plans and sections for Mechanical Equipment Rooms, floor plans and risers. In addition, required detail drawings, such as anchor and guide details, etc., shall be submitted.

C. Shop drawings for Equipment Rooms, and for piping and similar distribution services shall show by dimension the exact size and location of each element of the system in both the horizontal and vertical plane, as well as relationship to the building structure, architectural construction, equipment, and the work of other trades. Where new work is added to an existing structure, the shop drawings shall show the location of all existing services and equipment. Pads, foundations, anchorages, supports and attachments to the building structure where required for the installation of the work shall be shown in layout and detail with sizes, dimensions, materials and methods of construction noted. The work described in any shop drawing submission shall be carefully checked by this Contractor for all clearances field conditions, maintenance of architectural conditions and proper coordination with all trades on the job.

D. Each submitted shop drawing shall include a certification by the Construction Manager that all related job conditions have been checked and that no conflict exists. No shop drawing submission shall be reviewed without such certification.

E. The Contractor shall submit shop drawings of the following work for review:

1. Equipment pads, foundations and supports.

2. Construction details for piping.

3. Control and alarm systems.

4. All items of manufactured material and equipment.

5. Other specific items of work as required by the provisions of the technical sections of the Contract Documents should be included in Submittal section.

1.13 CERTIFICATION

A. Any certifications required by the specifications, in addition to those required for shop drawings, product data, equipment and other items, shall be so certified by the Owner, a Partner, or a Corporate Officer of the firm required to provide the Certification, or by another person duly authorized to sign binding agreements for and in behalf of the Owner, Partner, or Corporation.

1.14 CONTRACTOR'S COORDINATION DRAWINGS

A. Contractor shall furnish in writing, with copies to the Architect and Construction Manager any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. This Contractor and his Subcontractors shall prepare a complete set of construction "Coordination Drawings" indicating the equipment actually purchased and the exact routing and elevations for all lines such as piping, busway, conduit, ductwork, etc., including conduit embedded in concrete. The "Coordination Drawing" preparation and completion shall comply with the requirements of the project construction schedule. The sheet metal drawings, prepared on electronic media (CAD) at a scale not less than 3/8 in. = 1 ft. 0 in., shall serve as the base drawings to which all other Contractors will overlay and add their work. Each trade shall draw their work on separate layers represented by individual colors. Each "Coordination Drawing" shall be completed and signed off by the other Contractors and this Contractor prior to the installation of the work in the area covered by the specific

coordination drawing. The Contractors work shall be installed in accordance with the shop drawings and the "Coordination Drawings". If the Contractor allows one trade to install their work before coordinating with the work of other trades, the Contractor shall make necessary changes to correct the condition without extra cost to the Owner. The Contractor's "Coordination Drawings" indicating piping, conduit, busway, and equipment support points and loads exceeding 200 lb. imposed on the building structure shall be submitted to the Project Structural Engineer for review and approval. The elevation, location, support points, static, dynamic and expansion forces and loads imposed on the structure at support, and anchor points, and the size of all lines shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All work routed underground or embedded in concrete shall be indicated by dimension to column and building lines and shall be coordinated. This requirement for "Coordination Drawings" shall not be construed as authorization for the Contractor or Subcontractor to make any unauthorized changes to the Contract Drawings. Prior to final acceptance of the work of this section, the Contractor shall give the drawing files, in AutoCAD containing the Contractor's coordination documentation to the Owner.

1.15 ARCHITECT'S AND ENGINEER'S REVIEW

A. The Architect and Engineer shall review shop drawings and samples for conformance with the design concept of the project and the information contained in the Contract Documents. The review of shop drawings and samples shall be only for the convenience of the Owner in following the work and shall not relieve the Contractor of responsibility for deviations from the requirements of the Contract Documents. The review shall not be construed as a complete or detailed check of the work submitted, nor shall it relieve the Contractor of responsibility for errors of any sort in the shop drawings and samples, or from the necessity of furnishing any work required by the Contract Documents which may have been omitted from the shop drawing submittals. The review of a separate item shall not indicate review of the complete assembly in which it functions. Nothing in the Architect's and/or Engineer's review of shop drawings and samples shall be considered as authorizing a departure from Contract Documents or specifications; additional cost to the Owner; or increased time for completion of the work.

B. Architect's and/or Engineer's review is for general compliance with the design concept and Contract Documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departing therefrom. The Contractor remains solely responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for coordination with other work, whether new or existing and other trades, for selecting fabrication processes, for techniques of construction, for performing his work in a safe manner.

C. The Architect and/or Engineer shall review shop drawings and samples with reasonable promptness and shall return them to the Contractor stamped to indicate the appropriate action as follows:

1. "NO EXCEPTION TAKEN" means that fabrication, manufacture or construction may proceed, providing the submittal complies with the Contract Documents.

2. "EXCEPTIONS AS NOTED" means that fabrication, manufacture or construction may proceed, providing the submittal complies with the Architect's and/or Engineer's notations and the Contract Documents. A copy of the corrected submittal shall be returned to the Architect and/or Engineer for record. If, for any reason, the Contractor cannot comply with the notations, the Contractor shall resubmit as described for submittals stamped "REVISE AND RESUBMIT".

3. "REVISE AND RESUBMIT" means that the Contractor must comply with the Architect's and/or Engineer's notations and resubmit before fabrication, manufacture or construction may proceed. Submittals stamped in this manner shall not be permitted on the job site.

4. "REJECTED" means that the submittal does not comply with the Contract Documents and that fabrication, manufacture or construction shall not proceed. Submittals stamped in this manner shall not be permitted on the job site.

D. Each submitted shop drawing shall bear the Contractor's stamped and signed certification that the work has been checked for all related job conditions, for maintenance of architectural conditions, and has been coordinated with the shop drawings of other affected trades for interrelated work, as required for the proper and complete performance of the work. No shop drawing submittal shall be reviewed without this certification.

E. Shop drawings for manufactured material and equipment shall include model numbers, dimension drawings, operating weights, material specifications, operating features and controls, wiring diagrams, performance characteristics, service procedures, including clearance requirements for maintenance work, and conformance to specified codes and code ratings. Note that in addition to these requirements, other specific submittal data, and forms of data submission, are required by the Contract Documents for particular items of equipment and material.

F. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein shall be the minimum standards acceptable. The Engineer shall retain the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require that the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

1.16 MANUFACTURER'S RECOMMENDATIONS

A. With the exceptions as specified and/or indicated on the drawings or in the specifications, the Contractor shall apply, install, connect, erect, use, clean, commission and condition manufactured articles, materials, and equipment per manufacturer's current printed instructions and recommendations. Copies of such printed recommendations shall be kept at the project site and made available as required.

B. Where the manufacturer's recommendations conflict with the Contract Documents, the conflict shall be brought to the Engineer's attention immediately.

1.17 SPACE LIMITATIONS

A. The equipment selections used in the preparation of the Contract Documents shall fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts. Adequate space shall be allowed for clearance in accordance with code requirements, the requirements of the Local Authorities Having Jurisdiction, and the equipment manufacturer's recommendations.

B. In the preparation of drawings, a reasonable effort to accommodate acceptable equipment manufacturer's space requirements has been made. However, since space requirements and

equipment arrangement vary according to each manufacturer, the responsibility for initial access, maintenance access, code-required access, and proper fit rests with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to the Architect's and Engineer's review.

D. Coordinate the installation of piping and equipment with lighting fixtures, special ceiling construction, air distribution equipment and the structure. Provide additional risers, drops and offsets as required. If, after installed, new piping or equipment is found to be in conflict with the architecture, structure, or other trade work which is either existing or shown on the Contract Documents, the piping or equipment shall be relocated without additional cost to the Owner.

E. No piping or equipment shall be installed in the eight (8) inch high zone directly above the finished ceiling in Tenant areas to allow for Tenant build-out and flexibility unless otherwise specifically shown on the drawings or prior written authorization is received from the Engineer.

F. The Contractor shall follow the drawings in laying out the Work and check drawings of all trades to verify spaces in which Work will be installed. Maintain maximum headroom and, where space conditions appear inadequate, the Architect shall be notified before proceeding with the installation.

1.18 RECORD DRAWINGS

A. The Contractor shall maintain on a daily basis at the project site a complete set of "Record Drawings". The "Record Drawings" shall consist of a set of blue-line prints and AutoCAD files of the Contractor Coordination Drawings for this division. The prints shall include the updated AutoCAD files, which shall be periodically electronically updated to show the precise location of all buried or concealed work and equipment, including embedded piping and valves, and all changes and deviations in the mechanical work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without written definite instructions from the Architect or Engineer. Prior to commencing work, the Contractor shall obtain from the Architect or Engineer a set of AutoCAD format Architectural and Engineering Drawings on CD-ROM, to be used only to produce the Contractor's Coordination Drawings. The continuously updated coordination drawings shall be used to produce the final "Record Drawings" which shall be delivered to the Owner in AutoCAD electronic format upon project completion. The Contractor shall give to the Engineer a written release signed by a corporate officer of the Contractor prior to receipt of the Engineer's disks.

B. Dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two (2) dimensions to permanent structures.

C. Upon completion of the Work, the Contractor and his Subcontractors shall certify all "Record Drawings" on the front lower right-hand corner adjacent to the above marking with a rubber stamp impression or an AutoCAD image that states the Project name, the Contractor's name, the area covered, and the date.

D. Prior to final acceptance of the work of this division, the Contractor shall submit properly certified "Record Drawings" to the Architect and Engineer for review and shall make changes, corrections, or additions as the Architect and/or Engineer may require to the "Record Drawings". Submit four (4) prints of each version until accepted.

E. After the Architect's and Engineer's review, and any required Contractor revisions, the "Record Drawings" shall be delivered to the Construction Manager in AutoCAD format for the Owner's use. Upon acceptance, provide electronic versions within sixty (60) days of Final Acceptance.

1.19 ELECTRICAL EQUIPMENT AND ELECTRICAL ROOM PRECAUTIONS

A. In general, the Contractor shall not install piping or equipment in any switchboard, switchgear, transformer, elevator equipment, telephone, telecommunications, or electrical equipment rooms unless this piping or equipment serves only these rooms. Installation is strictly prohibited where it violates the requirements of the applicable Electrical Code.

B. No piping or other equipment foreign to the electrical installation shall be installed within the dedicated zone above switchboards, panelboards, distribution boards, and motor control centers to a height of six (6) feet above the equipment or the structural ceiling, whichever is lower. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in such foreign systems.

C. Caution workers both verbally and in writing as to the dangers involved in doing work within or adjacent to electrical equipment within electrical closets on various floors, the Mechanical Rooms and the Switchgear Rooms, Elevator Machine Rooms, due to dangers caused by the presence of high voltages and currents in these spaces.

D. Provide all necessary personal protective equipment meeting OSHA requirements when working in areas within live electrical equipment.

1.20 CUTTING AND PATCHING

A. In general, cutting and patching will be done under other divisions of the specifications.

B. Furnish to the Construction Manager necessary information so that openings for this work can be built into the floors and walls in time. Such cooperation is required to keep cutting of walls and floors to a minimum.

C. Set sleeves for pipes accurately before concrete floors are poured or set boxes on the forms to leave openings in the floors and subsequently set required sleeves in the openings.

D. Should Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

1.21 PROTECTION OF EQUIPMENT AND MATERIALS

A. Protect from damage, water, dust all material and equipment provided under this division, both in storage and installed in accordance with manufacturer's recommendations until Notice of Completion has been filed and accepted.

B. Arrange with Construction Manager for storage facilities for materials and equipment.

C. All products stored off site and delivered to the site must be kept in factory packing with positioning devices in place until installation. Equipment which is subject to damage from

moisture shall be stored indoors in a suitably controlled environment with factory covering in place.

D. Material, equipment or apparatus damaged because of improper storage or protection shall be rejected.

E. Protect equipment from damage due to moisture, water, spray-on fireproofing, and construction debris during construction.

F. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting and conduits with caps to prevent obstruction and damage.

G. Protect the system against freezing in cold weather.

H. Prior to starting equipment, remove all protective materials, shipping bars, retainers, positioning devices.

1.22 CONSTRUCTION REVIEW

A. Work may be reviewed at any time by the Architect or Engineer.

B. Advise the Architect and/or Engineer that work is ready for review at the following times:

1. Prior to backfilling buried work.

2. Prior to concealment of work in walls and above ceilings.

3. Testing of systems and equipment.

4. When all requirements of the Contract have been completed.

1.23 EQUIPMENT NOISE AND VIBRATION

A. Equipment and systems, as defined herein, shall be quiet and free of apparent vibration while in operation.

B. Vibration shall not be apparent to the senses in occupied areas of the building. To this end, both the balancing of rotating machinery and the installation of vibration isolation at various locations are required.

C. It shall be the responsibility of this Contractor to obtain equipment that is quiet in operation as compared to other available equipment of its size, capacity, and type; to install equipment so that a minimum amount of noise and/or vibration is transmitted to the building; and to fabricate the piping systems so that noises generated in the systems are held to an absolute minimum.

D. Any additional precautions deemed necessary to provide a quiet installation shall be done as part of the work of this division, subject to review by the Engineer and without additional cost to the Owner. After the systems are in operation, it shall be the responsibility of the Contractor to make any changes to equipment or Work installed that may be required to provide systems which are quiet in operation and comply with the acoustic requirements as specified herein.

E. Except in various special areas listed herein, the system noise level, in occupied spaces, shall be equal to or less than the "lowest value in the range" of the noise criteria curves for the particular space in accordance with the current edition of Applications Volume of the ASHRAE Handbook. The noise criteria curves shall be based on ANSI Standard S1.6-1984 (R-1990) octave bands and a sound pressure level in decibels referenced to 0.002 microbars. Sound levels within the occupied spaces must meet the criteria described above and with all building, wall partition, floor, ceiling plenum depth, and ceiling construction in place as they exist for the individual spaces. The attenuation through boundary construction of Equipment Rooms must be considered in selecting equipment for acceptable noise level as described herein.

F. The system noise level in the Tenant-occupied spaces of the project shall not exceed NC-35 (except as noted hereinbelow). This shall include all areas occupied by the Tenant, including areas directly under piping or any equipment.

1.24 FINAL REVIEW

A. At a time designated, the entire installation shall be reviewed for compliance with the Contract Drawings and specifications. The Contractor shall be available at all times during this Review.

B. The Contractor shall demonstrate prior to the Final Review that all systems and all equipment have been properly balanced and adjusted and are in compliance with the requirements of the Contract Documents. After these demonstration tests are completed satisfactorily, but prior to the Final Review field visit by the Engineer, the Contractor shall submit to the Engineer a written certification that attests to Contract Document compliance for this project.

C. Certificates and documents required herein shall be in order and presented to the Architect and Engineer at least two (2) weeks prior to the Final Review.

D. After the Final Review, any changes or corrections noted as necessary for the Work to comply with these specifications and the drawings shall be accomplished without delay in order to secure final acceptance of the Work.

1.25 DATE OF COMPLETION AND TESTING OF SYSTEMS

A. The date for the final performance and acceptance testing shall comply with the project construction schedule and shall be sufficiently in advance of the Contract completion date to permit the execution of the testing by the Contractor prior to occupancy and the close-out of the Contract. Any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper and satisfactory functioning of all equipment and systems shall be completed prior to the close-out of the Contract. Re-tests shall not relieve the Contractor of completion date responsibility.

B. The Contractor shall provide a detailed schedule of completion indicating when each system component and entire system is to be completed and outlining when tests will be performed. Completion schedule shall be submitted to the Architect, Engineer, and Owner for review at a time requested by the Construction Manager after the notice to proceed has been given by the Construction Manager to the respective Division 21 Subcontractors. This schedule shall be updated periodically by the Contractor as the project progresses. Each update shall be submitted to the Construction Manager, Architect, Engineer, and Owner for review.

1.26 OPERATING INSTRUCTIONS

A. The Contractor shall provide the services of a factory-trained specialist to supervise the commissioning, startup, and operation of all equipment specified herein and to instruct the Owner's operators during a five (5) day operating instruction period at or near the project site. The operating instruction period shall be defined as straight-time working hours and shall not include nights, weekends, or travel time to and/or from the project and shall include a period for videotaping of the operating instructions. See individual sections of these specifications for additional instructions by manufacturer-trained specialists.

B. The Owner shall be notified in writing at least two (2) weeks before each operating instruction period begins. The Contractor shall commence no instruction period until the Owner has issued his written acceptance of the starting time.

1.27 WARRANTY PERIOD

A. The warranty period shall be for the period from beneficial use by the Owner, in accordance with the construction schedule.

B. During the warranty period, the Contractor shall guarantee the following in a form satisfactory to the Owner:

1. All work installed will be free from any and all defects in workmanship and/or materials.

2. All apparatus will develop capacities and performance characteristics specified.

3. The systems shall operate without malfunction.

C. The Contractor shall, without cost to the Owner, remedy any defects within a reasonable time to be specified in notice from the Architect. In default thereof, the Owner may have such work done and charge all costs to the Contractor.

D. The start of the Contractor's warranty period, as defined in the General Conditions, shall commence on the issue of a "Certificate of Substantial Completion" by the Owner or the Owner's Representative for each item of material, equipment, or system.

E. The Subcontractor shall confer with the General Contractor prior to the bid date concerning the project schedule and determine if there is a need to operate any items of equipment or systems for temporary heating and/or cooling or other reasons prior to "Substantial Completion". All required extended warranty costs for equipment, materials, and systems shall be included in the Subcontractor's bid.

F. Provide complete documentation of all component and system tests prior to Owner acceptance and turnover of components or systems. In addition, the Owner reserves the right to review all test objectives, test plans and test cases, and witness all preoperational tests. Provide the Owner with a comprehensive schedule detailing the preparation of testing documentation and the conduct of all component or system tests.

G. Warrant that all components, subsystems and systems will perform their specified functions from the date of turnover and commercial operation through the useful life of the system, as determined by the various equipment manufacturers and installing Contractor. In the event

components fail for any reason, be responsible to repair/replace said components, and reimburse the Owner for all costs associated with the component, subsystem or system that failed to perform the specified function.

1.28 GUARANTEE

A. Submit a single guarantee stating that all portions of the work are in accordance with Contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one year from date of final acceptance by the Owner; except that where guarantees or warranties for longer terms are specified herein, such longer term shall apply. At no additional cost to Owner, within 24 hours after notification, correct any deficiencies which occur during the guarantee period, all to the satisfaction of the Owner and Architect. Require similar guarantees from his Subcontractors.

B. Guarantee that the materials and workmanship supplied under these specifications will be of the best grade, that the apparatus will be erected in a practical and first class manner, that it will be complete in operation, nothing being omitted in the way of labor and material required to make this so, although not specifically shown or mentioned herein and that it will be delivered in well working order, complete and perfect in every respect without additional cost - whether or not shown in detail on the drawings or described in detail in this specification.

C. Be responsible for all damage to or caused by the work performed under this division for a period of one year from date of the acceptance of work under this Contract. Repair at no cost to Owner all such damage which occurs within 24 hours' notice thereof by the Owner. Damage which occurs prior to the completion of this Work shall be repaired at once. Be responsible for any damage and repair thereof and reimburse Owner for all expense incurred thereby. Indemnify the Owner, the Architect, the Consulting Engineers and the Construction Manager against loss, liability, damage or expense, including reasonable attorneys' fees, in connection with any claim resulting from such leaks which may be asserted by tenants or any other third person.

1.29 DELIVERY, STORAGE AND HANDLING

A. Include all delivery, hauling, hoisting, shoring, and placement in the building of equipment and materials specified herein, including any equipment pre-purchased by the Construction Manager for installation by this Contractor. The Contractor shall be responsible for the timely delivery and introduction of equipment to the Project as required by the construction schedule for this Project. If any item of equipment is received prior to the time it is required, the Contractor shall be responsible for its proper storage and protection until such time as it may be required. The Contractor shall pay for all costs of demurrage or storage in a bonded warehouse.

B. If any item of equipment is not delivered to or installed at the project site in a timely manner as required by the project construction schedule, the Contractor shall be solely responsible for disassembly, re-assembly, manufacturer's supervision, shoring, general construction modifications, delays, overtime costs, etc. No additional cost or delays shall be incurred by the Owner.

PART 2 - PRODUCTS

2.1 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB's) or other hazardous materials identified by the Owner.

2.2 GENERAL

A. Refer to specific specification sections for addition equipment and system piping requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall be in accordance with the specification section pertaining to the individual equipment and system piping.

END OF SECTION

SECTION 21 01 00

OPERATION AND MAINTENANCE OF FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all operation and maintenance instructions and manuals for the fire suppression systems and equipment as indicated and scheduled on the drawings in accordance with the Construction Documents.

B. Section includes:

1. Operation and maintenance instructions.

2. Operation and maintenance manuals.

3. Recommended spare parts.

4. Service contracts.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. Each product required for the common fire suppression work shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fire Code.

2. Reference Standards

a. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

1) ASHRAE Guideline 4: Preparation of Operating and Maintenance Documentation for Building Systems.

b. National Fire Protection Association (NFPA)

1) NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

1.4 SUBMITTALS

A. Submittals shall be furnished in accordance with the requirements of Section 21 00 00 and shall include, but not be limited to, the following:

1. Two (2) copies of operation and maintenance manuals covering the complete operation and recommended maintenance procedures and intervals for each system and each piece of equipment provided by this Contract as indicated and scheduled on the drawings and in accordance with the Contract Documents for review before Final Review of the Project. Assemble all data in a completely indexed electronic volume(s) and identify the size, model, and features indicated for each item. The media shall be submitted and subjected to the same approval process as detailed for shop drawings and samples as described hereinbefore but shall be returned as “Reviewed”.

2. Submit six (6) bound copies of the “Reviewed” operation and maintenance books with all corrections to the Construction Manager upon Project completion.

3. Six (6) copies of the valve charts required by Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.

B. Provide spare parts data listing source and current price of replacement parts and supplies for each item of equipment.

C. Furnish manufacturer's installation instructions, indicating special procedures and installation requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Hard copies of O&M manuals shall be furnished in three-ring binders, each with a clearly defined table of contents and index tabs.

B. O&M manuals shall include complete lubrication, cleaning and servicing data compiled in clearly and easily understandable form. Data shall show serial numbers and model numbers of each piece or equipment, complete lists of replacement parts (including part numbers), motor ratings, and actual loads. Manuals shall include information specific to the actual equipment model installed, including all options clearly indicated.

C. Each manual shall include the following documentation:

1. A document directory identifying each system and all associated equipment.

2. Operating procedures for each system and all associated equipment.

3. Manufacturer’s maintenance procedures supplemented by project specific information.

4. Assembly and disassembly instructions with exploded view drawings where available.

5. Parts lists and a list recommended spare parts recommended for normal service requirements.

6. Project-specific wiring diagrams for each piece of equipment.

7. Troubleshooting and diagnostic procedures for each system and all associated equipment.

8. Description of alarm and trouble codes for software-based systems.

9. Performance curves and data.

10. Test reports.

11. Emergency contact information.

12. Identifying name and mark number.

13. Locations of major equipment (where several similar items are used, provide a list).

14. Complete nameplate data.

15. All set points.

PART 3 - EXECUTION

3.1 PREPARATION

A. Submit an outline of the instruction programs and instruction manuals to the Owner or Owner's representative for his approval at least two (2) weeks prior to the proposed start date of the instruction sessions.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This Contractor and his Subcontractors shall provide all labor, materials, tools, scaffolding, machinery, equipment, appliances, and services necessary to complete the fire suppression work under this Contract. All systems and equipment shall be complete in every respect and all items of material, equipment and labor shall be furnished and installed for a fully operational system. This Contractor shall coordinate his work with the work of the other trades so as to resolve conflicts without impeding job progress or the project construction schedule. Provide notice with the bid proposal of any concrete work required by this division that is not indicated on the Structural or Architectural drawings or drawings of other trades.

B. This Contractor shall examine all Contract Documents for all divisions of the specifications in order to determine the extent of work required to be completed under this division. Failure to examine all the Contract Documents for this project will not relieve this Contractor of the responsibility to perform all the work required for a complete, fully operational and satisfactory installation.

C. Provide all miscellaneous common fire suppression products required for a complete fire suppression installation as indicated, in accordance with the requirements of the Contract Documents.

D. Section includes:

1. Sleeves.

2. Formed steel channel.

3. Escutcheons.

4. Protective pans.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. Each product required for the common fire suppression work shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

    a. New York City Building Code.

    b. New York City Fire Code.

2. Reference Standards

    a. ASTM International

        1) ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 21 00 00 and shall include, but not be limited to:

1. Product cut sheets and schedule of sleeves and mechanical sleeve seals used for the project. The schedule shall include the material, diameter, length, number of links, location and service the sleeve and sleeve seal will be provided.

2. Product cut sheets and schedule of access doors used for the project. The schedule shall include the material, size, finish type, location and purpose of installation the access door will be provided.

3. Product cut sheets of formed steel channel.

4. Product cut sheets of escutcheons. The cut sheets shall indicate the size, finish and location, which the escutcheons will be installed.

B. Product Data: Submit manufacturer's literature, including general assembly.

C. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for each product and system that is installed.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 21 00 00 shall apply to all work specified herein.

B. All materials and equipment shall be fabricated by companies, whose primary business expertise is the manufacturing of commercial and industrial products of the type specified herein. The manufacturer shall have been in continuous operation in the manufacture of the products specified for a minimum of ten (10) years.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all materials of any type from one manufacturer.

A. Furnish all equipment, materials and accessories new and free from defects.

1.6 WORK INCLUDED

A. The work includes, but is not limited to, the following systems, equipment and services:

1. Fire suppression system consisting of all items indicated on the drawings and/or specified herein, such as:

a. Automatic sprinkler systems.

2. Furnish and install all miscellaneous supports for Division 21 work and equipment.

3. Furnishing of shop drawings, product data and samples.

4. Furnishing of “Record Drawings”.

5. Furnishing of Contractor “Coordination Drawings”.

6. Furnishing of operating and maintenance books.

7. Miscellaneous items as required for complete and functioning systems as specified herein and as indicated on the drawings.

8. All systems, equipment and services specified herein shall be furnished and installed complete and ready for use.

9. Provide all excavation and backfill required for Division 21 work.

10. Furnish and install all sleeves for the fire protection work complete with seals and firestop as specified herein and as required by the Authority Having Jurisdiction.

11. Furnish and install insulation for freeze protection, over the cable wrap type heat tracing provided by Division 26, on all piping as indicated on the drawings.

12. Patching or replacement of all fireproofing if it is damaged or removed during the installation of the Division 21 work.

13. Participate in and assist in the operation of the fire safety ventilation equipment as required during the performance testing and startup of the Division 28 fire detection, alarm and communication systems. Refer to Division 28 - Fire Detection, Alarm and Communication System for additional requirements.

14. Instruments as required for operating and testing the various systems shall be furnished and installed complete as specified herein.

15. Hydrostatic testing, operational testing and adjusting of all systems.

16. Complete flushing and chemical treatment and initial water treatment for all water systems.

17. Complete all tests required by all rules, regulations, etc., of all Authorities Having Jurisdiction and prepare, complete and file all forms, tabulations, plans, etc., pertinent thereto with the referenced authorities, and accomplish such work with personnel of proper caliber, in particular, Professional Engineers, where so required.

18. Participate in and provide all labor as required for "off-hour" testing of equipment and systems if required by job conditions or by Authorities Having Jurisdiction and as required to obtain the "Temporary Certificates of Occupancy (TCO)."

19. Participate in and provide all labor as required for system commissioning including any time required for a detailed review of the commissioning process as requested by the Engineer or the Owner.

20. Sprinkler systems shall be hydraulically calculated to the following hazard classification parameters:

    a. Office Areas: Light Hazard, 0.10 gpm/sq.ft. over 1,500 sq.ft.

    b. Storage, Mechanical Equipment Rooms: Ordinary Hazard Group 1, 0.15 gpm/sq.ft. over 1,500 sq.ft.

    c. Fuel Oil Storage and Emergency Generator Room: Ordinary Hazard Group 2, 0.20 gpm/sq.ft. over 1,500 sq.ft.

    d. Dry Pipe Sprinkler Systems: Ordinary Hazard Group 1, 0.15 gpm/sq.ft. over 1,950 sq.ft.

1.7 WORK OF OTHER DIVISIONS

A. Electrical connections for motors and mounting of loose motors.

B. Individual motor controllers except motor controllers furnished as integral parts of pieces of equipment.

C. Pits for sewage ejectors, sumps and pumps; however, this Contractor shall be responsible for correct dimensions, layout, coordination, etc.

D. All concrete work indicated on the structural, architectural, and mechanical/electrical drawings.

E. Concrete equipment pads, concrete thrust blocks, and concrete fill for equipment and inertia bases. However, this Contractor shall be responsible for providing the Construction Manager with the correct dimensions, layout, etc., for all equipment.

F. Metal architectural louvers.

G. Painting, except touch-up painting and as otherwise specified herein.

H. Installing access doors in general construction.

I. Fire reserve tank supporting structure.

J. Standby power generator.

K. Wiring for automatic controls and interlocks.

L. Utility mains and piping 5 feet beyond the foundation walls unless shown otherwise on the Drawings.

1.8 VERIFYING EXISTING CONDITIONS

A. Before commencing work, examine all adjoining work on which this work is in any way dependent for perfect workmanship according to the intent of this specification, and report to the Construction Manager any condition, which prevents performance of first-class work. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

B. Become thoroughly familiar with actual existing conditions at the building of the present installations to which connections must be made or which must be changed or altered. The intent of the work is shown on the drawings and described hereinafter, and no consideration shall be granted by reason of lack of familiarity on the part of the Contractor with actual physical conditions at the site. Inspect each and every area affected by the total alteration of the building before submitting bid.

1.9 SUBCONTRACTS

A. Where Contract Documents require manufacturers' services, and wherever the staff of this Contractor performing the work of this section cannot adequately perform such services, this Contractor shall stipulate such performance in its contracts with its Subcontractors or Sub-Subcontractors, vendors, manufacturers, and the like, or else subsequently pay them any additional fees required therefor.

1.10 FACTORY TESTING

A. All mechanical sleeve seals and access doors shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

1.11 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

1.12 COORDINATION

A. Coordinate the installation of work in this section with the following:

1. Division 03 - Concrete.

2. Division 04 - Masonry.

3. Division 05 - Metals.

4. Division 09 - Finishes.

5. Division 10 - Specialties.

1.13 UNIT PRICES

A. The Contractor shall state in the proposal, unit prices in accordance with the following schedule and the requirements of Section 21 00 00.

1. Sleeves $_____/each

1.14 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Warranty period shall commence upon final acceptance by the Owner.

C. Furnish a one (1) year manufacturer's warranty for each mechanical sleeve seal and access door.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Escutcheons

1. Chicago Specialty.
2. Producers Specialty.
3. Sanitary-Dash.

D. Formed Steel Channel

1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Unistrut Corp.

E. Sleeves

1. Metraflex Co.
2. Pipeline Seal & Insulator Inc. (Link-Seal)
3. Calpico, Inc.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair including, but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 SLEEVES

A. Furnish sleeves for all pipes passing through floors, walls and concrete, or concrete fireproofed beams.

B. Sleeves in Concrete Beams, Through Concrete Walls, and Exposed Pipes Penetrating Floors: Schedule 40 steel pipe.

C. Provide sleeves in foundation walls and in concrete pits with anchor flange.

D. Sleeves within Furred-out Enclosures in Floors, Through Partitions, Steel Beams and Walls: 18 gauge (1.2 mm) thick galvanized steel.

2.4 FORMED STEEL CHANNEL

A. Provide formed steel channel as required to sufficiently support piping and equipment in accordance with the Contract Documents.

B. Formed steel channel shall be galvanized 12 gauge (2.8 mm) thick steel, with holes 1-1/2 inches (38 mm) on center.

2.5 ESCUTCHEONS

A. Provide escutcheons as required to sufficiently enclose penetrations in fire and smoke rated walls and partitions in accordance with the Contract Documents.

B. Where pipes penetrate fire or smoke rated walls provide metal escutcheons on both sides of the wall penetration.

C. Escutcheons shall be either one-piece or two-piece construction, chrome-plated brass or stainless steel.

2.6 PROTECTIVE PANS

A. Provide protective pans under individual or rack of pipes passing over critical equipment, high voltage (440V) electrical bus duct, switchgear or starting equipment.

B. Protective pans shall be 12 gauge black iron with a 6 inch lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-Oleum paint and support with pipe hangers, and drain clear of the equipment below.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and returned to the manufacturer for replacement.

3.2 INSTALLATION

A. Installation shall be in accordance with the specification section pertaining to the individual equipment.

B. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the drawings shall be followed as closely as possible, but the right is reserved by the Architect to change locations and elevations to accommodate conditions which may arise during the progress of the work, prior to installation, without additional compensation for such changes. The responsibility for accurately laying out the work and coordinating the installation with other trades rests with this Contractor. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

C. Carry fixture connections, concealed in building construction, to points above floor, break out close to the underside or adjacent to fixture and continue exposed to fixture.

D. Piping Installation

1. Install pipes approximately as shown on the drawings and as directed during installation, as straight and direct as possible, forming right angles or parallel lines with

building walls and other pipes, and neatly spaced. Erect pipe risers plumb and true, and parallel with walls and other pipes and neatly spaced.

2. Keep all horizontal runs of piping, except where concealed in partitions, as high as possible and close to walls.

3. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

4. Ream all pipe smooth before installation. Do not bend, flatten, split or otherwise injure pipe.

5. Use reducing fittings, unless otherwise approved in special cases, in making reduction in size of pipe. Bushings shall not be allowed unless specifically approved.

6. Do not install exterior piping in water or when trench or weather conditions are unsuitable for the work, as decided by the Architect.

E. Sleeves

1. Set sleeves in position in forms. Provide reinforcing around sleeves.

2. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

3. Extend waterproof sleeves through floors 1 inch (25mm) above finished floor level. Caulk sleeves tight.

4. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with firestopping and caulk airtight. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.

5. Sleeves passing through fire-rated floors or walls shall be sealed with an intumescent formulation similar to Metraflex Metraseal 120 FireSeal or approved.

6. Sleeves passing through foundation walls or pit walls shall be sealed utilizing a mechanical seal similar to Link-Seal or approved.

7. Install chrome-plated steel escutcheons at finished surfaces.

8. Set sleeves as construction progresses and secure in place during pouring of concrete.

9. Firestopping shall be installed as specified under Section 07 84 00.

F. Mechanical Sleeve Seals

1. Mechanical sleeve seal installation shall be in accordance with the manufacturer’s recommendations and as indicated on the drawings.

2. Install mechanical sleeve seals at all exterior water tight entries, foundation walls and pit walls.

G. Access Doors

1. Size access doors as required for the equipment being accessed, however access doors shall not be smaller than 16 inches by 16 inches. Install all valves to fit within the limit of the following size access doors; where two (2) or less valves are located with their bonnets within 12 inches of the face of the door and all portions of the valves are within the area defined by the opening in the door, 16 inch x 16 inch doors may be used. Where more than two (2) valves are served by a door and the bonnets are within 12 inches of the face of the door, the size of the door shall be increased so that all portions of the valves are within the area defined by the opening in the door. Where the bonnets of the valves are more than 12 inches from the face of the door, the doors shall be minimum of 20 inch x 20 inch clear opening.

2. Furnish buttons or tabs to Ceiling Contractor for setting, as approved by Architect, to indicate location of valves, cleanouts or other equipment located above removable-type ceilings where access doors are not furnished.

H. Protective Pans

1. Install protective pans within 6 inches of the underside of piping or equipment.

2. Pans shall be sized a minimum 2 inches greater in each dimension around the piping and equipment, which it's being supported under.

3. Protective pans shall be supported by hangers and supports sized sufficient to carry the weight of the pan filled with water. All hangers and supports shall be attached to the structure. Hanging protective pans from the equipment or piping above shall not be acceptable.

4. Make drain connections to the side or bottom of pan by welding or brazing and drain clear of the equipment, which the pan is protecting.

5. Perform a standing water test on the pan by filling with water to within 1 inch of the top of the lip and let stand for 30 minutes with no leakage.

I. Escutcheons

1. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings, and pipe sleeve extensions, if any. Furnish pipe escutcheons with chrome finish for occupied areas, prime paint finish for unoccupied areas.

2. Escutcheons for waterproof floors, and areas where water and condensation can be expected to accumulate shall be stainless steel or chrome plated cast brass, solid or split hinged.

3. Escutcheons for dry areas shall be chrome plated cast brass or galvanized sheet steel, solid or split hinged.

3.3 CLEANING

A. Before final connections are made and before operation of equipment and piping, thoroughly blow out, rod out, or wash out all piping at least twice, in a manner as directed and/or approved by the Architect, to remove all accumulation of dirt, chips or other deleterious material. Make all temporary connections and furnish all appliances required for the purpose of cleaning at no extra expense to the Owner.

B. Clean up all equipment and leave in condition for finish painting before acceptance.

3.4 PROTECTIVE PAINTING

A. Painting, except as specified herein or indicated otherwise, shall be done under another division. This division shall cooperate with the other divisions to determine the size of equipment, sizes and lengths of pipes, etc., to be painted.

B. Equipment and materials furnished under this section shall be factory-finished as specified. If the factory finish is damaged during shipment, storage, installation, etc., it shall be repainted by this Contractor subject to the Engineer's approval. Touch-up painting is acceptable only for minor finish damage.

C. Repair damaged and marred factory-painted finishes with materials and procedures to match original factory finish.

D. Paint products for identification of fire suppression systems shall be exterior grade, alkyd-based products.

E. Finish painting of the fire standpipe and sprinkler risers, cross-connections, handles of all fire protection valves and apparatus shall be in accordance with Local Law 58 of 2009. Refer to Section 09 90 00 for all painting requirements, including, but not limited to, work included, materials, primers, application, surface preparation, paint specification for ferrous pipe and VOC limits.

F. Provide a heavy field coat of paint as specified in Section 09 90 00, on all fire standpipe and sprinkler piping in accordance with Local Law 58 of 2009, prior to the hydrostatic pressure test and whether the pipe will be encased, partially encased in building construction or exposed, as described herein:

1. Fire Standpipe Systems

   a. Main distribution piping, cross-connection and risers shall be painted red.

   b. Handles of valves serving dedicated fire standpipe systems shall be painted red.

2. Sprinkler Systems

   a. Main distribution piping, cross-connection and risers shall be painted red.

   b. Handles of valves serving dedicated sprinkler systems shall be painted green.

3.5 FIELD TESTS

A. Test all systems in full accordance with applicable Underwriters' and Municipal requirements.

B. Notify the Architects and Inspectors Having Jurisdiction at least 48 hours in advance of performing the required tests, so that arrangements may be made for their presence to witness the tests.

C. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architects, fire suppression and other Inspectors of the City, applicable Insurance Association and Public Utilities Inspectors Having Jurisdiction.

D. Repair or, if required by the Architects, replace defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Test the systems before any paint or insulation is applied.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

H. Performance Tests

1. Prior to applying the hydrostatic test, the system shall be tested with 50 psig compressed air or dry nitrogen for a period of ten minutes with no loss in pressure.

2. Apply a hydrostatic test to each fire standpipe and sprinkler system. Each system shall be tested to a pressure not less than 200 psig or 50 psig above the normal operating pressure, whichever is greater. Apply the test for a minimum of two (2) consecutive hours with no loss in pressure.

I. Final Acceptance

1. Prior to final acceptance the Contractor shall submit all performance test reports for each test performed. The reports shall be bound in a three-ring binder and submitted to the Architect, Engineer and Owner for review.

2. Final acceptance testing shall comply with the project construction schedule and shall be sufficiently in advance of the Contract completion date to permit the execution of the testing by the Contractor prior to occupancy and the close-out of the Contract.

3. Any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper and satisfactory functioning of all equipment and systems shall be completed prior to the closeout of the Contract. Re-tests shall not relieve the Contractor of completion date responsibility.

END OF SECTION

SECTION 21 05 23

GENERAL-DUTY VALVES FOR WATER-BASED FIRE SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all valves required for equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Ball valves.

2. Butterfly valves.

3. Check valves.

4. Tamper switches.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

C. The following specification sections apply to all work herein:

1.3 REFERENCES

A. Each valve and all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fire Code.

2. Reference Standards

a. American Society of Mechanical Engineers (ASME)

1) ASME/ANSI B16.5: Pipe Flanges and Fittings.

2) ASME B16.34: Valves Flanged Threaded and Welding End.

b. Manufacturers Standardization Society (MSS)

1) MSS SP-6: Standard Finishes for Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2) MSS SP-25: Standard Marking System for Valves, Fittings, Flanges and Unions.

3) MSS SP-53: Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components.

4) MSS SP-61: Pressure Testing Steel of Valves.

5) MSS SP-67: Butterfly Valves.

6) MSS SP-68: High Pressure Offset Seat Butterfly Valves.

7) MSS SP-70: Cast Iron Gate Valves, Flanged and Threaded Ends.

8) MSS SP-71: Cast Iron Swing Check Valves, Flanged and Threaded Ends.

9) MSS SP-80: Bronze Gate, Globe, Angle and Check Valves.

10) MSS SP-82: Valve Pressure Testing Methods.

11) MSS SP-85: Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

12) MSS SP-110: Ball Valves - Threaded, Socket-welding, Solder Joint, Grooved and Flared Ends.

c. National Fire Protection Association (NFPA)

1) NFPA 13: Standard for the Installation of Sprinkler Systems.

2) NFPA 14: Standard for the installation of Standpipe, Private Hydrants and Hose Systems.

3) NFPA 20: Standard for the Installation of Stationary Pumps for Fire Protection.

4) NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 21 00 00 and shall include, but not be limited to:

1. Schedule of valves, complete with typical mill reports.

2. Fire suppression piping control valves, pressure-reducing valves, breach control valves, deluge valves, check valves, alarm valves and chain operators.

B. Product Data: Submit manufacturer's literature including general assembly, including but not limited to the following:

1. Dimension and specification sheets.

2. Model number.

3. Pressure rating.

4. Working pressure.

5. List of materials.

6. Manufacturer's installation instructions.

C. Schedule of Valves: Submit a single, well-organized schedule for all valves indicating the following:

1. Valve type/model number.

2. System type.

3. Location/floor.

4. Pressure rating.

5. Pipe size.

6. Connection method.

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer's Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 21 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

F. Maintain one (1) copy of the approved submittals for each product on site.

1.6 FACTORY TESTING

A. All valves shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. The valve manufacturer shall provide documentation that all valves have been factory tested and performs to the performance and pressure ratings specified.

2. All valves shall be factory tested in accordance with the latest applicable version of NFPA and UL Standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer’s rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

D. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, pilot line and weld ends.

3. Set angle, gate, and globe valves closed to prevent rattling.

4. Set ball valves open to minimize exposure of functional surfaces.

5. Set butterfly valves closed or slightly open.

6. Block check valves in either closed or open position.

E. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

3. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

1.8 COORDINATION

A. Coordinate the installation of work in this section with the following sections:

B. The installation of all wiring for monitoring devices furnished under this section shall be installed as specified under Division 28.

1.9 UNIT PRICES

A. The Contractor shall state in the proposal, unit prices in accordance with the following schedule and the requirements of Section 21 00 00.

1. Ball Valve $_____/each

2. Butterfly Valve $_____/each

3. Check Valve $_____/each

1.10 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Furnish a five (5) year manufacturer's warranty for all manual valves.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Ball Valves

1. Apollo.
2. Crane.
3. Hammond.
4. Milwaukee.
5. NIBCO.
6. Stockham.
7. Watts.

D. Butterfly Valves

1. Jenkins.
2. Milwaukee.
3. Nibco.
4. Victaulic.

E. Check Valves

1. Crane.
2. Kennedy.
3. Mueller.
4. Nibco.
5. Williams Hagar.

F. Tamper Switches

1. Acme.
2. Grinnell.
3. Potter.
4. Viking.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. Shutoff valves, isolation valves, pressure-reducing valves and check valves shall be provided as indicated on the Construction Documents or as required by the Authorities Having Jurisdiction on the drawings, required or directed.

E. Valve pressure ratings shall not be less than indicated and as required for system pressures.

F. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

G. The use of butterfly valves shall be limited to shutoff services only and only where specifically permitted by the Engineer.

H. Valve-End Connections

1. Flanges on iron valves shall meet ASME B16.1

2. Flanges on steel valves shall meet ASME B16.5

3. Flanges on bronze and/or brass valves shall meet ASME B16.24

4. Grooved end valves shall meet AWWA C606.

5. Threaded ends shall meet ASME B1.20.1.

6. Soldered lines double union ends with solder joints ASME B16.18.

I. Valve Operators

1. Gear operators shall be provided on all quarter turn valves.

2. Handwheels shall be provided on all water supply valves including quarter-turn types.

3. Provide ladders or chain operating devices in Mechanical Equipment Rooms or stairwells for all valves located more than 7 feet 0 inches above floor.

J. Valves in insulated piping shall be provide with 2 inch (50 mm) stem extensions having the following features:

1. Extended operating handle of non-thermal-conductive material.

K. Valves controlling sprinkler takeoffs shall be FM approved, UL listed, NYC OTCR approved, OS&Y gate, butterfly or ball valves, approved for the proper pressure rating in the zone, which it is served.

L. All valves controlling water to sprinklers shall be as scheduled below:

Valve Type	*1/2 to 2 in.*	*2-1/2 to 12 in.*
Butterfly	*Nibco LD-3510-8 (2 in. Only, 300 wwp) (20.7 bar)*	*Nibco GD-6765-8N (350 wwp) (24.2 bar)*
Ball	*Milwaukee* *Butterball BB-SCS02 (350 wwp) (24.2 bar)*	

2.3 BALL VALVES

A. Ball valves shall be all brass, bronze or steel construction with replaceable Teflon seat ring, two-piece union or three-piece bolted design as specified herein.

B. Threaded valves used in brazed or soldered piping systems shall be fitted with adapters.

C. Drain Valves (at Riser Heels and Low Points): Ball valves shall be used as drain valves at all low points in water piping. Provide 3/4 inch (19 mm) with male threaded nipple for hose connection with 3/4 inch (19 mm) hose cap to protect hose threads and chain Milwaukee Butterball BB2 Series.

D. Ball valves shall be two-piece type with adjustable stem packing using a threaded packing nut. Valves shall provide positive shutoff.

E. Bronze ball valves shall be constructed as follows:

Body	Brass or Bronze
Body Style	Two-piece or three-piece full port
Trim	316 stainless steel ball and stem
Seat	Reinforced Teflon (RTFE)
Body P/T Rating	600 psig (41.7 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	300 psig (20.7 bar) minimum

F. Steel ball valves shall be constructed as follows:

Body	Cast steel
Body Style	Two-piece full port
Trim	316 stainless steel ball and stem
Seat	Reinforced Teflon (RTFE)
Body P/T Rating	600 psig (41.7 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	300 psig (20.7 bar) minimum

2.4 BUTTERFLY VALVES

A. Resilient Seated and High Performance Butterfly valves shall be full lug type suitable for bidirectional dead-end service at rated pressure without use of downstream flange. Conforming to ANSI Class 150 flange drilling.

B. Stem seal shall not rely on compression between seating material and disc but shall be accomplished by EPDM O-ring seals and have threaded upper and lower collar bushings to provide blowout proof stems and low torque operation.

C. Disc shall not be attached to stem by fasteners or locknuts. Molded-in seat material shall be EPDM and designed to prevent dislocation during closure; seating material must simultaneously act as flange gasket.

D. Valve must be factory tested and certified to seat bubble tight.

E. Gear operators shall be used on all fire protection butterfly valves.

F. Fire protection butterfly valve shall be suitable for indoor/outdoor use, equipped with two (2) factory-mounted internal supervisory switches.

G. Resilient seated butterfly valves shall be constructed as follows:

Body	Ductile Iron
Body Style	Tapped full lug or Grooved
Trim	316 stainless steel stem
Disc	Ductile iron, Aluminum bronze, bronze or stainless steel
Seat	EPDM
Body P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum
Seat P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum

H. High performance butterfly valves, ANSI Class 150 valves shall be constructed as follows:

Body	Ductile Iron
Body Style	Tapped full lug or Grooved
Trim	316 stainless steel stem
Disc	Aluminum bronze, bronze or stainless steel
Seat	PTFE
Body P/T Rating	285 psig (19.6 bar) at 100°F (38°C) minimum
Seat P/T Rating	200 psig (13.5 bar) at 100°F (38°C) minimum

2.5 CHECK VALVES

A. Check valves shall be threaded, flanged or grooved ends suitable for the system, which it is being installed.

B. Check valves shall be a horizontal swing check with renewable bronze seat and disc.

C. Valve must be factory tested and certified to seat bubble tight.

D. Cast iron swing check valves shall be constructed as follows:

Body	Cast Iron
Body Style	Bolted Cover
Disc	Cast Bronze
Ends	Flanged
Body P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum
Seat P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum

E. Class 600 cast steel swing check valves shall be constructed as follows:

Body	Carbon steel
Body Style	Bolted cover
Disc	Stainless steel
Seat	Steel
Trim	Carbon steel

Ends	Flanged
Body P/T Rating	ASME A216
WOG Rating	600 psig (41.4 bar) minimum

2.6 TAMPER SWITCHES

A. Provide tamper switches for all valves controlling water flow in fire suppression systems as identified on the Construction Documents or as required by the Authority Having Jurisdiction.

B. All interconnecting electrical wiring will be furnished under Division 26 for tamper switches on valves and tamper switches directly connected to equipment provided by this Contractor, required for the transmission of alarm impulses.

C. Tamper switches shall be open or closed type to conform with the alarm system to which they are connected.

D. Tamper switches shall give an alarm if the valves served are closed, the switches are removed, or if the cover is opened. Valve stems shall be notched to take tamper switches.

E. Provide tamper switches for the following valves including but not limited to the following:

1. All valves controlling the flow of water to the fire standpipe system, fire hose valves, fire pumps and jockey pumps.

2. All valves on the incoming fire service control valves, meter valves, fire reserve tank fill lines and all valves on the outlet of each fire reserve tank.

3. All valves controlling the flow of water to sprinkler heads, floor control valves, supply valves to pre-action and deluge valves.

F. Tamper switches shall be Acme Fire Alarm Co. Type OSYS-U, or as approved.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. All valve installations shall be in accordance with the manufacturer’s recommendations and the Authorities Having Jurisdiction.

B. Exposed valves shall be installed as nearly as possible parallel to or at right angles to the column lines of the building.

C. Valves in finished portions of the building, except in mechanical equipment rooms, stairwells, or where otherwise indicated on the drawings shall be concealed and provided with access doors.

D. All piping shall be carefully graded so as to eliminate traps and pockets. Where water traps cannot be avoided, provide drain valves.

E. All valves throughout the building shall be thoroughly and substantially supported with UL listed and/or FM approved hangers and support devices. Furnish and install any special hangers or supports that may be required due to any peculiarities of construction. The design, selection spacing, and application of horizontal hangers, supports, restraints, anchors, and guides shall be in accordance with the applicable NFPA 13 and 14.

F. All valves shall be installed according to the Local Authority rules and an inspection certificate furnished.

G. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Balanced Check Valves (center-guided): In horizontal or vertical position, with stem upright and plumb.

3.3 CLEANING

A. Before final connections are made and before operation of all valves, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all valves in condition suitable for finish painting, before final acceptance.

3.4 INSPECTION AND STARTUP SERVICE

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that material composition is suitable for service, and that it is free from defects and damage.

E. A factory representative from the pressure-reducing valve and control valve manufacturer shall be present for startup service, inspection and any necessary adjustments.

F. After completion of the automatic sprinkler system and at the beginning of the warranty period the Automatic Sprinkler Subcontractor shall perform, without charge to the Owner, one (1) inspection of the sprinkler system during the warranty period. Inspection shall be as per the applicable NFPA No. 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems", plus the following maintenance to be performed during the course of the inspection:

G. Defective valves shall be replaced with new valves.

H. Integrated Test

1. Test the communication between tamper switches and the fire alarm systems. Verify that alarms are fully functional prior to final acceptance testing.

2. Verify that all valves have been properly lubricated and left ready for operation.

3. All alarms (BMS, fire alarms, etc.) shall be tested to fulfill satisfactory operating conditions. Verify proper operation of electrical safety interlocks and limit switches.

I. Final Acceptance Test: The Standard Form of the National Fire Sprinkler Association, Inc., "Report of Inspection" (Sheets 1 and 2), shall be filled out in triplicate after each inspection and the copies sent to the Architect and Owner.

J. Commissioning

1. Reserved.

3.5 ADJUSTING AND BALANCING

A. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

B. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

C. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

D. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

E. The building fire alarm system devices shall be properly adjusted and left in good working condition.

F. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

G. Adjust valve stops to assure positive shutoff.

END OF SECTION

SECTION 21 05 29

HANGERS AND SUPPORTS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all hangers, supports and anchors required for piping and equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. The Division 21 Subcontractor shall assume complete responsibility for the anchoring of the equipment, piping systems, specified hereinafter to the concrete foundation pads, to the concrete inertia bases, and to the supporting structural steel and concrete beams.

C. Section includes:

1. Pipe hangers and supports.

2. Attachments to structure.

3. Formed steel channel supports and accessories.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. All hangers and supports, including all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

2. Reference Standards

a. American Society of Mechanical Engineers

1) ASME B31.1: Power Piping.

2) ASME B31.9: Building Services Piping.

b. ASTM International

1) ASTM A 36: Standard Specification for Carbon Structural Steel.

2) ASTM A 47: Standard Specification for Ferritic Malleable Iron Castings.

3) ASTM A 48: Standard Specification for Gray Iron Castings.

4) ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5) ASTM A 240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

6) ASTM A 283: Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

7) ASTM A 536: Standard Specification for Ductile Iron Castings.

8) ASTM A 575: Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

9) ASTM A 668: Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.

10) ASTM A 1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

11) ASTM B 633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

12) ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials.

13) ASTM E 119: Method for Fire Tests of Building Construction and Materials.

14) ASTM E 814: Test Method of Fire Tests of Through Penetration Firestops.

15) ASTM F 708: Standard Practice for Design and Installation of Rigid Pipe Hangers.

c. American Welding Society

1) AWS D1.1: Structural Welding Code - Steel.

d. Manufacturers Standardization Society of the Valve and Fittings Industry

1) MSS SP 58: Pipe Hangers and Supports - Materials, Design and Manufacturer.

2) MSS SP 77: Guidelines for Pipe Support Contractual Relationships.

3) MSS SP 89: Pipe Hangers and Supports - Fabrication and Installation Practices.

4) MSS SP 90: Guidelines on Terminology for Pipe Hangers and Supports.

5) MSS SP 127: Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

e. National Fire Protection Association (NFPA)

1) NFPA 13: Standard for the Installation of Sprinkler Systems.

2) NFPA 14: Standard for the installation of Standpipe, Private Hydrants and Hose Systems.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 21 00 00 and shall include, but not be limited to:

1. Provide shop drawings indicating system layout with location showing critical dimensions, sizes, pipe hanger and support locations and detail of trapeze hangers.

2. Method of attachment to and load imposed on building structures by hangers, anchors, supports, guides and supplemental steel shall be submitted for review and approved by the project Architect and Structural Engineer.

3. Shop drawings indicating support methods, point loadings to the building structure and hanger locations shall be submitted for review sufficiently in advance of concrete pouring schedules to permit evaluation, critique and any necessary changes to hanging and support methods.

B. Product Data: Submit manufacturer's literature including general assembly,

1. Hangers and Supports: Submit manufacturer's catalog data including load capacity and sizing schedules specific to this project.

2. Inserts: Submit manufacturer's catalog data including load capacity.

C. Design Data: Indicate load-carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load-carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit sizing methods and calculations sealed by a Professional Engineer

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer's Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

1. Hangers and Supports: Submit special procedures and assembly of components.

2.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 21 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

F. Maintain one (1) copy of the approved submittals for each product on site.

1.6 FACTORY TESTING

A. All hangers, rods, supports and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

1.8 COORDINATION

A. Coordinate with other trades to use common means of support. Submit for approval all pertinent design data relating to the support as well as verification of the responsibility for the support.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Furnish a five (5) year manufacturer's warranty for all pipe hangers and supports.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Anchors and Inserts (Wedge Type)

1. Allfasteners.
2. DeWalt.
3. Hilti.
4. ITW Red Head.
5. MKT Fastening, LLC.
6. Simpson Strong-Tie.

D. Anchors and Inserts (Adhesive Type)

1. Allfasteners.
2. DeWalt.
3. Hilti.
4. ITW Red Head.
5. Simpson Strong-Tie.

E. Formed Steel Channel Supports

1. Allfasteners.
2. Anvil International.
3. Carpenter & Patterson, Inc.
4. Empire Industries, Inc.
5. Eaton
6. Erico – Caddy.
7. Hilti.
8. National Pipe Hanger Corporation.
9. PHS Industries, Inc.
10. Piping Technology and Products.
11. Thomas & Betts - Kindorf.
12. Tolco Inc.

F. Pipe Hangers, Supports and Guides

1. Allfasteners.
2. Anvil International.
3. Carpenter & Patterson.
4. Cooper B-Line.
5. Empire Industries, Inc.
6. Eaton
7. Erico – Caddy.
8. Hilti.
9. National Pipe Hanger Corporation.
10. PHS Industries, Inc.
11. Piping Technology and Products.
12. Thomas & Betts - Kindorf.
13. Witch Co.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 PIPE HANGERS AND SUPPORTS

A. Provide suitable and substantial hangers and supports for all piping and equipment. Hangers and supports shall be of the type, size and spacing specified or as required by the Authority Having Jurisdiction.

B. Hangers shall be UL Listed and/or FM Approved and approved for use on fire service as listed in NFPA 13. All hangers and supports shall be designed to support five (5) times the weight of the water-filled pipe plus 250 lb. (114 Kg) at each point of piping support.

C. Comply with maximum load ratings with consideration for allowable stresses prescribed by ASME B31.1 or MSS SP-58 and shall comply with NFPA 13 requirements.

D. Pipe hangers, anchors, supports and guides shall be manufactured, selected, fabricated and installed in accordance with MSS SP-58, MSS SP-69 and MSS SP-89.

E. Provide supports, guides and anchors that do not transmit unacceptable vibration to building structure.

F. The support systems shall provide for, and control, the free or intended movement of the piping, including its movement in relation to that of connected equipment.

G. In addition to the short-term frame shortening anticipated during the initial construction period, all systems shall be installed with provisions to accommodate long-term frame shortening equivalent to 1/16 inch (1.6 mm) per foot in addition to any expansion and/or contraction of the systems as a result of thermal changes.

H. Provide for vertical adjustments after installation of supported material and during commissioning, where feasible, to ensure pipe is at design elevation and slope.

I. Select hangers and supports to perform under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses being introduced into piping system and connected equipment.

J. Where piping is required to be seismically restrained, the yoke on clevis hangers and/or roller hangers shall be reinforced to prevent the yoke from deforming. In the case of clevis hangers providing nuts on the inside and outside of the threaded rod connecting the yoke and clevis is acceptable.

K. Provide drawings indicating pipe loads, including method of suspension and hanger location, and submit them for approval prior to proceeding with installation. Provide all the supplementary steel required to support, guide and anchor piping within shafts, Mechanical Equipment Rooms and all the other floors.

L. Particular care shall be taken to support all pipes in a manner approved by the Architect, including the providing of supplementary steel, if required.

M. Where insulation is provided, protect the insulation, the length of the sleeve with a galvanized 20 gauge shield (360 deg.).

N. Support vertical risers from the building construction by means of pipe clamps at every floor. Provide channels of approved sizes where pipe clamps are too short to connect to the building construction.

O. Finishes

1. Hangers, anchors, inserts, supports and guides (swivel ring, split ring, roller, wrought pipe clamp, or adjustable wrought clevis-type hangers, roller supports, floor stands, wall brackets, etc.) installed within the building shall be hot dipped galvanized in accordance with ASTM A123 or stainless steel.

2. Strut channels installed indoors shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90.

3. Hangers, anchors, supports, guides and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123 or stainless steel. All hanger

hardware shall be hot-dip galvanized or stainless steel. Zinc-plated hardware shall not be acceptable for outdoor or corrosive use.

P. Hangers

1. Pipes 2 inches (50 mm) and smaller shall be supported with one of the following:

   a. Adjustable steel swivel ring (band type) hanger.

   b. Malleable iron split ring hanger.

   c. Adjustable steel clevis hanger.

2. Pipes 2-1/2 inches (63.5 mm) and larger shall be supported with one of the following:

   a. Adjustable steel swivel ring (band type) hanger.

   b. Adjustable steel clevis hanger.

3. Insulated pipes shall be supported adjustable steel clevis hangers and pre-insulated sheet metal insulation shields.

Q. Trapeze Hangers

1. Shall be constructed of one of the following:

   a. 12 gauge roll-formed 1-5/8 inch (40 mm) by 1-5/8 inch (40 mm) minimum structural steel channel.

   b. Two (2) structural steel channels secured together with 1/2 inch (12.5 mm) or 3/4 inch (20 mm) steel pipe sections.

2. Pipes shall be secured to trapeze by one of the following methods:

   a. Uninsulated Pipe: 2-piece pipe straps with thermoplastic elastomeric liner sized for outside diameter of pipe.

   b. Insulated Pipe: 2-piece pipe straps sized for outside diameter of pipe and insulation using insulation shields.

R. Accessories

1. Pipe protection saddles shall be formed from carbon steel, 1/8 inch (3 mm) minimum thickness, sized for insulation thickness.

2. Preinsulated shields shall be 180 degree, 18 gauge minimum galvanized sheet metal, minimum 12 inch (305 mm) long, with high density water-repellant Kaylo insulation, foam glass or high-density polyisocyanurate inserts minimum thickness to match outside diameter of the insulated pipe.

2.4 ATTACHMENTS TO STRUCTURE

A. All piping shall be carried by pipe hangers and supports attached to building structure. All supports and restraints requiring connections to steel-plated building construction shall be welded to steel plating.

B. Method of attachment to and load imposed on building structures by hangers, anchors, supports, guides and supplemental steel shall be submitted for review.

C. In no case shall hangers be supported by means of vertical expansion bolts.

D. Powder and power-actuated devices, grip nails, and/or expansion nails shall NOT be permitted.

E. Structural Steel Attachments

1. Center-loaded beam clamps or welded beam attachments shall be used where piping is to be suspended from building steel. Clamp shall be forged steel or malleable iron with cross bolts sized as required to fit beams and selected on the basis of load configuration and load to be supported.

2. Where allowed by Structural Engineer, C-clamps with locknuts, cup point set screws and retaining straps shall be used. Top flange C-clamps shall be used when attaching a hanger rod to the top flange of structural shapes. Set screw torque shall be in accordance with manufacturer's recommendation.

F. Concrete Inserts

1. Cast-in-place continuous or spot concrete inserts shall be used where applicable.

2. Continuous inserts shall be made of 12 gauge, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs./ft. in concrete.

3. Spot inserts shall be constructed of one of the following:

a. Malleable iron or pressed steel having a space for rods of all sizes. All inserts for pipes 3 inches (75 mm) and larger in size shall be installed with a reinforcing rod 5/8 inch (16 mm) in diameter, run through a slot in the insert specifically provided for this purpose.

b. Internally threaded machined steel insert with large, flanged heads suitable for installation on wood forms and/or formed metal decking.

G. Post Installed Anchors

1. Contractor shall submit each anchor's ICC-ES report to the Structural Engineer of the project for review.

a. Anchors shall be installed in accordance with the manufacturer's ICC-ES report and published installation instructions.

b. All post-installation anchors shall be listed in the manufacturer's ICC-ES report for use in cracked concrete.

2. Contractor shall review the structural composition of all concrete slabs where post-installation anchors will be used and only anchor models/types approved for use in the specific structural slab type shall be permitted, in accordance with the manufacturer's ICC-ES report and per approval of the project's Structural Engineer.

3. Each post-installation anchor shall be sized for the worst-case operating loads imposed to the structure.

4. Post-installed anchors may be installed in the vertical position under any of the following conditions:

   a. When used in concrete having gravel or crushed stone aggregate to support pipes 4 inches or less in diameter.

   b. When post-installed anchors are alternated with hangers connected directly to the structural members, such as trusses and girders, or to the sides of concrete beams to support pipe 5 inches and larger.

   c. When post-installed anchors are spaced not over 10 ft. apart to support pipes 4 inches or larger.

5. Post-installed anchors shall not be used in ceilings of gypsum or other similar soft material.

6. Post-installed anchors shall not be used in cinder concrete, except for branch lines where the post-installed anchors are alternated with through-bolts or hangers attached to beams.

7. Where through-bolts or hangers attached to beams is not feasible, the Contractor is responsible for providing hangers certified by a registered Professional Engineer capable of complying with the following:

   a. Hangers shall be designed to support five times the weight of the water-filled pipe plus 250 lbs (114 kg) at each point of piping support.

   b. These points of support shall be adequate to support the system.

   c. The spacing between hangers shall not exceed the value given for the type of pipe as indicated in Table 9.2.2.1(a) or Table 9.2.2.1(b).

   d. Hanger components shall be ferrous.

   e. Detailed calculations shall be submitted, when required by the reviewing authority, showing stresses developed in hangers, piping, and fittings and safety factors allowed.

8. Where periodic/continuous Special Inspections are required, coordinate with the Special Inspector prior to and during the installation of anchors.

2.5 FORMED STEEL CHANNEL SUPPORTS AND ACCESSORIES

A. Formed steel channel supports shall be capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3 and shall comply with NFPA 13 requirements.

B. Channel shall be made of minimum 12 gauge ASTM A570 Grade 33 steel electro galvanized after fabrication. Channel sections may be formed by single or factory welded multiple sections of any of the following:

1. 1-5/8 inch (41.25 mm) x 1-5/8 inch (41.25 mm) channel.

2. 2-7/16 inch (62 mm) x 1-5/8 inch (41.25 mm) channel.

3. 3-1/4 inch (82.5 mm) x 1-5/8 inch (41.25 mm) channel.

C. Grip/Lock nuts shall be made of 3/8 inch (10 mm) thick case hardened mild steel bars electro galvanized after fabrication.

D. All angle brackets connectors and washers shall be made of 1/4 inch (6.35 mm) steel plate electro galvanized after fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Hanger, rods, supports and accessories shall be installed in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

B. Furnish and install all necessary supports for equipment furnished under this section. To meet the varying conditions in each case, these supports shall consist of pipestands, steel angle or strap hangers, saddles, brackets, as required for a complete installation.

C. All such supports shall have substantial flanges bolted to floor construction; hangers shall be supported from the framing as described hereinabove. Supports shall be properly located with reference to any supporting pads, legs of the equipment carried and must be distributed as not to bring any undue strains to the equipment.

D. All hanger and support details shall be submitted for review and approval.

E. Guarantee that the work, as installed under this section of the specifications, will not result in the transmission of objectionable noise or vibration to any occupied parts of the building, and take full responsibility for any necessary modifications of this equipment, or of the foundations and supports for the same, necessary to secure this result.

F. All attachments to the building structure shall comply with the requirements of Section 21 05 48.13 Vibration Isolation for Fire Suppression Piping and Equipment and Section 21 05.48.16 Seismic Controls for Fire Suppression Piping and Equipment

G. Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom beam flanges.

H. Proper care and ventilation should be given when welding galvanized components.

I. Clamps on Riser Piping

1. Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

2. Bolt tightening torques shall be to industry standards.

3. Steel Pipes: Clamp is fitted preferably below coupling or welded pipe lug.

J. Support from Structural Members: Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

K. Field welding of supports should be done by qualified welders using qualified welding procedures.

L. Space supports so that there is at least one hanger for each length of pipe, with one hanger within 30 inches (762 mm) of the end sprinkler head.

M. Horizontal piping shall be supported in accordance with the following schedules:

SINGLE ROD SUPPORT - STEEL PIPE		
Pipe Size	Maximum Hanger Spacing	Rod Size
1 to 1-1/4 inches	12 feet 0 inches	3/8 inch
1-1/2 and 4 inches	15 feet 0 inches	3/8 inch
5 to 8 inches	15 feet 0 inches	1/2 inch
10 inches	15 feet 0 inches	5/8 inch
12 inches	15 feet 0 inches	3/4 inch

N. Maximum hanger spacing may not be exceeded; however, actual installed spacing will depend on location of structural framing and floor slab construction. Where building construction does not permit the above spacing, provide additional steel supports.

O. Unsupported lengths of branch sprinkler piping shall be in conformance with NFPA standards based on static or flowing pressure, whichever is greater. Systems with pressures exceeding 100 psi have more restrictive unsupported lengths and require restraints to prevent upward movement of the pipe.

P. Install lock nuts at the bottom of all hanger rods.

Q. Vertical pipe risers shall be supported independently of connected horizontal piping.

R. Support vertical risers from the building construction by means of pipe clamps, Grinnell Model No. 261, at every story height

S. Where hangers cannot be supported from building framing, they may be supported from concrete inserts, subject to the approval of the Structural Engineer. Furnish, locate and set such inserts and make sure that such inserts are in place when the concrete is poured.

T. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

U. Smaller pipes may be suspended from cross-pieces of pipe or steel angles, which, in turn, shall be hung from building concrete construction by means of rods and inserts. The intention is to provide supports which, in each case, shall be amply strong and rigid for the load, but which shall not weaken or unduly stress the building construction.

V. Provide approved roller supports, floor stands, wall brackets, etc., for all lines running near the floor or near walls, which can be properly supported or suspended by the floors or walls. Pipelines near walls may also be hung by hangers carried from approved wall brackets at a higher level than the pipe.

W. No piping shall be hung from other piping or ductwork. In no case shall hangers be supported by means of vertical expansion bolts.

X. Hangers for piping shall support the pipe without piercing the insulation. Pre-insulated pipe shields shall be used to protect the insulation on pipes. It is the intent that the insulation shields shall bear only on the insulation, which is of such density that the insulation will not be compressed, crushed or deformed.

Y. Power- or powder-actuated devices shall *not* be permitted.

3.3 CLEANING

A. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all hangers and supports in condition suitable for finish painting, before final acceptance.

B. Touch up, repair or replace damaged products before Substantial Completion.

3.4 INSPECTION AND STARTUP SERVICE

A. Inspect each hanger, rod and support for piping and equipment for proper installation according to the manufacturer’s instructions.

3.5 FIELD TESTS

A. Performance Test: All hanger and support devices and components shall be tested in accordance with the latest applicable industry standards.

3.6 ADJUSTING AND BALANCING

A. Adjust all pipe hangers, miscellaneous supports and equipment supports to equalize load for the piping and equipment they carry and to ensure that rods are vertical under operating conditions.

B. Hangers at equipment shall be adjusted to ensure that there are no loads imposed on the equipment by the piping connected to the equipment.

C. Hangers and Supports

1. Ensure that rod is vertical under operating conditions.

2. Equalize loads for all piping and equipment supports.

D. Adjustable Clevis

1. Tighten hanger load nut securely to ensure proper hanger performance.

2. Tighten upper nut after adjustment.

E. Beam Clamps: Tighten all set screws and lock nuts.

F. Riser Clamps

1. Ensure all riser clamps are securely resting on the concrete slab or Kindorf after system is tested and pressurized.

2. Tighten riser clamp nuts after vertical adjustments are made.

END OF SECTION

SECTION 21 05 53

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all identification nameplates and tags required for equipment and piping as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Charts.

2. Equipment nameplates.

3. Pipe identification.

4. Signage.

5. Valve tags.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. All nameplates, signs and valve tags shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fire Code.

2. Reference Standards

a. American Society of Mechanical Engineers

1) ASME A13.1: Scheme for the Identification of Piping Systems.

b. American National Standards Institute

1) ANSI Z535: Safety Color Code - Environmental Facility Safety Signs - Criteria for Safety Symbols - Product Safety Sign & Labels - Accident Prevention Tags.

c. ASTM International

1) ASTM D 882: Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

d. National Fire Protection Association (NFPA)

1) NFPA 13: Standard for the Installation of Sprinkler Systems.

2) NFPA 14: Standard for the installation of Standpipe, Private Hydrants and Hose Systems.

3) NFPA 20: Standard for the Installation of Stationary Pumps for Fire Protection.

4) NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

5) NFPA 72: National Fire Alarm Code.

6) NFPA 101: National Life Safety Code.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 21 00 00 and shall include, but not be limited to:

1. Schedule of valve tags, including catalog cut, color, model number and diagrammatic charts.

2. Schedule of nameplates for all equipment, including model number, reference name and diagrammatic charts.

3. Catalog cuts of pipe markers.

B. Product Data: Submit manufacturer’s literature for each product submitted.

C. Manufacturer’s Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

D. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 21 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Furnish all equipment, materials and accessories new and free from defects.

E. Maintain one (1) copy of the approved submittals for each product on site.

F. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories and ANSI Z535 - Safety Color Code - Environmental Facility Safety Signs - Criteria for Safety Symbols - Product Safety Sign & Labels - Accident Prevention Tags.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

D. Store tapes, adhesives, mastics, and labeling materials in ambient conditions acceptable to and in accordance with the recommendations of the manufacturer.

E. Labeling and markers which become damaged in the opinion of the Engineer may be rejected and shall be repaired or replaced by the Contractor at no additional expense to the Contract.

1.7 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Furnish a one (1) year manufacturer's warranty for all system tags and nameplates.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances

should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Pipe Identification

1. Brady Corporation.
2. Brimar Industries Incorporated.
3. Marking Services Incorporated.
4. Seton Nameplate Corp.

D. Valve Tags

1. Brady Corporation.
2. Brimar Industries Incorporated.
3. Marking Services Incorporated.
4. Seton Nameplate Corp.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 PIPING IDENTIFICATION

A. All piping shall piping shall be identified as to type of use, service and direction of flow in accordance with ANSI A13.1.

B. Pipe markers shall meet ANSI and OSHA requirements for identifying the service, direction of flow, system and zone, for the various piping systems.

C. They shall be factory-fabricated, flexible, semi-rigid UV-resistant heavy-duty vinyl, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

D. Each marker shall consist of one (1) label with direction-of-flow arrows and the name of the service printed in black letters not less than 1 inch (25 mm) high for pipe 2-1/2 inches (60 mm)

and smaller, 2 inch (50 mm) high for 3 inches (75 mm) pipe and larger. Markers shall have backgrounds of different colors for the various service groups.

E. Locate markers at each valve, at each entry thru walls, within access doors and on 20 foot (6,096 mm) centers for straight runs of pipe.

1. All fire standpipe and sprinkler piping shall be painted in accordance with the New York City Building Code, prior to the hydrostatic pressure test and whether the pipe will be encased, partially encased in building construction or exposed. as described herein:

a. Fire Standpipe System

1) Main distribution piping, cross connection and risers shall be painted red.

2) Handles of valves serving dedicated fire standpipe systems shall be painted red.

b. Combination Fire Standpipe Systems

1) Main distribution piping, cross connection and risers shall be painted red.

2) Handles of valves serving combination fire standpipe systems shall be painted yellow.

c. Sprinkler Systems

1) Sprinkler floor control assemblies and main distribution piping within egress stairs shall be painted red.

2) Handles of valves serving dedicated sprinkler systems shall be painted green.

2.4 SIGNAGE

A. Provide all designating signs for curb valves, fire department connections, control valves, alarms, hydraulically designed systems, and equipment as required by the Contract Documents and Authorities Having Jurisdiction.

B. Fire department connections and fire pump test headers located on the exterior of the building shall be conspicuously marked to indicate their function.

2.5 VALVE TAGS

A. Provide a valve tag for each valve.

B. Each valve tag shall be 2 inch (50 mm) diameter, brass or aluminum, stamped with designating numbers, minimum 2 inches (50 mm) high, prefixed by the letters “FP”, painted with white enamel, and background painted with red enamel.

C. Attach each valve tag to valve handle or spindle with a brass chain.

D. All valves and controls shall be designated with corresponding numbers on the valve charts or diagrams.

E. The nomenclature to be used on these tags shall be submitted to the Consulting Engineer for approval.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Valve tags and nameplates shall be installed in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

B. Install nameplates with adhesive.

C. Install valve tags with corrosion-resistant brass chain.

3.3 CLEANING

A. Clean and remove all accumulation of dirt, chips or other deleterious material on equipment nameplates, valve tags and signage. Leave all valve tags and equipment nameplates in clean and legible condition before final acceptance.

B. Touch-up, repair or replace damaged tags and nameplates before final acceptance.

END OF SECTION

SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all piping, material, fittings and appurtenances required for a complete sprinkler system as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Alarm devices.

2. Material of piping systems.

3. Signage.

4. Sprinkler heads.

5. Sprinkler drains.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 22, 23, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

B. Refer to Section 21 00 00.03 – Table of Contents for Fire Suppression for specification sections that apply to all work herein.

1.3 REFERENCES

A. All piping, materials, fittings and appurtenances and all associated components of the sprinkler system shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

A. New York City Building Code.

B. New York City Fire Code.

2. Reference Standards

A. American Society of Mechanical Engineers

1. ASME B16.1: Cast Iron Pipe Flanges and Flanged Fittings.

2. ASME B16.3: Malleable Iron Threaded Fittings.

3. ASME B16.4: Gray Iron Threaded Fittings.

4. ASME B16.5: Pipe Flanges and Flanged Fittings.

5. ASME B16.9: Factory-Made Wrought Steel Buttwelding Fittings.

6. ASME B16.11: Forged Fittings, Socket-Welding and Threaded.

7. ASME B16.25: Buttwelding Ends.

8. ASME B36.10M: Welded and Seamless Wrought Steel Pipe.

B. ASTM International

1. ASTM A 53/A 53M: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2. ASTM A 135: Standard Specification for Electric-Resistance-Welded Steel Pipe.

3. ASTM A 234: Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

4. ASTM A 733-16: Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples

5. ASTM A795: Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

C. American Welding Society

1. AWS A5.8: Specification for Filler Metals for Brazing and Braze Welding.

2. AWS D1.1: Structural Welding Code - Steel.

3. AWS D10.12M/D10.12: Guide for Welding Mild Steel Pipe

D. Manufacturers Standardization Society

1. MSS SP6: Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2. MSS SP9: Spot Facing for Bronze, Iron and Steel Flanges.

3. MSS SP43: Wrought Stainless Steel Butt-welding Fittings.

4. MSS SP44: Steel Pipe Line Flanges.

5. MSS SP-51: Class 150LW Corrosion Resistant Cast Flanges and Flanged Fittings.

6. MSS SP-75: Specifications for High-Test Wrought Butt Welding Fittings.

7. MSS SP-77: Guidelines for Pipe Support Contractual Relationships.

8. MSS SP-83: Steel Pipe Unions Socket-Welding and Threaded.

9. MSS SP-97: Forged Carbon Steel Branch Outlet Fittings-Socket Welding, Threaded and Butt-welding Ends.

E. National Fire Protection Association (NFPA)

1. NFPA 13: Standard for the Installation of Sprinkler Systems.

2. NFPA 25: Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

3. NFPA 72: National Fire Alarm Code.

4. NFPA 101: Life Safety Code.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and *Section 21 00 00* and shall include, but not be limited to:

1. Provide a pipe, material and fitting schedule for all sprinkler systems including:

A. System working pressure.

B. Type of pipe including material of construction.

C. Fitting type of each type of pipe and each size.

2. Sprinkler system appurtenances, sprinkler heads, sprinkler guards, water flow devices, tamper switches and signage as required by the Authority Having Jurisdiction.

3. The Contractor shall submit piping shop drawings and hydraulic calculations for review prior to fabrication of any of the systems. Shop drawings shall indicate plan locations and elevations of piping and hangers, including bottom elevation of major piping and be coordinated with ductwork and other mechanical and electrical services.

4. Provide hydraulic calculations indicating compliance with the construction documents and the local code requirements.

B. Welders' Certificate: Submit welders' certification of compliance with ASME Section IX and AWS D1.1 prior to proceeding with any welding.

C. Product Data: Submit manufacturer's literature including general assembly, materials of construction, manufacturing process, pressure ratings and approvals.

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for the system.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and *Section 21 00 00* shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

F. The Contractor must maintain on site current copies of each welder or welding operator's Procedure Qualification Record.

G. All welds shall bear the identifying number, letter or symbol of the welder or welding operator.

H. To ensure uniformity and compatibility of piping components in grooved in piping system all grooved products and grooving tools must be the products of a single manufacturer.

I. The manufacturer of grooved piping fittings shall provide on-site training for Contractor's field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

J. Maintain one (1) copy of the approved submittals for each product on site.

1.6 FACTORY TESTING

A. All piping, fittings and couplings shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment and as specified herein:

1. The piping manufacturer shall provide hydrostatic test reports indicating pressure rating and compliance with the specifications.

2. The fitting and coupling manufacturer shall provide hydrostatic test reports indicating pressure rating and compliance with the specifications.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

1.8 COORDINATION

A. Certain materials will be furnished, installed, or furnished and installed, under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to insure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general construction drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

E. Furnish and set all sleeves for passage of pipes through structural masonry and concrete walls and floors and elsewhere as required for proper protection of each pipe passing through building surfaces. Coordinate this work with Construction Manager in order to expedite and properly perform this work.

F. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this section shall be coordinated through the Construction Manager and must be approved by the Structural Engineer.

G. Should the Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

H. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Contractor to coordinate, protect and schedule his work with other trades in accordance with the construction sequence.

I. Architectural drawings shall be checked for ceiling height requirements.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 21 00 00.

B. Furnish a five (5) year manufacturer's warranty for all piping.

C. Furnish a five (5) year manufacturer's warranty for all fittings and couplings.

D. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Alarm Devices

1. Tamper Switches
   A. Potter Electric Signal Co.
   B. System Sensor.

2. Water Flow Switches

   A. Potter Electric Signal Co.
   B. System Sensor.

D. Material of Piping Systems

1. Mechanical Couplings and Fittings for Grooved Steel Pipe

   A. Grinnell
   B. Gruvlok.
   C. Victaulic

2. Steel Pipe

   A. Allied Pipe & Tube.
   B. Ward Mfg.
   C. Wheatland Pipe & Tube.

3. Steel Pipe Flanges

   A. Anvil International.
   B. Taylor Forge.
   C. Weldbend.

4. Threaded Steel Pipe Fittings

   A. Anvil International
   B. Ward Mfg.

5. Welded Steel Pipe Fittings

   A. Merit
   B. National Flange and Fitting Co.
   C. Weldbend.

E. Sprinkler Heads

1. Reliable Sprinkler Corp.
2. Tyco Fire.
3. Victaulic
4. Viking Corp.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. Use materials as scheduled and indicated on the fire protection drawings.

E. All piping, fittings and appurtenances shall be UL Listed and/or FM approved.

F. An inspection certificate shall be provided by the Contractor stating the installation complies with the local Authority Having Jurisdiction.

G. All piping, fittings, and appurtenances shall be installed according to NFPA 13

H. Pitch all branch piping at a minimum 1/2 in. (13 mm) in 10 feet (3 m) and all main distribution piping at a minimum 1/4 in. (7.5 mm) in 10 feet (3 m). All trapped piping shall be provided with low point drains where required.

2.3 ALARM DEVICES

A. Provide all alarm devices directly connected to equipment and piping required for a complete system and for the transmission of alarms to the building fire alarm system.

B. Switches shall be normally open or closed type in order to conform with the alarm system which they are connected.

C. All interconnecting electrical wiring will be furnished under Division 26.

D. Provide tamper switches for all valves controlling the flow of water to sprinkler systems including floor control valves

E. Tamper switches shall give an alarm if the valves served are closed, the switches are removed, or if the cover is opened.

F. Valve stems shall be notched to take the switches unless valves are provided with tamper switches from the factory.

G. Tamper switches shall be the following:

1. For each OS&Y valve, 2 in. (50 mm) through 6 in. (150 mm) provide one (1), Potter Model No. OSYSU-1 supervisory switch.

2. For each butterfly valve, provide one (1), Potter Model No. PCVS-2 supervisory switch with two (2) sets of alarm contacts.

3. Where tamper switches are located outdoors or in corrosive environments provide with corrosion resistant hardware of 316 stainless steel and nickel plated to ASTM B377 Type V Brackets.

H. Provide water flow switches for each sprinkler control valve assembly.

I. Water flow switches shall give an alarm due to water flow in the sprinkler system.

J. Water flow switches shall be vane type, closed circuit with an adjustable retard or time delay to prevent false alarms due to water pressure surges and two (2) sets of alarm contacts.

K. Water flow devices shall be the following:

1. For each sprinkler system control assembly provide one (1) Potter Model No. VSR, vane type water flow alarm switch with retard.

2.4 MATERIAL OF PIPING SYSTEMS

A. Piping:

1. Sprinkler piping shall be as indicated in the “Material Schedule” on the Construction Documents. Pipe ends may be factory or field-formed to match joining method.

2. Sprinkler drain piping shall be Schedule 40 galvanized steel pipe.

3. All Schedule 40 sprinkler pipe, black steel or galvanized, shall be of United States or Canadian origin and manufactured in accordance with ASTM A-53A-53M, Type E , Grade B.

4. Each length of pipe shall be legibly marked by the Manufacturer to show company name, type of pipe, specification number and pipe length.

5. Black steel and galvanized pipe nipples shall be manufactured in accordance with ASTM A733-16, and made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.

6. When grooved steel pipe is used in lieu of threaded pipe Schedule 40 pipe shall be either rolled or cut grooved.

B. Fittings

1. Fittings shall be threaded or welded, standard weight or extra-heavy pattern, UL and FM approved fittings, manufactured of steel, ductile iron or malleable iron as required for the pressures experienced in the system. Grooved ductile iron fittings with mechanical couplings may be used in lieu of threaded fittings.

2. When grooved pipe and rigid fittings are utilized, mechanical couplings shall be Victaulic Model No. 07 “Zero-Flex”. Where required to comply with project seismic requirements, flexible fittings with mechanical couplings shall be Victaulic Model No. 77.

3. Welded joints and fittings may be used where permitted by the Authorities Having Jurisdiction. Safety procedures described in NFPA 13 must be followed and pressure ratings shall meet or exceed maximum system working pressures.

4. Welding filler metals shall comply with AWS D10.12M/D10.12.

5. Mechanical-T fittings may be used for less than full size branch pipe connections 2 in. (50 mm) and larger. Mechanical-T fittings shall be Victaulic Model No. 920 with a locating collar engaged into the pipe.

6. The manufacturer’s hole cutting tool with coupon retaining pilot dual bit shall be used for all holes made outside of the fabrication shop.

7. The following pipe preparation and installation procedures shall be followed:

A. Holes must be drilled on centerline of pipe.

B. Make certain the hole to receive the Mechanical-T is the proper size.

C. Check pipe surface within 5/8 in. (16 mm) of hole to be certain it is clean, smooth and free from indentations or projections which would affect gasket sealing. The pipe around the entire circumference within the Mechanical-T fitting shall be free of any dirt, scale or projection, which might prevent the Mechanical-T from seating fully on the pipe surface.

D. Remove any burrs, sharp or rough edges from the hole, which might affect assembly, proper seating of the locating collar, or flow from the outlet or gasket seating.

E. Install in accordance with the manufacturer's installation instructions.

F. Tighten bolt nuts uniformly until the upper housing is in complete surface contact in the gasket pocket area and the assembly is rigid. Nuts must be tightened to 50 lb.ft. with even gaps between the bolt pads.

C. Joining Methods

1. Make threaded joints with the use of utility compound or teflon tape applied to male threads only. The use of lampwick or filler shall not be acceptable.

2. Cut or rolled grooves in pipe for use with mechanical grooved couplings shall be made with an approved machine manufactured by the supplier of the couplings.

3. Make welded joints (except for pipe welded end-to-end) with forged one-piece welding flanges, caps, nozzles, elbows, branch outlets and tees. Submit cut samples for approval if directed. Use fittings of a type which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends. "Weld-o-lets" may be used where standard fittings of required sizes are not available and elsewhere as approved. Weld fittings shall be UL and FM listed.

4. All job welding shall be done by the electric arc welding process in accordance with the following:

A. All joints shall be 45 degree bevel type. Pipe mill-beveled or machine-beveled by this Contractor.

B. All scale and oxide removed with hammer, chisel or file and bevel left smooth and clean.

C. Pipe lengths lined up straight with abutting pipe ends concentric.

D. Both conductors from the welding machine shall be extended to locations at which welding work is being done. The leads from welding machine to location of welding work shall be held together with tape or other approved means so as to prevent induced current in structural steel, in piping or in other metals within the building. The ground lead shall be connected to length of pipe with suitable

clamp in such manner that welding current will not flow through joints in pipe, structural steel of building or steel pipe supports.

E. Weld metal thoroughly fused with base metal at all sections. Welds shall be of sound metal, free from laps, slag inclusion or other defects.

2. All welders shall be certified for the service for which they are employed and on which they work by the National Certified Pipe Welding Bureau of the Mechanical Contractors Association of America.

3. Connections to equipment shall be made with weld neck flanges of forged steel or stainless steel as required.

2.5 SPRINKLER PIPING SPECIALTIES

A. Sprinkler Inspector's Test Fittings

1. Basis of Design Product: Subject to compliance with requirements, provide AGF Manufacturing “DrainanTest" or equal.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

3. Pressure Rating: 300 psig (2,070 kPa).

4. Body Material: Cast bronze housing with sight glass.

5. Size: Same as connected piping.

6. Inlet and Outlet: Threaded or grooved end.

7. Provide with pressure-relief valve for sprinkler systems with pressure-reducing valves.

B. Adjustable Drop Nipples

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a) Aegis Technologies, Inc.

b) Merit Manufacturing.

2. Standard: UL 1474.

3. Pressure Rating: 250 psig (1,725 kPa) minimum

4. Body Material: Steel pipe with EPDM rubber O-ring seals.

5. Size: Same as connected piping.

6. Length: Adjustable.

7. Inlet and Outlet: Threaded.

2.6 SIGNAGE

A. Provide all designating signs for sprinkler control valves, alarms and hydraulically designed systems as required by the Authorities Having Jurisdiction.

2.7 SPRINKLER HEADS

A. Sprinkler heads shall be as scheduled on the drawings.

B. Furnish and install all sprinkler heads required for a complete sprinkler system installation in accordance with these specifications, the Authority Having Jurisdiction, and applicable standards with UL and or FM approval.

C. Provide automatic sprinkler heads of finish as approved by the Architect.

D. All sprinkler heads shall be commercial quick response sprinklers with 1/2 in. (13 mm) diameter orifice. Sprinkler heads shall be upright, pendent, flush pendent, concealed pendant or dry type pendent to fit the conditions in which they are installed.

E. All pendent, flush pendent and recessed pendant sprinkler heads installed in finished areas with ceilings shall be chrome plated with chrome plated escutcheons unless otherwise noted on the construction documents.

F. All upright, sidewall and pendent sprinkler heads in areas without ceilings or unfinished areas shall be rough brass construction unless otherwise noted on the construction documents.

G. All concealed sprinkler heads installed in finished areas with ceilings shall have white cover plates unless otherwise noted on the Construction Documents.

H. All sprinkler heads shall be of the proper temperature rating for the locations in which they are installed. In general temperature rating shall be an ordinary temperature rating of 165°F (74°C), except for Mechanical Equipment Rooms and Kitchen areas, which shall be 286°F (141°C). Where the maximum ceiling temperatures exceed 100°F (38°C), install sprinkler heads with temperature ratings in accordance with NFPA 13.

I. All sprinkler heads located in areas subject to damage or less than 7 ft. 0 in. above the finished floor shall be provided with a protective sprinkler guard. Sprinkler guards shall be Reliable Model C for sprinklers installed prior to cage assembly and Reliable Model D for sprinkler guard installation prior to sprinkler installation.

J. Furnish and install, where directed, one (1) approved type sprinkler cabinet containing not less than six (6) extra sprinkler heads, of the various degrees used in the work and provide one (1) sprinkler wrench for emergency use. The sprinkler cabinet shall be Reliable Sprinkler Model A4.

2.8 SPRINKLER DRAINS

A. Provide all necessary drain valves, capped nipples and auxiliary piping as required to drain trapped portions of the sprinkler system.

B. Inspector test connections shall be provided with a sight connection and piped to waste.

C. Main drain and test connection shall be piped to waste.

D. All sprinkler drain piping, test connections and auxiliary piping shall be Schedule 40 galvanized steel pipe.

E. Provide all piping required to spill the drains and test connections to the floor, funnel or other drainage connections provided under the Plumbing Contract or arrange with the Plumbing Subcontractor to provide additional drainage facilities, in which case pay all charges related to the additional plumbing work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify existing conditions prior to starting work.

C. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto.

D. Wherever this Contractor's work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to ensure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items in an approved manner in order that the Ceiling Trade may know where to install access doors and panels.

E. The Construction Manager will provide benchmarks, monuments, and other reference points on the job, which will be available for this Contractor's use.

F. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

3.2 INSTALLATION

A. Install work in accordance with NFPA 13 and the New York City Building Code.

B. Run and arrange piping approximately as indicated on the construction documents and coordinate with other trades.

C. The arrangement, positions and connections of pipes, drains, valves and the like, indicated on the Construction Documents shall be followed as closely as possible; however, the right is reserved by the Architect to change locations and elevations to accommodate conditions that may arise during the progress of the work, without additional compensation for such changes, provided that no additional appurtenances are required prior to the installation of the work.

D. Install piping in concealed spaces above finished ceilings and as neatly spaced, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes.

E. Erect all risers plumb and true, parallel with walls and other pipes.

F. Ream all pipe smooth before installation. Do not bend, split, flatten nor otherwise injure pipe.

G. The Contractor shall provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

H. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

I. Provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not. Include the complete installation of the quantity of heads indicated on the drawing with all required piping, valves, etc. The layout to be determined and shop drawings prepared after the tenant layouts and reflected ceiling plans are available.

J. Install sprinkler heads in all areas on a true axis line in both directions in center of tile with a maximum deviation of 1/2 in. (13 mm) plus or minus from the axis line as established by the Architect for use of all trades. At the completion of the installation, remove and reinstall any heads found to exceed the tolerance above.

K. Install flush plate sprinkler heads within the manufacturer's tolerances.

L. Prior to installation of flush plates, notify Architect and Consulting Engineer for verification of installation.

M. Install "U" bends for all pendent heads. Any heads found out of tolerance shall be removed and reinstalled.

N. Install all pendent sprinkler heads in exposed hung ceiling areas, in strict accordance with shop drawings. The Architect reserves the right to reject any and all installed heads not in accordance with the approved shop drawings.

O. The arrangement, positions and connections of pipes, drains, valves, and the like, indicated on the construction documents shall be followed as closely as possible, however the right is reserved by the Architect to change locations, and elevations, to accommodate conditions which may arise during the progress of the work, without additional compensation for such changes, provided that no additional fire standpipe appurtenances are required prior to the installation of the work.

P. It is the responsibility of this Contractor for accurately laying out the work. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

Q. No piping shall pass over high voltage (440V) electrical bus duct, motor control centers, motor starter racks, telephone equipment, transformer equipment, switchgear equipment or any other electrical equipment. Where required, provide protective pans under or over individual pipes and construct the pans of 16 gauge stainless steel with a 6 in. (150 mm) lip, the corners being welded to make the pans watertight. The pan shall drain clear of the bus duct or electrical or telephone equipment. Where pans are above piping, they shall be designed to serve as a deflector plate. Pans over bus duct and electrical or telephone equipment shall be sized to fully protect equipment. Support pans with pipe hangers/Kindorf and pipe drain clear of the equipment below to safe waste. Give each pan three (3) coats of Rust-Oleum paint and support with pipe hangers and drain clear of the equipment below.

R. Route piping in an orderly manner parallel and perpendicular to walls maintaining gradient and headroom without interfering with use of space or taking more space than necessary. Whenever practical group piping at common elevations.

S. Do not install pipes or other apparatus in a manner that interferes with the full swing of the doors and the path of egress as determined by the Architectural Documents.

T. Furnish and install sleeves for pipe passing through partitions, walls and floors.

U. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

V. Install valves in accordance with the specifications and provide access where valves and fittings are not accessible. Coordinate size and location of access doors with valves.

W. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

X. Grooved Piping:

1. All grooved end components shall be the product of one manufacturer.

2. The manufacturer shall provide on-site training for Contractor's field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

3. Piping shall have rolled or cut grooved-ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with coupling manufacturer's current listed standards conforming to ANSI/AWWA C-606.

4. Mechanical couplings for grooved pipe couplings shall be of the rigid or flexible type as required for the installation, with plated nuts and bolts to secure housing sections together and a synthetic rubber flush seal gasket of the cavity pressure-responsive design.

5. Grooved piping systems shall be installed in accordance with the requirements of the manufacturer's latest published literature.

6. Flexible type couplings shall be installed at final connections to equipment and/or in locations where vibration attenuation and stress relief are required as determined by the Engineer.

7. Coupling housings shall be cast ductile iron conforming to ASTM A 536 (Grade 65-45-12), or malleable iron conforming to ASTM A 47, finished painted with alkyd enamel.

8. Flange adapters shall be cast ductile iron conforming to ASTM A 536 (Grade 65-45-12), or malleable iron conforming to ASTM A 47, finished painted with alkyd enamel.

9. Gaskets for mechanical couplings and flange adapters shall be molded flush seal type conforming to the outside diameter of the steel pipe. Synthetic rubber of elastomers having properties as indicated in ASTM D 2000 shall be used. Gasket selection shall comply with the coupling manufacturer's standards, installation and design requirements and shall be suitable for the intended service and temperature range.

10. Gaskets for water service from -30°F (-34°C) to 230°F (110°C) shall be Grade "E" EPDM.

11. Bolts for mechanical couplings shall be zinc plated (ASTM B 633) heat treated carbon steel track head conforming to physical properties of ASTM A 183, minimum tensile strength 110,000 psi (7,585 bar).

3.3 CLEANING

A. During construction, properly cap all lines, so as to prevent the entrance of sand, dirt, etc. Each system of piping shall be blown through after completion (for the purpose of removing grit, dirt, sand, etc., from coils and piping), for as long a time as required to thoroughly clean the apparatus.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all sprinkler piping and appurtenances in suitable condition, before final acceptance.

C. Touch up, repair or replace damaged piping before final acceptance.

D. As soon as sprinkler heads are in place, cover each head with a small paper bag of an approved type, and remove it only after all painting is complete. After the bag is removed, clean and polish all heads.

E. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting to prevent obstruction and damage.

F. Protect the system against freezing in cold weather.

3.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Fire Protection Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all piping, hangers, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

D. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

3.5 FIELD TESTS

A. Performance Test

1. Test all systems before any paint is applied, piping is insulated, furred in or otherwise covered.

2. Required tests shall be witnessed by Fire Marshal, Authority Having Jurisdiction, Owner's representative or Engineer.

3. Test all systems in full accordance with applicable Underwriters' and Municipal requirements, but in no case shall the system be tested at less than 200 psi (13.8 bar) hydrostatic pressure. Apply the test for a minimum of one (1) hour with no loss in pressure. Prior to applying the hydrostatic test, the system shall be tested with 50 psi (3.5 bar) compressed air for a period of ten minutes with no loss in pressure.

4. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

B. Final Acceptance Test

1. After completion of the sprinkler system and at the beginning of the warranty period the Contractor shall perform, without charge to the Owner, one (1) inspection of the sprinkler system during the warranty period. Inspection shall be as per the applicable NFPA No.

25, “Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems”, plus the following maintenance to be performed during the course of the inspection:

A. Operation of all control valves.

B. Lubrication of operating stems of all interior valves.

C. Operation of all water gong, water flow and tamper switches.

D. The Standard Form of the National Fire Sprinkler Association, Inc., “Report of Inspection” (Sheets 1 and 2), shall be filled out in triplicate after each inspection and the copies sent to the Architect and Owner.

3.6 ADJUSTING AND BALANCING

A. Upon completion of installation, hangers for piping, and supports for equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping or the equipment that it is connected to.

B. Securely tighten clevis hanger load nuts first to ensure proper hanger performance. Tighten top nut after adjustment.

END OF SECTION

SECTION 22 00 00

GENERAL REQUIREMENTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Division 22 of the specifications requires the furnishing and installing of all items, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include, but are not limited to, materials, labor, supervision, supplies, equipment, transportation, rigging, storage, utilities, and all required permits and licenses.

B. Before submittal of bid, examine all drawings, specifications, addenda, alternates, special conditions, and all other bidding documents of all sections of this project, verify all governing conditions at the site, and become fully informed as to the extent and character of the work required, as well as its relation to other work in the building. Submittal of a bid is an agreement to all requirements of the Contract Documents, and no consideration will be granted for any claimed misunderstanding thereof.

C. Submittal of a bid is a representation by the bidder that it is qualified in all respects properly to perform the work for which it is bidding and has experience with similar work. Bidders are deemed to be aware, on the basis of their background and experience, materials which may be required in their responsibilities, even though unspecified.

1.2 ABBREVIATIONS

ADA	Americans with Disabilities Act
AGA	American Gas Association
AHJ	Authority Having Jurisdiction
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ASA	Acoustical Society of America
ASME	American Society of Mechanical Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratory
FM	Factory Mutual
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
MSDS	Material Safety Data Sheet
MSS	Manufacturers Standardization Society

NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code (NFPA 70)
NEMA	National Electrical Manufacturers Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NUSIG	National Uniform Seismic Installation Guidelines
NYCEC	New York City Electrical Code
NYCMC	New York City Mechanical Code
OSHA	Occupational Safety and Health Administration
PDI	Plumbing and Drainage Institute
TEMA	Tubular Exchanger Manufacturers Association, Inc.
UL	Underwriters Laboratories

1.3 DEFINITIONS

A. For purposes of these specifications the following definitions apply:

1. ARCHITECT: The Architect of record.

2. ENGINEER: The Engineer of record.

3. CONTRACTOR: The individual, partnership or corporation to whom has been awarded the contract for providing the plumbing work.

4. SUBCONTRACTOR: The individual, partnership or corporation to whom has been awarded the contract for providing assistance to the Contractors work.

5. GENERAL CONTRACTOR: An individual or group that contracts with another organization or individual (Owner) for the construction of a building or other structure. They may or may not do any actual construction of a portion of the project.

6. CONSTRUCTION MANAGER: An individual or group that contracts with another organization or individual (Owner) for the scheduling and coordination of all design and construction processes, including the selection, hiring and oversight of specialty Trade Contractors, for a building or other structure.

7. PROVIDE: To “furnish” and “install”.

8. INSTALL: To join, unite, fasten, link, attach, set up or otherwise connect together; complete, tested and ready for normal satisfactory operation.

9. FURNISH: To supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application.

10. AS DIRECTED: As directed by the Architect or the Engineer.

11. CONCEALED: Embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed within hung ceilings or accessible raised floor cavities.

12. SUBMIT: Submit to the Architect and/or the Engineer for review.

13. FINISHED SPACES: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

14. EXPOSED: Exposed to view.

15. SUPPLY: To purchase, procure, acquire, and deliver complete with related accessories.

16. WORK: Includes labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.

17. PIPING: Includes pipe, tube, fittings, flanges, valves, controls, strainer, hangers, supports, unions, traps, drains, insulation, and all related accessories.

18. WIRING: Includes raceway, fittings, wire, boxes, and all related accessories.

19. INDICATED: As shown or noted on the drawings or specifications.

1.4 RELATED DOCUMENTS

A. The General Conditions and Supplementary Conditions accompanying these specifications are hereby made a part of the requirements for the work under this section of the specifications.

B. No General Conditions and/or Supplementary General Conditions clause referring to the work of this section shall be considered waived unless specifically stated herein.

C. Refer to Owner's "Commissioning Requirements" for the scope of work related to systems furnished and installed under Division 22.

1.5 REFERENCE STANDARDS

A. Comply with the currently enforced versions of all applicable laws, rules, regulations, standards, codes and ordinances of federal, state, and local authorities, Underwriters Laboratory, IRI, ETL, NFPA and the National Electric Code. Modifications required by the Authorities Having Jurisdiction shall be made without additional cost to the Owner.

B. Comply with the currently enforced versions of all applicable laws, rules, regulations, codes and ordinances of New York City and shall be BSA approved or have an OTCR approval. Modifications required by the Authorities Having Jurisdiction shall be made without additional cost to the Owner.

1. Secure and pay for necessary approvals, permits, inspections, carting, legal dumping, etc., and deliver the official records of the granting of permits to the Owner without additional cost to the Owner.

2. The drawings have been filed. Contractor shall pay all fees to obtain release of approved plans and shall complete and file all forms, tabulations, plans, etc., required for Special Inspections.

3. Where so required by the Building Code of the City of New York, the Owner shall employ the services of a Special Inspector to perform inspections of materials, installations,

fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

C. All equipment, materials, and methods to be furnished and/or installed by this division shall comply with all applicable requirements of laws, codes, ordinances, legislation, standards, etc., of all federal, state, and local authorities, whether indicated on the Contract Documents or not.

D. Where Contract Drawing and specification requirements are in excess of rules, regulations and code requirements, and are permitted under the code, the Contract Drawings and specifications shall govern. In the event of a conflict between the Contract Documents and the applicable laws, rules, regulations, codes, and ordinances of federal, state, and local Authorities Having Jurisdiction, the latter shall govern.

E. Where alterations to and/or deviations from the Contract Drawings and specifications are required by the authorities listed above, report the requirements to the Architect and secure his written approval before starting the required modifications.

F. Pay royalties or fees required in connection with the use of patented devices, or systems, and save the Owner, the Engineer and the Construction Manager harmless from any claims or lawsuits arising from such use and indemnify each thereof against attorneys' fees in connection therewith.

1.6 QUALITY ASSURANCE

A. All materials and equipment shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products of the type specified herein. The manufacturer shall have been in continuous operation in the manufacture of the products specified for a minimum of ten (10) years.

B. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

C. Make every effort to furnish all equipment of any equipment type (such as pumps, hot water heaters, storage tanks, etc.) from one manufacturer.

D. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A "Materials Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

E. All adhesives specified herein or utilized in the manufacture of equipment or components which are specified herein shall meet or exceed the volatile organic compound (VOC) limits of South Coast Air Quality Management District Rule No. 1168.

F. All sealants specified herein or utilized in the manufacture of equipment or components which are specified herein shall meet or exceed Bay Area Resources Board Reg. 8, Rule 51. Submit as part of the shop drawing process for review by the Engineer and/or Owner, supporting documentation which demonstrates conformance with these requirements.

G. In the event that products, materials and/or processes are not available that do not contain asbestos, PCB's, VOC's formaldehyde formulations, hazardous materials or may result in

hazardous out-gassing as determined by the manufacturer a “Materials Safety Data Sheet”, as described above, shall be submitted as part of the shop drawing process for review by the Engineer and/or Owner.

H. Furnish all equipment, materials and accessories new and free from defects.

1.7 ENGINEERING REFERENCE POINTS

A. The Construction Manager shall provide benchmarks, monuments, and other reference points on the job which will be available for this Contractor's use.

B. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

1.8 INDEMNIFICATION

A. Covenant and agree that this Contractor and his Subcontractors and his and their agents, servants and employees will provide and maintain a safe place to work and that he and they will comply with all laws and regulations of any governmental Authority Having Jurisdiction thereof.

B. This Contractor agrees to indemnify, defend and hold harmless the Owner, Owner’s agents and Engineer from and against any liability, loss, damage or expense, including attorneys’ fees, arising from a failure or alleged failure on the part of this Contractor, his Subcontractors and his and their agents, servants and employees to provide and maintain a safe place to work or to comply with all laws and regulations of any governmental Authority Having Jurisdiction thereof.

C. This Contractor agrees to indemnify, defend and hold harmless the Owner, Owner’s agents and Engineer from and against any liability, loss, damage or expense, including attorneys’ fees, arising from a failure or alleged failure on the part of this Contractor, his Subcontractors and his and their agents, servants and employees to discharge the obligations assumed by him or them in the performance of the work, including any act or omission allegedly resulting in death or personal injury or property damage, or due to improper construction, construction techniques, or the use of improper or inappropriate material or tools.

1.9 COMPLETE PERFORMANCE OF WORK

A. Work shall be executed in strict accordance with the best practice of the trades in a thorough, workmanlike manner by competent, skilled technicians and trade personnel.

B. This Contractor shall provide a competent, experienced, full-time Superintendent who is authorized to make decisions on behalf of the Contractor.

C. All labor, materials, apparatus, and appliances essential to the complete and proper functioning of the systems described and/or indicated herein, or which may be reasonably implied as essential, whether mentioned in the Contract Drawings and specifications or not, shall be provided by the Contractor. The entire installation shall be ready in every respect for the satisfactory and efficient operation when completed.

D. In cases of doubt as to the work intended, or in the event of need for explanation thereof, request supplementary written instructions in the form of a Request for Information (RFI) from the Architect and/or Engineer.

E. Coordinate the work specified herein and shown on the Contract Drawings with all other trades.

F. Be responsible for material and workmanship until completion and final acceptance. Replace any of same which may be damaged, lost or stolen, without additional cost to Owner. Guard the building and its contents against damage by this Contractor, his employees or Subcontractors, and make good any damage free of charge.

G. Where, due to union regulations or trade agreements, any of the work shown on the drawings or specified herein is not considered this trade's work, subcontract the work in question, but assume full responsibility for the complete installation. Except for such changes as may be specifically approved by the Architects and Consulting Engineers, in accordance with alternates or options stated hereinafter, all work must be in full accordance with the intent of the plans and specifications, complete in every way and ready for satisfactory and efficient operation when delivered to the Owner.

H. Provide signs required by the Authorities Having Jurisdiction.

I. Provide all rigging required for complete installation and furnish drawings showing necessary points of support, reactions and supplementary bracing. This shall be submitted for approval by the Owner. Should any shoring be required, provide same after Owner's approval.

J. Become thoroughly acquainted with the work involved, obtain and verify at the building all measurements necessary for the proper installation of work. Furnish to other Contractors any information relating to work of this division necessary for the proper installation of their contracts. Coordinate with other Contractors for finish adjacent to work of this section and arrange to have visible portions of the work (such as access doors, escutcheons, etc.) fit in with the finish in a manner satisfactory to the Architects.

K. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as fresh water connections, foundations, electric wiring, access doors, and the like) in ample time for installation.

L. Wherever this Contractor's work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to insure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items (valves, dampers, pull boxes, etc.) in an approved manner in order that the other trades may know where to install such items such as access doors, panels, etc.

M. Provide required supports and hangers for piping and equipment, so that loading will not exceed allowable loadings of structure. Submittal of a bid shall be deemed a representation that the Contractor submitting such bid has ascertained allowable loadings and has included in his estimates the costs associated with furnishing required supports.

N. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this section shall be coordinated through the Construction Managerand approved by the Structural Engineer. All such drilling, cutting and reinforcing costs shall be borne by this Contractor.

O. At the conclusion of each day's work, clean up and stockpile on site, at a location designated by the Construction Manager, all rubbish, debris and trash, which may have accumulated during the day as a result of work of this Contractor and of his presence on the job.

1. Sidewalks and streets adjoining the property shall be kept broom-clean and free of debris, rubbish, trash and obstructions of any kind caused by work of this Contractor, which will affect the condition and safety of streets, walks, utilities and property.

P. Due to the nature of the alteration work, which requires the building to be kept operable at all times, except for those floors being actively altered, this Contractor shall coordinate his activities with the Construction Managerand the building Owner. Any interruption of building services must be done at the convenience of the building Owner. If temporary connections to maintain services are required or if the work must be performed after hours, this work shall be so arranged with all parties involved.

Q. If this Contractor must perform work in occupied areas, he shall make arrangements with the Construction Managerand the Owner as to the time and method by which this work shall be performed. He shall arrange for all adjacent areas to be properly protected against damage, dirt and dust.

1.10 DESCRIPTION OF BID DOCUMENTS

A. Specifications, in general, describe quality and type of materials and equipment.

B. The drawings show the various systems schematically, no added compensation shall be permitted for variations due to field conditions.

C. Where disagreements occur between the plans and the specifications or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the Base Bid.

D. Work not shown on the drawings but called for in the specifications, or vice versa, shall be provided by the Contractor without additional expense to the Owner.

E. Where a variance occurs between the drawings and specifications, or within either document itself, the Contractor shall request through the Construction Manager, clarification in writing from the Architect on which item and manner in which the work shall be installed.

F. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

G. Equipment shown on the drawings with particular manufacturers identified has been coordinated for structural penetrations, electrical connection, operating and service (maintenance) requirements, and physical size with regard to the space where the equipment is shown. If they comply with the project specifications, these and the other specified manufacturers of this equipment will be acceptable contingent on the Contractor providing a complete installation and maintaining full responsibility to provide, at no additional cost, any modifications to the structure or electrical service that are required to properly install, operate, and service the equipment being used. These modifications shall not include additional area for equipment unless approved by the Architect.

1. The Contractor shall note these changes on the equipment submittal and shall show all differences in equipment being supplied from that shown on the Drawings. Failure of the Contractor to provide this information with the submittal will indicate that the submitted equipment meets or exceeds the equipment shown on the Drawings in performance and is physically no larger in housing size.

a. Failure of the Contractor to comply with the above and any discrepancies found shall result in the Contractor providing equipment equal to that specified at the Contractor's expense.

1.11 SUBMITTALS

A. No part of the work shall be started in the shop or in the field until the Architect and/or Engineer have reviewed the shop drawings and samples for that portion of the work. Thereafter, the work shall be executed in accordance with the Contract Documents and the indicated status of the reviewed shop drawing.

B. All shop drawings and samples shall be identified as follows:

1. Date of submittal.

2. Title of project (including floor and room designations).

3. Name of Contractor and date of his approval.

4. Name of Subcontractor or supplier and date of submittal to Contractor.

5. Number of submission.

6. Any qualification(s), departure(s) or deviation(s) from the requirements of the Contract Documents.

7. Federal specification, FM Approval, OTCR number, BSA approval number, or ASTM number or any local listing or approval where required.

8. Such additional information as may be required by the specifications for the particular material being furnished.

9. When the submitted materials modify components, styles, etc., on the same drawing, or alternate or options available for the intended material, the material shall be appropriately annotated in a manner to avoid any misunderstanding of the submission.

C. Shop drawings and samples shall be submitted for review sufficiently in advance of the scheduled start of the work in the shop or in the field to allow ample time, in consideration of the number and complexity of the drawings in the submittal, for the Architect and/or Engineer to make an orderly review. No extension of the time to complete the work shall be granted to the Contractor by reason of his failure in this respect.

D. The Contractor shall carefully check shop drawings and samples, including those received by him from Subcontractors and manufacturers, for accuracy, completeness of required information, and conformance with the Contract Documents. Shop drawings found to be inaccurate, incomplete or not in conformance with the Contract Documents shall be corrected before being submitted to the Architect and/or Engineer for review.

E. Within three (3) weeks after award of the Contract, the Contractor shall submit for the Architect's and/or Engineer's review, a list of the manufacturers and Subcontractors whose products and services he proposes to use for the work. Proposed substitutions for material and equipment required by the Contract Documents shall be submitted to the Architect and/or Engineer for review during this period. Submittals proposing or requesting substitutions shall be

expressly identified as such in a letter of transmittal, with the reasons for requesting the substitution stated. Submittals for this purpose shall be complete in every respect, shall conform to all the information requirements for shop drawing and sample submittals, and shall include, at no cost to the Owner, the necessary revisions to other related work required by the Contract Documents. The judgment of the Architect and/or Engineer with respect to the adequacy and acceptability of a proposed substitution shall be final and binding on the Contractor, and shall not be subject to question in any other place. After the expiration of this period, substitutions for material or equipment shall not be proposed or requested in shop drawing and sample submittals, and the Contractor shall be required to execute the work in accordance with the provisions of the Contract Documents.

F. Within six (6) weeks after award of the Contract, the Contractor shall submit a schedule listing all shop drawings and samples with the projected date that each item will be submitted to the Architect and/or Engineer for review.

G. Shop drawings and Requests for Information (RFI's) related to commissioning items shall be copied to the Commissioning Authority.

H. Prior to Final Acceptance, the following data shall be furnished in accordance with the Conditions of the Construction Contract, Division 01 Specifications, and this Division 22 of the Specifications, and shall include, but not be limited to:

1. Record drawings.

2. Operating and maintenance books.

3. Contract or coordination drawings.

1.12 SHOP DRAWINGS

A. The term "shop drawings" shall include layout, detail, and assembly drawings, diagrams, schedules, catalog sheets, printed descriptive matter, and tabular and graphical presentations of operating and performance data that describe work required by the Contract Documents. Catalogs and catalog sheets shall be clearly annotated indicating the specific items being proposed.

B. In addition, during the installation period, submit detailed shop layout drawings for each floor of the project, including all the Mechanical Equipment Rooms, showing equipment and piping work and other distribution services described herein, including locations and sizes of all openings in cellular steel floor decks, walls and floors. Shop drawings with multiple parts shall be submitted as a package. Shop drawings will be 3/8 inch equal to 1 ft. 0 in. scale. Piping shop drawings shall also indicate the point loading and spacing of each hanger and the method of support. Drawings shall include full coordinated plans and sections for Mechanical Equipment Rooms, floor plans and risers. In addition, required detail drawings, such as anchor and guide details, etc., shall be submitted.

C. Shop drawings for Equipment Rooms, and for piping and similar distribution services shall show by dimension the exact size and location of each element of the system in both the horizontal and vertical plane, as well as relationship to the building structure, architectural construction, equipment, and the work of other trades. Where new work is added to an existing structure, the shop drawings shall show the location of all existing services and equipment. Pads, foundations, anchorages, supports and attachments to the building structure where required for the installation of the work shall be shown in layout and detail with sizes, dimensions, materials and

methods of construction noted. The work described in any shop drawing submission shall be carefully checked by this Contractor for all clearances field conditions, maintenance of architectural conditions and proper coordination with all trades on the job.

D. Each submitted shop drawing shall include a certification by the Construction Manager that all related job conditions have been checked and that no conflict exists. No shop drawing submission shall be reviewed without such certification.

1.13 CERTIFICATION

A. Any certifications required by the specifications, in addition to those required for shop drawings, product data, equipment and other items, shall be so certified by the Owner, a Partner, or a Corporate Officer of the firm required to provide the Certification, or by another person duly authorized to sign binding agreements for and in behalf of the Owner, Partner, or Corporation.

1.14 CONTRACTOR'S COORDINATION DRAWINGS

A. Contractor shall furnish in writing, with copies to the Architect and Construction Manager any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. This Contractor and his Subcontractors shall prepare a complete set of construction “Coordination Drawings” indicating the equipment actually purchased and the exact routing and elevations for all lines such as piping, busway, conduit, ductwork, etc., including conduit embedded in concrete. The “Coordination Drawing” preparation and completion shall comply with the requirements of the project construction schedule. The sheet metal drawings, prepared on electronic media (CAD) at a scale not less than 3/8 in. = 1 ft. 0 in., shall serve as the base drawings to which all other Contractors will overlay and add their work. Each trade shall draw their work on separate layers represented by individual colors. Each “Coordination Drawing” shall be completed and signed off by the other Contractors and this Contractor prior to the installation of the work in the area covered by the specific coordination drawing. The Contractors work shall be installed in accordance with the shop drawings and the “Coordination Drawings”. If the Contractor allows one trade to install their work before coordinating with the work of other trades, the Contractor shall make necessary changes to correct the condition without extra cost to the Owner. The Contractor's “Coordination Drawings” indicating piping, conduit, busway, and equipment support points and loads exceeding 200 lb. imposed on the building structure shall be submitted to the Project Structural Engineer for review and approval. The elevation, location, support points, static, dynamic and expansion forces and loads imposed on the structure at support, and anchor points, and the size of all lines shall be indicated. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All work routed underground or embedded in concrete shall be indicated by dimension to column and building lines and shall be coordinated. This requirement for “Coordination Drawings” shall not be construed as authorization for the Contractor or Subcontractor to make any unauthorized changes to the Contract Drawings. Prior to final acceptance of the work of this section, the Contractor shall give the drawing files, in AutoCAD containing the Contractor’s coordination documentation to the Owner.

1.15 ARCHITECT'S AND ENGINEER'S REVIEW

A. The Architect and Engineer shall review shop drawings and samples for conformance with the design concept of the project and the information contained in the Contract Documents. The review of shop drawings and samples shall be only for the convenience of the Owner in following the work and shall not relieve the Contractor of responsibility for deviations from the

requirements of the Contract Documents. The review shall not be construed as a complete or detailed check of the work submitted, nor shall it relieve the Contractor of responsibility for errors of any sort in the shop drawings and samples, or from the necessity of furnishing any work required by the Contract Documents which may have been omitted from the shop drawing submittals. The review of a separate item shall not indicate review of the complete assembly in which it functions. Nothing in the Architect's and/or Engineer's review of shop drawings and samples shall be considered as authorizing a departure from Contract Documents or specifications; additional cost to the Owner; or increased time for completion of the work.

B. Architect's and/or Engineer's review is for general compliance with the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departing therefrom. The Contractor remains solely responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for coordination with other work, whether new or existing and other trades, for selecting fabrication processes, for techniques of construction and for performing his work in a safe manner.

C. The Architect and/or Engineer shall review shop drawings and samples with reasonable promptness and shall return them to the Contractor stamped to indicate the appropriate action as follows:

1. “NO EXCEPTION TAKEN” means that fabrication, manufacture or construction may proceed, providing the submittal complies with the Contract Documents.

2. “EXCEPTIONS AS NOTED” means that fabrication, manufacture or construction may proceed, providing the submittal complies with the Architect's and/or Engineer's notations and the Contract Documents. A copy of the corrected submittal shall be returned to the Architect and/or Engineer for record. If, for any reason, the Contractor cannot comply with the notations, the Contractor shall resubmit as described for submittals stamped “REVISE AND RESUBMIT”.

3. “REVISE AND RESUBMIT” means that the Contractor must comply with the Architect's and/or Engineer's notations and resubmit before fabrication, manufacture or construction may proceed. Submittals stamped in this manner shall not be permitted on the job site.

4. “REJECTED” means that the submittal does not comply with the Contract Documents and that fabrication, manufacture or construction shall not proceed. Submittals stamped in this manner shall not be permitted on the job site.

D. Each submitted shop drawing shall bear the Contractor's stamped and signed certification that the work has been checked for all related job conditions, for maintenance of architectural conditions, and has been coordinated with the shop drawings of other affected trades for interrelated work, as required for the proper and complete performance of the work. No shop drawing submittal shall be reviewed without this certification.

E. Shop drawings for manufactured material and equipment shall include model numbers, dimension drawings, operating weights, material specifications, operating features and controls, wiring diagrams, performance characteristics, service procedures, including clearance requirements for maintenance work, and conformance to specified codes and code ratings. Note that in addition to these requirements, other specific submittal data, and forms of data submission, are required by the Contract Documents for particular items of equipment and material.

F. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein shall be the minimum standards acceptable. The Engineer shall retain the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require that the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

1.16 MANUFACTURER'S RECOMMENDATIONS

A. With the exceptions as specified and/or indicated on the drawings or in the specifications, the Contractor shall apply, install, connect, erect, use, clean, commission and condition manufactured articles, materials, and equipment per manufacturer's current printed instructions and recommendations. Copies of such printed recommendations shall be kept at the project site and made available as required.

B. Where the manufacturer's recommendations conflict with the Contract Documents, the conflict shall be brought to the Engineer's attention immediately.

1.17 SPACE LIMITATIONS

A. The equipment selections used in the preparation of the Contract Documents shall fit into the physical spaces provided and indicated, allowing ample room for access, servicing, removal and replacement of parts. Adequate space shall be allowed for clearance in accordance with code requirements, the requirements of the Local Authorities Having Jurisdiction, and the equipment manufacturer's recommendations.

B. In the preparation of drawings, a reasonable effort to accommodate acceptable equipment manufacturer's space requirements has been made; however, since space requirements and equipment arrangement vary according to each manufacturer, the responsibility for initial access, maintenance access, code-required access, and proper fit rests with the Contractor.

C. Physical dimensions and arrangements of equipment to be installed shall be subject to the Architect's and Engineer's review.

D. Coordinate the installation of piping and equipment with lighting fixtures, special ceiling construction, air distribution equipment and the structure. Provide additional risers, drops and offsets as required. If, after installed, new piping or equipment is found to be in conflict with the architecture, structure, or other trade work which is either existing or shown on the Contract Documents, the piping or equipment shall be relocated without additional cost to the Owner.

E. No piping or equipment shall be installed in the eight (8) inch high zone directly above the finished ceiling in Tenant areas to allow for Tenant build-out and flexibility unless otherwise specifically shown on the Drawings or prior written authorization is received from the Engineer.

F. The Contractor shall follow the Drawings in laying out the Work and check drawings of all trades to verify spaces in which Work will be installed. Maintain maximum headroom and, where space conditions appear inadequate, the Architect shall be notified before proceeding with the installation.

1.18 RECORD DRAWINGS

A. The Contractor shall maintain on a daily basis at the project site a complete set of “Record Drawings”. The “Record Drawings” shall consist of a set of blue-line prints and AutoCAD files of

the Contractor Coordination Drawings for this division. The prints shall include the updated AutoCAD files, which shall be periodically electronically updated to show the precise location of all buried or concealed work and equipment, including embedded piping and valves, and all changes and deviations in the mechanical work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without written definite instructions from the Architect or Engineer. Prior to commencing work, the Contractor shall obtain from the Architect or Engineer a set of AutoCAD format Architectural and Engineering Drawings on CD-ROM, to be used only to produce the Contractor's Coordination Drawings. The continuously updated coordination drawings shall be used to produce the final "Record Drawings" which shall be delivered to the Owner in AutoCAD electronic format upon project completion. The Contractor shall give to the Engineer a written release signed by a corporate officer of the Contractor prior to receipt of the Engineer's disks.

B. Dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two (2) dimensions to permanent structures.

C. Upon completion of the work, the Contractor and his Subcontractors shall certify all "Record Drawings" on the front lower right-hand corner adjacent to the above marking with a rubber stamp impression or an AutoCAD image that states the Project name, the Contractor's name, the area covered, and the date.

D. Prior to final acceptance of the work of this division, the Contractor shall submit properly certified "Record Drawings" to the Architect and Engineer for review and shall make changes, corrections, or additions as the Architect and/or Engineer may require to the "Record Drawings". Submit four (4) prints of each version until accepted.

1.19 ELECTRICAL EQUIPMENT AND ELECTRICAL ROOM PRECAUTIONS

A. In general, the Contractor shall not install piping or equipment in any switchboard, switchgear, transformer, elevator equipment, telephone, telecommunications, or electrical equipment rooms unless this piping or equipment serves only these rooms. Installation is strictly prohibited where it violates the requirements of the applicable Electrical Code.

B. No piping or other equipment foreign to the electrical installation shall be installed within the dedicated zone above switchboards, panelboards, distribution boards, and motor control centers to a height of 6 ft. above the equipment or the structural ceiling, whichever is lower. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in such foreign systems.

C. Caution workers both verbally and in writing as to the dangers involved in doing work within or adjacent to electrical equipment within electrical closets on various floors, the Mechanical Rooms and the Switchgear Rooms, Elevator Machine Rooms, due to dangers caused by the presence of high voltages and currents in these spaces.

D. Provide all necessary personal protective equipment meeting OSHA requirements when working in areas within live electrical equipment.

1.20 CUTTING AND PATCHING

A. In general, cutting and patching will be done under other divisions of the specifications.

B. Furnish to the Construction Managernecessary information so that openings for this work can be built into the floors and walls in time. Such cooperation is required to keep cutting of walls and floors to a minimum.

C. Set drains and sleeves for pipes accurately before concrete floors are poured, or set boxes on the forms to leave openings in the floors and subsequently set required sleeves in the openings.

D. Should the Contractor neglect to perform preliminary work, and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

1.21 UTILITY CONNECTIONS

A. Arrange and pay costs for all specified utilities, including the following:

1. Connection to municipal water mains and sewers.

2. Connection to utility company gas mains.

3. Payment of service charges.

4. Provisions for temporary utilities.

5. Connections to electric and other utility points of service interface.

1.22 PROTECTION OF EQUIPMENT AND MATERIALS

A. Protect from damage, water, dust all material and equipment provided under this division, both in storage and installed in accordance with manufacturer’s recommendations until Notice of Completion has been filed and accepted.

B. Arrange with Construction Manager for storage facilities for materials and equipment.

C. All products stored off site and delivered to the site must be kept in factory packing with positioning devices in place until installation. Equipment which is subject to damage from moisture shall be stored indoors in a suitably controlled environment with factory covering in place.

D. Material, equipment or apparatus damaged because of improper storage or protection shall be rejected.

E. Protect equipment from damage due to moisture, water, spray-on fireproofing, and construction debris during construction.

F. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting and conduits with caps to prevent obstruction and damage.

G. Protect the system against freezing in cold weather.

H. Prior to starting equipment, remove all protective materials, shipping bars, retainers, positioning devices.

1.23 CONSTRUCTION REVIEW

A. Work may be reviewed at any time by the Architect or Engineer.

B. Advise the Architect and/or Engineer that work is ready for review at the following times:

1. Prior to backfilling buried work.

2. Prior to concealment of work in walls and above ceilings.

3. Testing of systems and equipment.

4. When all requirements of the Contract have been completed.

1.24 EQUIPMENT NOISE AND VIBRATION

A. Equipment and systems, as defined herein, shall be quiet and free of apparent vibration while in operation.

B. Vibration shall not be apparent to the senses in occupied areas of the building. To this end, both the balancing of rotating machinery and the installation of vibration isolation at various locations are required.

C. It shall be the responsibility of this Contractor to obtain equipment that is quiet in operation as compared to other available equipment of its size, capacity, and type; to install equipment so that a minimum amount of noise and/or vibration is transmitted to the building; and to fabricate the piping systems so that noises generated in the systems are held to an absolute minimum.

D. Any additional precautions deemed necessary to provide a quiet installation shall be done as part of the work of this division, subject to review by the Engineer and without additional cost to the Owner. After the systems are in operation, it shall be the responsibility of the Contractor to make any changes to equipment or work installed that may be required to provide systems which are quiet in operation and comply with the acoustic requirements as specified herein.

E. Except in various special areas listed herein, the system noise level, in occupied spaces, shall be equal to or less than the “lowest value in the range” of the noise criteria curves for the particular space in accordance with the current edition of Applications Volume of the ASHRAE Handbook. The noise criteria curves shall be based on ANSI Standard S1.6-1984 (R-1990) octave bands and a sound pressure level in decibels referenced to 0.002 microbars. Sound levels within the occupied spaces must meet the criteria described above and with all building, wall partition, floor, ceiling plenum depth, and ceiling construction in place as they exist for the individual spaces. The attenuation through boundary construction of Equipment Rooms must be considered in selecting equipment for acceptable noise level as described herein.

F. The system noise level in the Tenant-occupied spaces of the project shall not exceed NC-35 (except as noted hereinbelow). This shall include all areas occupied by the Tenant, including areas directly under piping or any equipment.

G. Areas that shall conform to noise criteria other than NC-35 shall include the following:

1.	Board Room, Auditorium and Conference Rooms	NC-30
2.	Lobby, Toilets, Corridors, General Offices and Cafeteria	NC-40
3.	Laboratory Areas	NC-40

4.	Computer Room, Print Shop and Storage	NC-50
5.	Technology Floors and Kitchens	NC-55

1.25 FINAL REVIEW

A. At a time designated, the entire installation shall be reviewed for compliance with the Contract Drawings and specifications. The Contractor shall be available at all times during this Review.

B. The Contractor shall demonstrate prior to the Final Review that all systems and all equipment have been properly balanced and adjusted and are in compliance with the requirements of the Contract Documents. After these demonstration tests are completed satisfactorily, but prior to the Final Review field visit by the Engineer, the Contractor shall submit to the Engineer a written certification that attests to Contract Document compliance for this Project.

C. Certificates and documents required herein shall be in order and presented to the Architect and Engineer at least two (2) weeks prior to the Final Review.

D. After the Final Review, any changes or corrections noted as necessary for the work to comply with these specifications and the drawings shall be accomplished without delay in order to secure final acceptance of the work.

1.26 WARRANTY PERIOD

A. The warranty period shall be for the period from beneficial use by the Owner, in accordance with the construction schedule.

B. During the warranty period, the Contractor shall guarantee the following in a form satisfactory to the Owner:

1. All work installed will be free from any and all defects in workmanship and/or materials.

2. All apparatus will develop capacities and performance characteristics specified.

3. The systems shall operate without malfunction.

C. The Contractor shall, without cost to the Owner, remedy any defects within a reasonable time to be specified in notice from the Architect. In default thereof, the Owner may have such work done and charge all costs to the Contractor.

D. The start of the Contractor's warranty period, as defined in the General Conditions, shall commence on the issue of a “Certificate of Substantial Completion” by the Owner or the Owner's Representative for each item of material, equipment, or system.

E. The Subcontractor shall confer with the General Contractor prior to the bid date concerning the project schedule and determine if there is a need to operate any items of equipment or systems for temporary heating and/or cooling or other reasons prior to “Substantial Completion”. All required extended warranty costs for equipment, materials, and systems shall be included in the Subcontractor’s bid.

F. Provide complete documentation of all component and system tests prior to Owner acceptance and turnover of components or systems. In addition, the Owner reserves the right to review all test objectives, test plans and test cases, and witness all preoperational tests. Provide the Owner

with a comprehensive schedule detailing the preparation of testing documentation and the conduct of all component or system tests.

G. Warrant that all components, subsystems and systems will perform their specified functions from the date of turnover and commercial operation through the useful life of the system, as determined by the various equipment manufacturers and installing Contractor. In the event components fail for any reason, be responsible to repair/replace said components, and reimburse the Owner for all costs associated with the component, subsystem or system that failed to perform the specified function.

1.27 GUARANTEE

A. Submit a single guarantee stating that all portions of the work are in accordance with Contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one year from date of final acceptance by the Owner; except that where guarantees or warranties for longer terms are specified herein, such longer term shall apply. At no additional cost to Owner, within 24 hours after notification, correct any deficiencies which occur during the guarantee period, all to the satisfaction of the Owner and Architect. Require similar guarantees from his Subcontractors.

B. Guarantee that the materials and workmanship supplied under these specifications will be of the best grade, that the apparatus will be erected in a practical and first class manner, that it will be complete in operation, nothing being omitted in the way of labor and material required to make this so, although not specifically shown or mentioned herein and that it will be delivered in well working order, complete and perfect in every respect without additional cost - whether or not shown in detail on the drawings or described in detail in this specification.

C. Be responsible for all damage to or caused by the work performed under this division for a period of one (1) year from date of the acceptance of work under this Contract. Repair at no cost to Owner all such damage which occurs within 24 hours' notice thereof by the Owner. Damage which occurs prior to the completion of this work shall be repaired at once. Be responsible for any damage and repair thereof and reimburse Owner for all expense incurred thereby. Indemnify the Owner, the Architect, the Consulting Engineers and the Construction Manager against loss, liability, damage or expense, including reasonable attorneys' fees, in connection with any claim resulting from such leaks which may be asserted by tenants or any other third person.

1.28 DELIVERY, STORAGE AND HANDLING

A. Include all delivery, hauling, hoisting, shoring, and placement in the building of equipment and materials specified herein, including any equipment pre-purchased by the Construction Manager for installation by this Contractor. The Contractor shall be responsible for the timely delivery and introduction of equipment to the Project as required by the construction schedule for this Project. If any item of equipment is received prior to the time it is required, the Contractor shall be responsible for its proper storage and protection until such time as it may be required. The Contractor shall pay for all costs of demurrage or storage in a bonded warehouse.

B. If any item of equipment is not delivered to or installed at the project site in a timely manner as required by the project construction schedule, the Contractor shall be solely responsible for disassembly, re-assembly, manufacturer's supervision, shoring, general construction modifications, delays, overtime costs, etc. No additional cost or delays shall be incurred by the Owner.

PART 2 - PRODUCTS

2.1 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB's) or other hazardous materials identified by the Owner.

2.2 GENERAL

A. Refer to specific specification sections for additional equipment and system piping requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall be in accordance with the specification section pertaining to the individual equipment and system piping.

END OF SECTION

SECTION 22 01 00

OPERATION AND MAINTENANCE OF PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all operation and maintenance instructions and manuals for the plumbing systems and equipment as indicated and scheduled on the drawings in accordance with the Construction Documents.

B. Section includes:

1. Operation and maintenance instructions.

2. Operation and maintenance manuals.

3. Recommended spare parts.

4. Service contracts.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. Each product required for the common plumbing work shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fuel Gas Code.

c. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American National Standards Institute (ANSI)

1) Rotodynamic Centrifugal Pumps (ANSI/HI 1.1-1.4)

2) Rotodynamic Vertical Pumps (ANSI/HI 2.1-2.4)

3) Rotary Pumps (ANSI/HI 3.1-3.6)

b. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

1) ASHRAE Guideline 4: Preparation of Operating and Maintenance Documentation for Building Systems.

1.4 SUBMITTALS

A. Submittals shall be furnished in accordance with the requirements of Section 22 00 00 and shall include, but not be limited to the following:

1. Two (2) copies of operation and maintenance manuals covering the complete operation and recommended maintenance procedures and intervals for each system and each piece of equipment provided by this contract as indicated and scheduled on the drawings and in accordance with the Contract Documents before Final Review of the Project. Assemble all data in a completely indexed electronic volume(s) and identify the size, model, and features indicated for each item. The media shall be submitted and subjected to the same approval process as detailed for shop drawings and samples as described hereinbefore, but shall be returned as “Reviewed”.

2. Provide spare parts data listing; source and current price of replacement parts and supplies for each item of equipment.

3. Furnish manufacturer's installation instructions indicating special procedures and installation requirements.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Hard copies of Operation and Maintenance Manuals shall be furnished in three ring binders each with a clearly defined Table of Contents and index tabs.

B. Operation and Maintenance manuals shall include complete lubrication, cleaning, and servicing data compiled in clearly and easily understandable form. Data shall show serial numbers and model numbers of each piece or equipment, complete lists of replacement parts (including part numbers), motor ratings, and actual loads. Manuals shall include information specific to the actual equipment model installed, including all options clearly indicated.

C. {Each manual shall include the following documentation:

1. A document directory identifying each system and all associated equipment.

2. Operating procedures for each system and all associated equipment.

3. Manufacturer’s maintenance procedures supplemented by project specific information.

4. Assembly and disassembly instructions with exploded view drawings where available.

5. Parts lists and a list recommended spare parts recommended for normal service requirements.

6. Project specific wiring diagrams for each piece of equipment.

7. Trouble shooting and diagnostic procedures for each system and all associated equipment.

8. Description of alarm and trouble codes for software-based systems.

9. Performance curves and data.

10. Test reports.

11. Emergency contact information.

12. Identifying name and mark number.

13. Locations of major equipment (where several similar items are used, provide a list).

14. Complete nameplate data.

15. All set points.

PART 3 - EXECUTION

3.1 PREPARATION

A. Submit an outline of the instruction programs and instruction manuals to the Owner or Owner's representative for his approval at least two (2) weeks prior to the proposed start date of the instruction sessions.

3.2 INSTRUCTION OF OPERATING PERSONNEL

A. :

B. The instruction sessions shall be scheduled at time(s) convenient to the Owner's personnel. Instruction shall cover all equipment and systems provided under this section. Instruction shall be comprised of both classroom-type and actual hands-on operating experience.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Contractor and his Subcontractors shall provide all labor, materials, tools, scaffolding, machinery, equipment, appliances, and services necessary to complete the plumbing work under this Contract. All systems and equipment shall be complete in every respect and all items of material, equipment and labor shall be furnished and installed for a fully operational system. This Contractor shall coordinate his work with the work of the other trades so as to resolve conflicts without impeding job progress or the project construction schedule. Provide notice with the bid proposal of any concrete work required by this division that is not indicated on the Structural or Architectural Drawings or Drawings of other trades.

B. This Contractor shall examine all Contract Documents for all divisions of the specifications in order to determine the extent of work required to be completed under this division. Failure to examine all the Contract Documents for this project will not relieve this Contractor of the responsibility to perform all the work required for a complete, fully operational and satisfactory installation.

C. Provide all miscellaneous common plumbing products required for a complete plumbing installation as indicated, in accordance with the requirements of the Contract Documents.

D. Section includes:

1. Sleeves.

2. Mechanical sleeve seals.

3. Access doors.

4. Formed steel channel.

5. Escutcheons.

6. Protective pans.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. Each product required for the common plumbing work shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

    a. New York City Building Code.

    b. New York City Fuel Gas Code.

    c. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

    a. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

    b. ISO 9000:2001: Quality Management.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Product cut sheets and schedule of sleeves and mechanical sleeve seals used for the project. The schedule shall include the material, diameter, length, number of links, location and service the sleeve and sleeve seal will be provided.

2. Product cut sheets and schedule of access doors used for the project. The schedule shall include the material, size, finish type, location and purpose of installation the access door will be provided.

3. Product cut sheets of formed steel channel.

4. Product cut sheets of escutcheons. The cut sheets shall indicate the size, finish and location, which the escutcheons will be installed.

B. Product Data: Submit manufacturer's literature including general assembly.

C. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for each product and system for which they are installed.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All materials and equipment shall be fabricated by companies, whose primary business expertise is the manufacturing of commercial and industrial products of the type specified herein. The manufacturer shall have been in continuous operation in the manufacture of the products specified for a minimum of ten (10) years.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all materials of any type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

1.6 WORK INCLUDED

A. The work includes, but is not limited to, the following systems, equipment and services:

1. Plumbing fixtures and their supports.

2. Domestic hot and cold water supply piping.

3. Electric water coolers.

4. Drinking water fountains.

5. Sanitary waste piping.

6. Vent piping.

7. Electric domestic hot water heaters.

8. Provide all miscellaneous supports for Division 22 work and equipment.

9. Furnishing of shop drawings, product data and samples.

10. Furnishing of “Record Drawings”.

11. Furnishing of Contractor “Coordination Drawings”.

12. Furnishing of operating and maintenance books.

13. Miscellaneous items as required for complete and functioning systems as specified herein.

14. All systems, equipment, and services specified herein shall be furnished and installed complete and ready for use.

15. Provide all sleeves for the Plumbing work complete with seals and firestop as specified herein and as required by the Authority Having Jurisdiction.

16. Provide insulation for freeze protection, over the cable wrap type heat tracing provided by Division 26.

17. Patching or replacement of all fireproofing if it is damaged or removed during the installation of the Division 22 work.

18. Participate in and assist in the operation of the fire safety ventilation equipment as required during the performance testing and startup of the Division 28 fire detection,

alarm and communication systems. Refer to Division 28 - Fire Detection, Alarm and Communication System for additional requirements.

19. Participate in and provide equipment, materials, and labor as required to construct at the project site a complete mechanical, plumbing, and fire protection “mock up”, in or out of sequence, of one (1) typical floor and the associated Air Handling Unit Room. Refer to Division 01 for details and construction requirements. The field “mock up” shall remain in place for use in the completed building systems. The “mock up” shall be reviewed and shall serve as a model for the mechanical and plumbing installation and other similar typical floors.

20. Participate in and provide equipment, materials, and labor as required to construct at the project site a complete mechanical and plumbing Toilet Room “mock up”, in or out of sequence. See Architectural Section 09 00 00 for details and construction requirements. The field “mock up” shall remain in place for use in the completed building systems. The “mock up” shall be reviewed and shall serve as a model for the mechanical and plumbing installation and other similar typical floor Toilet Rooms.

21. Instruments as required for operating and testing the various systems shall be furnished and installed complete as specified herein.

22. Hydrostatic testing, operational testing and adjusting of all systems.

23. Complete flushing and chemical treatment and initial water treatment for all water systems.

24. Complete all tests required by all rules, regulations, etc., of all Authorities Having Jurisdiction and prepare, complete and file all forms, tabulations, plans, etc., pertinent thereto with the referenced authorities, and accomplish such work with personnel of proper caliber, in particular, Professional Engineers, where so required.

25. Participate in and provide all labor as required for “off-hour” testing of equipment and systems if required by job conditions or by Authorities Having Jurisdiction and as required to obtain the “Temporary Certificates of Occupancy (TCO).”

26. Participate in and provide all labor as required for system commissioning including any time required for a detailed review of the commissioning process as requested by the Engineer or the Owner.

1.7 WORK OF OTHER DIVISIONS

A. Electrical connections for motors and mounting of loose motors.

B. Individual motor controllers except motor controllers furnished as integral parts of pieces of equipment.

C. Pits for sewage ejectors, sumps and pumps. However, this Contractor shall be responsible for correct dimensions, layout, coordination, etc.

D. All concrete work indicated on the Structural, Architectural, and Mechanical/Electrical Drawings.

E. Concrete equipment pads, concrete thrust blocks, and concrete fill for equipment and inertia bases. However, this Contractor shall be responsible for providing the Construction Managerwith the correct dimensions, layout, etc., for all equipment.

F. Metal architectural louvers.

G. Painting, except touch up painting and as otherwise specified herein.

H. Installing access doors in general construction.

I. Domestic water and combination domestic/fire reserve tank supporting structure.

J. Standby power generator.

K. Wiring for automatic controls and interlocks.

L. Subsurface and landscape drainage.

M. Utility mains and piping 5 feet beyond the foundation walls unless shown otherwise on the drawings.

1.8 VERIFYING EXISTING CONDITIONS

A. Before commencing work, examine all adjoining work on which this work is in any way dependent for perfect workmanship according to the intent of this specification, and report to the Construction Manager any condition, which prevents performance of first-class work. No “waiver of responsibility” for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

B. Become thoroughly familiar with actual existing conditions at the building of the present installations to which connections must be made or which must be changed or altered. The intent of the work is shown on the drawings and described hereinafter, and no consideration shall be granted by reason of lack of familiarity on the part of the Contractor with actual physical conditions at the site. Inspect each and every area affected by the total alteration of the building before submitting bid.

1.9 SUBCONTRACTS

A. Where Contract Documents require manufacturers' services, and wherever the staff of this Contractor performing the work of this section cannot adequately perform such services, this Contractor shall stipulate such performance in its contracts with its Subcontractors or Sub-Subcontractors, vendors, manufacturers, and the like, or else subsequently pay them any additional fees required therefor.

1.10 FACTORY TESTING

A. All mechanical sleeve seals and access doors shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

1.11 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and *Section 22 00 00*.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

1.12 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Warranty period shall commence upon final acceptance by the Owner.

C. Furnish a one (1) year manufacturer's warranty for each mechanical sleeve seal and access door.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Access Doors

1. Karp Associates, Inc.
2. Milcor.
3. Williams Brothers Corp.

D. Escutcheons

1. Chicago Specialty.
2. Producers Specialty.
3. Sanitary-Dash.

E. Formed Steel Channel

1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Unistrut Corp.

F. Mechanical Sleeve Seals

1. Calpico, Inc.
2. Metraflex Co.
3. Pipeline Seal & Insulator Inc. (Link-Seal).

G. Sleeves

1. Calpico, Inc.
2. Metraflex Co.
3. Pipeline Seal & Insulator Inc. (Link-Seal).

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 SLEEVES

A. Furnish sleeves for all pipes passing through floors, walls and concrete, or concrete fireproofed beams.

B. Sleeves in concrete beams, through concrete walls, and exposed pipes penetrating floors: Schedule 40 steel pipe.

C. Provide sleeves in foundation walls and in concrete pits with anchor flange.

D. Sleeves within furred-out enclosures in floors, through partitions, steel beams and walls: 18 gauge (1.2 mm) thick galvanized steel.

2.4 MECHANICAL SLEEVE SEALS

A. Provide modular, mechanical type sleeve seals for all piping passing through waterproof concrete foundation walls, pit walls and similar construction, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between the pipe and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

B. Where mechanical sleeve seals are required but cannot be provided due to space limitations, caulk the annular space with lead and oakum.

2.5 ACCESS DOORS

A. Provide access doors as required for all concealed valves, cleanouts and other elements requiring access above ceilings or behind walls or as indicated on the drawings. The installation of all doors will be performed under the work of another section. Coordinate the work and assume responsibility for the accessibility of all valves.

B. Provide access doors factory made, completely flush, heavy metal access doors as manufactured by Karp Associates, Inc.

C. Frames shall be a 14 gauge steel, welded with mitered corners ground smooth, anchors.

D. Doors shall be 14 gauge steel, heavy hinges flush with frame, invisible when closed, wing-type airplane catches; no bolts, screws, nuts or other loose devices required for opening of door.

E. All access doors and frames shall be given a prime coat of corrosion-resistant paint at the factory.

F. Furnish the following access doors as manufactured by Karp Associates, Inc.

1. In plaster ceilings, KARP DSC 210-PL.

2. In 3-hour masonry enclosures (pipe or duct shafts), KARP DSC-211-FRT with 1-1/2 inch vermiculite plaster fill. Metal lath lining for plaster shall be self-furring type, tack-welded to pan.

3. In non-rated masonry, KARP DSC-211.

4. In drywall construction, KARP DSC-214M.

2.6 FORMED STEEL CHANNEL

A. Provide formed steel channel as required to sufficiently support piping and equipment in accordance with the Contract Documents.

B. Formed steel channel shall be galvanized 12 gauge (2.8 mm) thick steel, with holes 1-1/2 inches (38 mm) on center.

2.7 ESCUTCHEONS

A. Provide escutcheons as required to sufficiently enclose penetrations in fire and smoke rated walls and partitions in accordance with the Contract Documents.

B. Where pipes penetrate fire or smoke rated walls provide metal escutcheons on both sides of the wall penetration.

C. Escutcheons shall be either one-piece or two-piece construction, chrome-plated brass or stainless steel.

2.8 PROTECTIVE PANS

A. Provide protective pans under individual or rack of pipes passing over critical equipment, high voltage (440V) electrical bus duct, switchgear or starting equipment.

B. Protective pans shall be *12 gauge black iron* with a 6 inch lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-Oleum paint and support with pipe hangers, and drain clear of the equipment below.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and returned to the manufacturer for replacement.

3.2 INSTALLATION

A. Installation shall be in accordance with the specification section pertaining to the individual equipment.

B. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the drawings shall be followed as closely as possible, but the right is reserved by the Architect to change locations and elevations to accommodate conditions which may arise during the progress of the work, prior to installation, without additional compensation for such changes. The responsibility for accurately laying out the work and coordinating the installation with other trades rests with this Contractor. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

C. Carry fixture connections, concealed in building construction, to points above floor, break out close to the underside or adjacent to fixture and continue exposed to fixture.

D. Piping Installation

1. Install pipes approximately as shown on the drawings and as directed during installation, as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and neatly spaced. Erect pipe risers plumb and true, and parallel with walls and other pipes and neatly spaced.

2. Keep all horizontal runs of piping, except where concealed in partitions, as high as possible and close to walls. Maintain minimum 1/8 inch fall per foot on all soil, waste and leader lines.

3. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

4. Ream all pipe smooth before installation. Do not bend, flatten, split or otherwise injure pipe.

5. Use reducing fittings, unless otherwise approved in special cases, in making reduction in size of pipe. Bushings shall not be allowed unless specifically approved.

6. Where chrome-plated piping is installed, cut and thread pipe so that no unplated pipe threads are visible when the work is completed.

7. Do not install exterior piping in water or when trench or weather conditions are unsuitable for the work, as decided by the Architect.

E. Sleeves

1. Set sleeves in position in forms. Provide reinforcing around sleeves.

2. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

3. Extend sleeves through floors *1 in. (25 mm)* above finished floor level. Caulk sleeves tight.

4. Where piping penetrates floor, ceiling or wall, close off space between pipe and adjacent work with firestopping and caulk airtight. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.

5. Sleeves passing through fire-rated floors or walls shall be sealed with an intumescent formulation similar to Metraflex Metraseal 120 FireSeal or approved.

6. Sleeves passing through foundation walls or pit walls shall be sealed utilizing a mechanical seal similar to Link-Seal or approved.

7. Install *chrome-plated steel*escutcheons at finished surfaces.

8. Set sleeves as construction progresses and secure in place during pouring of concrete.

9. Fire stopping shall be installed as specified under Section 07 84 00.

F. Mechanical Sleeve Seals

1. Mechanical sleeve seal installation shall be in accordance with the manufacturer's recommendations and as indicated on the drawings.

2. Install mechanical sleeve seals at all exterior water tight entries, foundation walls and pit walls.

G. Access Doors

1. Size access doors as required for the equipment being accessed, however access doors shall not be smaller than 16 inches by 16 inches. Install all valves to fit within the limit of the following size access doors; where two (2) or less valves are located with their bonnets within 12 inches of the face of the door and all portions of the valves are within the area defined by the opening in the door, 16 inch x 16 inch doors may be used. Where more than two (2) valves are served by a door and the bonnets are within 12 inches of the face of the door, the size of the door shall be increased so that all portions of the valves are within the area defined by the opening in the door. Where the bonnets of the valves are more than 12 inches from the face of the door, the doors shall be minimum of 20 inch x 20 inch clear opening.

2. Furnish buttons or tabs to Ceiling Contractor for setting, as approved by Architect, to indicate location of valves, cleanouts or other equipment located above removable-type ceilings where access doors are not furnished.

H. Protective Pans

1. Install protective pans within 6 inches of the underside of piping or equipment.

2. Pans shall be sized a minimum 2 inches greater in each dimension around the piping and equipment, which it's being supported under.

3. Protective pans shall be supported by hangers and supports sized sufficient to carry the weight of the pan filled with water. All hangers and supports shall be attached to the structure. Hanging protective pans from the equipment or piping above shall not be acceptable.

4. Make drain connections to the side or bottom of pan by welding or brazing and drain clear of the equipment, which the pan is protecting.

5. Perform a standing water test on the pan by filling with water to within 1 inch of the top of the lip and let stand for 30 minutes with no leakage.

I. Escutcheons

1. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings, and pipe sleeve extensions, if any. Furnish pipe escutcheons with chrome finish for occupied areas, prime paint finish for unoccupied areas.

2. Escutcheons for waterproof floors, and areas where water and condensation can be expected to accumulate shall be stainless steel or chrome plated cast brass, solid or split hinged.

3. Escutcheons for dry areas shall be chrome plated cast brass or galvanized sheet steel, solid or split hinged.

3.3 CLEANING

A. Before final connections are made and before operation of equipment and piping, thoroughly blow out, rod out, or wash out all piping at least twice, in a manner as directed and/or approved by the Architect, to remove all accumulation of dirt, chips or other deleterious material. Make all temporary connections and furnish all appliances required for the purpose of cleaning at no extra expense to the Owner.

B. Clean up all equipment and leave in condition for finish painting before acceptance.

C. Disinfect underground water mains after installation and test in accordance with AWWA Standard C-601 and requirements of the local Authorities Having Jurisdiction.

D. Disinfect interior potable water distribution system in accordance with requirements of the local Authorities Having Jurisdiction. Provide the following procedure where no prescribed method exists:

1. After the system is flushed, fill with either 50 ppm chlorine-water solution and let stand for 24 hours, or 200 ppm chlorine-water solution and let stand for 3 hours.

2. Flush system with clean potable water until no excess chlorine remains in system.

3. Repeat procedure if contamination persists after further test.

E. All pipe, fittings, valves, etc., used in the nitrogen, hydrogen, helium, oxygen, nitrous oxide and medical compressed air systems shall be factory cleaned for oxygen service and capped or sealed in plastic and marked “For Oxygen Service”. Pipe, fittings, etc., not expressly cleaned by the manufacturer shall be thoroughly cleaned of oil, grease and other contaminants as follows:

1. Wash pieces in a hot solution of sodium carbonate or trisodium phosphate mixed in the proportion of one pound to three gallons of water. Scrub and continuously agitate the part during washing. After washing, rinse thoroughly in clean hot water. Dry parts in clean nitrogen wash, bag and seal in unused plastic bags.

2. Exercise great care in the storage and handling of clean materials and the condition of tools used in cutting and reaming to prevent introduction of oil, grease and other contaminants. All contaminated material shall be recleaned.

3.4 PROTECTIVE PAINTING

A. Painting, except as specified herein or indicated otherwise, shall be done under another division. This division shall cooperate with the other divisions to determine the size of equipment, sizes and lengths of pipes, etc., to be painted.

B. Equipment and materials furnished under this section shall be factory-finished as specified. If the factory finish is damaged during shipment, storage, installation, etc., it shall be repainted by this Contractor subject to the Engineer’s approval. Touch-up painting is acceptable only for minor finish damage.

C. Paint products for identification of plumbing systems shall be exterior grade, alkyd-based products.

D. Repair damaged and marred factory-painted finishes with materials and procedures to match original factory finish.

3.5 FIELD TESTS

A. Test all systems in full accordance with applicable Underwriters’ and Municipal requirements.

B. Notify the Architects and Inspectors Having Jurisdiction at least 48 hours in advance of performing the required tests, so that arrangements may be made for their presence to witness the tests.

C. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architects, plumbing and other inspectors of the city, applicable Insurance Association and Public Utilities Inspectors Having Jurisdiction.

D. Repair or, if required by the Architects, replace defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Test the systems before any paint or insulation is applied.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

H. Test all fixtures for soundness, stability of support and satisfactory operation.

I. Performance Tests

1. Gravity Drainage Systems: Subject the sanitary and storm drains, waste, and vent piping inside the building to a standing water test. The standing water test shall include the entire system from the lowest to the highest point of the system. The system shall be tested to a hydrostatic pressure equivalent to at least a ten foot head of water. After filling, shut off water supply and allow it to stand two (2) consecutive hours, with no leakage.

2. Pressure Systems

a. Prior to applying the pressure test, the system shall be tested to 50 psig with compressed air or dry nitrogen for a period of ten minutes with no loss in pressure.

b. All interior water distribution systems, compressed air systems, vacuum systems, helium, hydrogen, oxygen, nitrogen, medical and specialty gas systems shall be tested to a pressure not less than 150 psig or 50 psig above the normal operating pressure, whichever is greater. Apply the test for a minimum of two (2) consecutive hours with no loss in pressure.

3. Gas Piping

a. Test the gas piping low pressure distribution system (< 1/2 psi) with a non-mercury gauge at a pressure of 3 psig for a minimum of 30 minutes with no drop in pressure.

b. Test the gas piping distribution system over 1/2 psi but less than 3 psi at a pressure of 50 psig for a minimum of 30 minutes with no loss in pressure.

c. Test the gas piping distribution system over 3 psi but less than 15 psi to a pressure of 100 psig for a minimum of 60 minutes with no loss in pressure.

d. Test the gas piping distribution system over 15 psi to a pressure equal to twice the operating pressure but not less than 100 psig for a minimum of 60 minutes with no loss in pressure.

J. Final Acceptance

1. Prior to final acceptance the Contractor shall submit all performance test reports for each test performed. The reports shall be bound in a three ring binder and submitted to the Architect, Engineer and Owner for review.

2. Final acceptance testing shall comply with the project construction schedule and shall be sufficiently in advance of the Contract completion date to permit the execution of the testing by the Contractor prior to occupancy and the close-out of the Contract.

3. Any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper and satisfactory functioning of all equipment and systems shall be completed prior to the close-out of the Contract. Re-tests shall not relieve the Contractor of completion date responsibility.

END OF SECTION

SECTION 22 05 23

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all valves required for equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Alarm devices.

2. Backflow preventer and vacuum breakers.

3. Ball valves.

4. Check valves.

5. Circuit balancing valves.

6. Plug valves.

7. Valve schedule.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. Each valve and all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fuel Gas Code.

c. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American Society of Mechanical Engineers (ASME)

1) ASME/ANSI B16.5: Pipe Flanges and Fittings.

2) ASME B16.34: Valves Flanged Threaded and Welding End.

3) ASME PTC 25: Pressure Relief Devices.

b. American Water Works Association (AWWA)

1) AWWA C500: Standard for Metal Seated Gate Valves for Water Supply Service.

2) AWWA C504: Standard for Rubber Seated Butterfly Valves.

3) AWWA C508: Standard for Swing Check Valves for Waterworks Service.

4) AWWA C510: Standard for Double Check Valve Backflow Prevention Assembly.

5) AWWA C511: Standard for Reduced Pressure Principle Backflow Prevention Assembly.

c. ASTM Society for Testing and Materials (ASTM)

1) ASTM F1508: Standard Specification for Angle Style, Pressure Relief Valves for Steam, Gas and Liquid.

d. Manufacturers Standardization Society (MSS)

1) MSS SP-6: Standard Finishes for Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2) MSS SP-25: Standard Marking System for Valves, Fittings, Flanges and Unions.

3) MSS SP-53: Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components.

4) MSS SP-55: Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components.

5) MSS SP-61: Pressure Testing Steel of Valves.

6) MSS SP-67: Butterfly Valves.

7) MSS SP-68: High Pressure Offset Seat Butterfly Valves.

8) MSS SP-70: Cast Iron Gate Valves, Flanged and Threaded Ends.

9) MSS SP-71: Cast Iron Swing Check Valves, Flanged and Threaded Ends.

10) MSS SP-72: Ball Valves with Flanged or Butt-welding Ends for General Service.

11) MSS SP-78: Cast Iron Plug Valves, Flanged and Threaded Ends.

12) MSS SP-80: Bronze Gate, Globe, Angle and Check Valves.

13) MSS SP-82: Valve Pressure Testing Methods.

14) MSS SP-85: Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

15) MSS SP-110: Ball Valves - Threaded, Socket-welding, Solder Joint, Grooved and Flared Ends.

e. National Sanitation Foundation International (NSF)

1) NSF/ANSI Standard 61: Drinking Water System Components.

f. United States Environmental Protection Agency (USEPA)

1) Safe Drinking Water Act (SDWA).

2) Reduction of Lead in Drinking Water Act (Federal Public Law 111-380).

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of valves, complete with typical mill reports.

B. Product Data: Submit manufacturer's literature including general assembly, including but not limited to the following:

1. Dimension and specification sheets.

2. Model number.

3. Pressure rating.

4. Working pressure.

5. List of materials.

6. Manufacturer's installation instructions.

C. Schedule of Valves: Submit a single well-organized schedule for all valves indicating the following:

1. Valve type/model number.

2. System type.

3. Location/floor.

4. Pressure rating.

5. Pipe size.

6. Connection method.

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer's Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All valves shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. The valve manufacturer shall provide documentation that all valves have been factory tested and performs to the performance and pressure ratings specified.

2. All valves shall be factory tested in accordance with the latest applicable standards.

3. All valves provided by this Contractor for use by Division 21 shall be FM Approved, UL Listed and approved for use in fire suppression systems.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

D. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves and weld ends.

3. Set angle, gate and globe valves closed to prevent rattling.

4. Set ball valves open to minimize exposure of functional surfaces.

5. Set butterfly valves closed or slightly open.

6. Block check valves in either closed or open position.

E. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

3. Use sling to handle large valves and rig sling to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

1.8 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a five (5) year manufacturer's warranty for all manual valves and relief valves.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved

neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Ball Valves

1. Apollo.
2. Crane.
3. Hammond.
4. Jamesbury.
5. Milwaukee.
6. NIBCO.
7. Stockham.
8. Watts.

D. Check Valves

1. Crane.
2. Hammond (I.B. Series only).
3. Flomatic Corporation.
4. Kennedy.
5. Mueller Steam Specialty.
6. Nibco.
7. Val-Matic Valve & Manufacturing Corp.
8. Walworth.

E. Circuit Balancing Valves

1. Armstrong.
2. Bell & Gossett.
3. Nibco.

F. Globe Valves

1. Crane.
2. Hammond.
3. Milwaukee.
4. Nibco.
5. Stockham.
6. Walworth.

G. Hose Bibbs

1. J. R. Smith.
2. Woodford Mfg.
3. Zurn Ind.

H. Plug Valves

1. Clow Valve Co.
2. Flowserve-Nordstrom.
3. Nibco.
4. Walworth.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. Shut-off valves, isolation valves, pressure-reducing valves and check valves shall be provided as indicated on the Construction Documents or as required by the Authorities Having Jurisdiction on the drawings, required or directed.

E. Air release valves shall be provided at the high points of all domestic hot water systems and where trapped sections of horizontal piping exist in the field due to Contractor coordination.

F. Pressure-relief valves shall be provided on each hot water pressure vessel, heat exchanger or pump discharge as specified herein. Temperature and pressure ratings for pressure-relief valves shall be appropriate for the system in which they are installed and in accordance with the requirements of the Authority Having Jurisdiction.

G. Direct acting pressure-relief valves shall be provided on pilot controls for all automatic control valves.

H. Valve pressure ratings shall not be less than indicated and as required for system pressures.

I. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

J. Valves used in potable water systems and valves supplying water for potable use shall be compliant with the Reduction of Lead in Drinking Water Act (Federal Public Law 111-380) limiting the lead content of the wetted surfaces to a weighted average of 0.25% or less.

K. Valves bodies shall be identified as lead-free by a symbol or letters “LF” casted into the body. Valve handles shall be distinctively identified by white handles with blue graphics.

L. The use of NRS gate valves and butterfly valves shall be limited to shutoff services only and only where specifically permitted by the Engineer.

M. Unless otherwise noted, all valves for shutoff and bypass service shall be ball valves, 3 in. (75 mm) and below, and gate or butterfly valves, 4 in. (100 mm) and above.

N. All end connections shall be the same as are used for fittings for 3 in. (75 mm) and below. 4 in. (100 mm) and above, valves shall be flanged.

O. Valve-End Connections

1. Flanges on iron valves shall meet ASME B16.1.

2. Flanges on steel valves shall meet ASME B16.5.

3. Flanges on bronze and/or brass valves shall meet ASME B16.24.

4. Threaded ends shall meet ASME B1.20.1.

5. Soldered lines double union ends with solder joints ASME B16.18.

P. Valve Operators

1. Provide gear operators on quarter-turn valves 5 in. (125 mm) and larger.

2. Provide lever handles on quarter-turn valves, (except plug valves) 4 in. (100 mm) and smaller.

3. Handwheels shall be provided on valves other than quarter-turn types.

4. Provide wrenches for plug valves 4 in. (100 mm) and smaller. Furnish one (1) wrench for every five (5) plug valves for each size plug-valve head.

5. Chain wheels shall be provided for attachment to valve handwheels, stems, or other operators on all valves installed more than 7 feet 0 in. (2.1 m) above floors and/or working platforms.

Q. Valves in insulated piping shall be provide with 2 in. (50 mm) stem extensions having the following features:

1. Extended operating handle of non-thermal-conductive material.

2. Extended differential measuring ports.

3. Protective sleeve that allow operation of valve and access to the measuring ports without breaking the vapor seal or disturbing insulation.

4. Memory stops that are fully adjustable after insulation is applied.

2.3 BACKFLOW PREVENTER AND VACUUM BREAKERS

A. Backflow preventers and vacuum breakers shall be provided as required by the local Authority Having Jurisdiction.

B. Atmospheric Vacuum Breakers

1. Atmospheric vacuum breakers must assure positive protection against back-siphonage in the event that pressure loss causes vacuum conditions. Poppets are to be Selcon plastic. Vacuum breakers are to be rough brass unless otherwise noted.

2. Atmospheric vacuum breakers shall be used as protection against cross-connections where the vacuum breaker is not subjected to back pressures due to pumps or gravity (open end service) and must be installed on the discharge side of last shutoff and be of non-spilling type. Install at a minimum of 6 in. (152.4 mm) above the highest overflow level, with the air inlet in a level position and a check valve in line after vacuum breaker. No valves shall be installed after vacuum breaker. They shall be rated to 150 psi (10.3 bar) working pressure and shall withstand water temperature to 110°F (43.3°C). Atmospheric vacuum breakers shall be Watts Model No. LF288A or Apollo Model No. AVB1LF.

C. Pressure Vacuum Breakers

1. Pressure vacuum breakers must be installed where subject to continuous pressure 12 in. (305 mm) above the highest outlet they are protecting. Install accessibly for periodic testing, and unit shall not become inoperative if subject to long periods under pressure. The vacuum breaker shall render positive protection against back-siphonage and incorporate a check valve and a vacuum relief with inlet and discharge shutoffs and field-testing cocks in one assembly. In sizes above 2 in. (50.8 mm), two check valves are required.

2. All valves, check valves, nipples and other fittings shall be all-bronze construction. Units 6 in. (152.4 mm) and larger must be internally epoxy coated. Vacuum breakers shall be rated to 150 psi (10.3 bar) working pressure and shall withstand water temperatures to 180°F (82.2°C) for units up to 2 in. (50.8 mm) and to 140°F (60°C) for units 3 in. to 10 in. (76.2 mm to 254 mm). The vacuum relief valve must have a spring-loaded member to assure positive opening of air inlet when back-siphonage occurs. Pressure vacuum breakers shall be Watts Model No. LF800M4QT (1/2 in. to 2 in.) (12.7 mm to 50.8 mm).

D. Double Check Valve Assembly

1. Backflow preventer, 3/4 in. (19 mm) through 4 in. (100 mm) shall consist of two (2) bronze independently operated internally spring-loaded check valves, two brass gate valves and four test cocks for field testing. Check valves must be loaded to withstand 1 psi (0.07 bar) in direction of flow. All internal parts must be readily accessible for maintenance without removing device from line, must be installed in a horizontal position and be accessible for periodic testing. Units 5 in. to 10 in. (127 mm to 254 mm) shall be of similar construction, but have “Y” type check valves and be of internally epoxy coated cast iron construction.

2. Assembly shall be Watts Model No. LF709 rated to 150 psi (10.3 bar) minimum working pressure and shall withstand water temperatures to 140°F (60°C), or as approved. Unit shall be shipped completely assembled and all valves, check valves, nipples and other fittings.

E. Reduced Pressure Backflow Preventer

1. Unit shall prevent contamination of water lines due to pressure reversal. This shall be accomplished by automatically reducing the pressure through the unit by means of the

"reduced pressure principle". Unit shall consist of two (2) "Y" pattern spring-loaded check valves, a differential pressure-relief valve having two diaphragms separated by a spacer, two shutoff valves, and test cocks for field testing. Under normal flow conditions, both check valves shall be open and the differential relief valve shall remain closed. Under backflow conditions and when one of the check valves leaks, the differential relief valve shall open and discharge to atmosphere to maintain the zone at 2.0 psi (0.15 bar) lower than inlet pressure.

2. Device shall automatically reduce the pressure in the zone" between the check valves. Should the pressure differential, normally 9 psi (0.63 bar), drop to 2.0 psi (0.15 bar), the relief valve shall open, discharge the liquid to floor or funnel drain and maintain the proper differential. A small hole in the spacer shall bleed to atmosphere if either diaphragm is damaged, giving visual evidence or diaphragm failure. Both check valves and relief valve shall be constructed so they may be serviced without removing device from the line. Unit shall be rated to 175 psi (12 bar) working pressure at 180°F (82.2°C) water temperature. Backflow preventers 2 in. (50 mm) and smaller, Watts Model No. LF709, shall have bronze bodies and trim. 2-1/2 in. (63.5 mm) and larger shall have cast iron bodies with epoxy coating and bronze trim, Watts Model No. LF709.

F. Hose Connected Vacuum Breakers

1. Hose connected vacuum breakers must assure against back-siphonage by relieving water under pressure when hose end is closed off.

2. Unit shall be vandalproof, all brass construction, finished to match existing piping with female inlet and hose-end outlet connection. Hose connected vacuum breakers shall be Watts Model No. 8A or Apollo Model No. HBVAF2.

G. Pipeline Air Gaps

1. Pipeline air gaps must assure against back-siphonage by overflowing. Units shall be installed in water makeup lines to vessels under atmospheric pressure only. Air gap of unit must be at least twice the pipe diameter of the pipe in which it is installed.

2. Pipe material and finish of unit shall match piping system in which it is installed. Unit shall be as approved.

2.4 BALL VALVES

A. Ball valves shall be all brass or bronze construction with replaceable Teflon seat ring, two-piece union or three-piece bolted design as scheduled herein.

B. Threaded valves used in brazed or soldered piping systems shall be fitted with adapters. When brazing, three-piece design shall be used and reinforced Teflon seats must be removed prior to brazing.

C. Ball valves shall be two-piece type with adjustable stem packing using a threaded packing nut. Valves shall provide positive shutoff.

D. Drain Valves (at Riser Heels and Low Points): Ball valves to be used as drain valves at all low points in water piping. Provide a 3/4 in. (19 mm) ball valve with male threaded nipple for hose connection with 3/4 in. (19 mm) hose cap to protect hose threads and chain

E. Bronze ball valves shall be constructed as follows:

Body	Brass or bronze
Body Style	Two-piece or three-piece full port
Trim	316 stainless steel ball and stem
Seat	Reinforced Teflon (RTFE)
Body P/T Rating	600 psig (41.7 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	300 psig (20.7 bar) minimum

F. Steel ball valves shall be constructed as follows:

Body	Cast steel
Body Style	Two-piece full port
Trim	316 stainless steel ball and stem
Seat	Reinforced Teflon (RTFE)
Body P/T Rating	600 psig (41.7 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	*{300 (20.7 bar*psig minimum

2.5 BUTTERFLY VALVES

A. Resilient Seated and High Performance Butterfly valves shall be full lug type suitable for bidirectional dead-end service at rated pressure without use of downstream flange. Conforming to ANSI Class 150 or Class flange drilling as scheduled herein.

B. Stem seal shall not rely on compression between seating material and disc, but shall be accomplished by EPDM O-ring seals and have threaded upper and lower collar bushings to provide blowout proof stems and low torque operation.

C. Disc shall not be attached to stem by fasteners or locknuts. Molded-in seat material shall be EPDM and designed to prevent dislocation during closure; seating material must simultaneously act as flange gasket.

D. Valve must be factory tested and certified to seat bubble tight.

E. Gear operators shall be used on all butterfly valves provided for the Division 21 Contractor.

F. Butterfly valves provided for Division 21 shall be suitable for indoor/outdoor use, equipped with two (2) factory-mounted internal supervisory switches.

G. Resilient seated butterfly valves shall be constructed as follows:

Body	Ductile iron
Body Style	Tapped full lug or grooved
Trim	316 stainless steel stem
Disc	Aluminum bronze, bronze or stainless steel
Seat	EPDM
Body P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum
Seat P/T Rating	175 psig (12.1 bar) at 100°F (38°C) minimum

H. ANSI Class 150 and Class 300 high performance butterfly valves shall be full lug type suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

I. High Performance ANSI Class 150 butterfly valves shall be constructed as follows:

Body	Cast steel
Body Style	Tapped full lug
Trim	316 stainless steel stem
Disc	Aluminum bronze, bronze or stainless steel
Seat	PTFE
Body P/T Rating	285 psig (19.6 bar) at 100°F (38°C) minimum
Seat P/T Rating	200 psig (13.5 bar) at 100°F (38°C) minimum

J. High Performance ANSI Class 300 butterfly valves shall be constructed as follows:

Body	Cast steel
Body Style	Tapped full lug
Trim	316 stainless steel stem
Disc	Aluminum bronze, bronze or stainless steel
Seat	PTFE
Body P/T Rating	720 psig (49.6 bar) at 100°F (38°C) minimum
Seat P/T Rating	700 psig (48.3 bar) at 100°F (38°C) minimum

2.6 CHECK VALVES

A. Provide check valves as required to prevent the reversal of water, air or gas flow in the plumbing systems as identified on the Construction Documents and required by the Authority Having Jurisdiction.

B. Provide non-slam swing or spring-loaded center-guided check valves for the pump discharges of all water pumps, except pumps used in circulating systems.

C. Provide swing check valves on circulating pump discharges.

D. Provide ball check or swing check valves on the cold and hot water supplies to all lavatory and pantry faucets, shower valves and mixing valves where the backflow of hot or cold water can migrate across the supplies to the fixture.

E. Provide non-slam lever weighted check valves or ball check valves on all sump and ejector discharges.

F. Check valves shall be threaded, flanged or grooved ends suitable for the system, which it is being installed.

G. Check valves shall be a horizontal swing check with renewable bronze seat and disc.

H. Valve must be factory tested and certified to seat bubble tight.

I. Spring loaded check valves shall be center guided globe type constructed as follows:

Body	Carbon steel/ductile iron

Body Style	Lug type/flanged
Trim	316 stainless steel
Spring	Stainless steel
Body P/T Rating Class 150	285 psig (19.6 bar) at 100°F (38°C) minimum
Body P/T Rating Class 300	740 psig (51 bar) at 100°F (38°C) minimum

J. Class 150 cast steel swing check valves shall be constructed as follows:

Body	Carbon steel
Body Style	Bolted cover
Disc	Stainless steel
Seat	Steel/stellite facing
Trim	Carbon steel
Ends	Flanged
Body P/T Rating	ASME B 16.34
WOG Rating	150 psig (17 bar) minimum

2.7 CIRCUIT BALANCING VALVES

A. Circuit balancing stations shall be provided on all hot water circulation risers, loops and circulating water systems as identified on the Construction Documents. Balancing stations shall consist of shut off valves, check valve and circuit balancing valve with metering port extensions as specified herein.

B. Circuit balancing valves shall be used for flow balancing, measurement, and shutoff 1/2 in. (12.5 mm) to 3 in. (75 mm) with a flow range starting at 0.5 gpm minimum.

C. Provide valves suitable for water temperatures to 180˚F (82.2°C).

D. Provide valves with integral metering test ports for connecting a portable differential pressure meter. Each meter connection shall have pressure/temperature readout points. Each valve shall have two (2) 1/4 in. (6.25 mm) NPT metering ports with integral check valves and gasketed caps located on both sides of valve seat.

E. Valves are to be of the globe style and provide multi-turn, 3600 adjustment with a micrometer type indicator located on valve handwheel. Valve handwheel shall have hidden memory stop feature that shall provide a means for locking the valve position after the system is balanced. Quarter turn valves are not acceptable.

F. Balancing valves 1/2 in. (12.5 mm) through 2 in. (50 mm) shall have valve body and stem that is dezincification resistant bronze or brass alloy with high strength resin handwheel and sleeve. Valves shall have minimum of four (4) full 360 degree handwheel turns and have ±5% accuracy scale from 25% open to 100% full open. Circuit balancing valves shall be Bell & Gossett Circuit Setter Plus CB-1SLF.

G. Circuit balancing valves shall be installed at least five (5) pipe diameters down-stream from any fitting and pumps. Two (2) pipe diameters downstream from the valve should be free of any fittings. When installed, easy and unobstructed access to the valve handwheel and metering ports for adjustment and measurement are to be provided. Mounting of valve in piping must prevent sediment build-up in metering ports.

H. Provide a differential pressure test kit to be furnished to the owner. Test kit shall include standard tubing kit, tubing manifold, bypass flushing valve, isolation valves, pressure probes in a plastic carrying case for ease of storage at facility. Test kit shall be similar to Bell & Gossett Circuit Setter Plus Kit.

2.8 GLOBE VALVES

A. Globe valves used for circuit balancing shall be all bronze body and trim, provided with memory locking stops.

B. Globe valves 2-1/2 in. (65 mm) and smaller shall be Class 150 bronze valves providing positive shutoff.

C. Bronze globe valves shall be constructed as follows:

Body	Bronze
Body Style	Screw in bonnet rising stem
Trim	Bronze
Disc	Bronze
Packing	Asbestos free
Ends	Threaded or solder
WOG Rating	300 psig (20.7 bar) minimum
Body P/T Rating	ASME B 16.34
WOG Rating	200 psig (13.8 bar) minimum

2.9 HOSE BIBBS AND HYDRANTS

A. Hose Bibbs

1. All interior single hose bibbs for use on hot and cold water service shall be Woodford Mfg. Model No. 24 with vacuum breaker and 3/4 in. (19 mm) hose end faucets with male pipe thread for connection to exposed piping or female threaded flanged connection for piping concealed in wall construction.

2. For all locations requiring a freezeless single hose bibb for use on hot and cold water service, shall be Woodford Mfg. Model No. 16 freezeless wall faucet with vacuum breaker and 3/4 in. (19 mm) hose end faucets with male pipe thread for connection to exposed piping or female threaded flanged connection for piping concealed in wall construction.

B. Non-Freeze Ground Hydrants: Freezeless ground hydrants shall be Woodford Mfg. “Anti-Siphon Freezeless Yard Hydrants” Model No. Y95, or as approved, cast brass, antisiphon, freezeless yard hydrant with Model 50H backflow preventer and tamper proof hinged door lock.

C. Roof Hydrants: Freezeless roof hydrants shall be Woodford Mfg. “Freezeless Roof Hydrant” Model No. RHY2, or as approved, cast brass, automatic draining with integral backflow preventer, 3/4 in. (19 mm) hose connection, well seal and EPDM boot to cover well seal. Provide a 2 degree shim for installation on pitched roofs as needed.

D. Wall Hydrants: Freezeless wall hydrants shall be Woodford Mfg. “Automatic Draining Freezeless Wall Faucet” Model No. 65, or as approved, cast brass, antisiphon, nonfreeze wall hydrants with

bronze sleeve, within custom enclosure as detailed by the Architect for the exterior Ground Floor locations shown on the drawings.

2.10 PLUG VALVES

A. Plug valves shall be top entry types that provide bidirectional positive shutoff.

B. Class 125 Valves shall be constructed as follows:

Body	Cast iron
Body Style	One-piece port
Plug	Nickel plated
Seat	Welded nickel
Body P/T Rating	175 psig (12 bar) at 250°F (120°C) minimum
Seat P/T Rating	300 psig (20.7 bar) at 100°F (38°C) minimum
WOG Rating	*175 psig (12 bar*minimum

2.11 VALVE SCHEDULE

A. Provide valves for the plumbing systems as specified herein and in accordance with the schedule below.

Service	Size	Fig. #	Type	Material
Hot and Cold Water	*1/4 in. to 3 in.*	*Nibco T-113-LF*	*NRS Gate, Threaded*	*Bronze B-62*
	1/4 in. to 3 in.	*Nibco S-113-LF*	*NRS Gate, Soldered*	*Bronze B-62*
	1/4 in. to 2 in.	*Nibco T-585-66-LF*	*Full Port Ball 2-Piece Style, Threaded*	*Bronze B-584*
Drain Valves	*At system low points*	*Nibco 585-70-66-HC-LF*	*Ball with hose cap and chain*	*Bronze B-584*
Gas	*3/4 in. - 1-1/2 in. > 1-1/2 in.*	*Walworth 2911 Walworth 1796*	*Plug*	*IBBM*
Compressed Air and Vacuum	*1/2 in. - 2 in.*	*Nibco CS-595-YX-66-EC*	*3 Piece Ball*	*Bronze body with 316SS Trim*
Circuit Balancing	*1/2 in. - 3 in.*	*Apollo 121TLF or Bell & Gosset CB-1TLF*	*Globe, Threaded*	*Bronze, Rising Stem*

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Install shutoff valves, isolation valves and/or balancing at connections to each piece of equipment, arranged and installed with unions or flanges to allow service, maintenance, and equipment removal without system shutdown.

B. High performance butterfly valves or gate valves shall be provided on the discharge of all pumps.

C. The use of butterfly valves is limited to shutoff services only and only where permitted by the Construction Documents. Butterfly and ball valves will not be permitted in those services, which require balancing or throttling.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above center of pipe in a position that allows full stem movement. Butterfly valves may be installed with stem horizontal to allow support for the disc and the cleaning action of the disc.

F. All water piping connections to equipment shall include all necessary isolation valves, air vent valves, drain connections, balancing valves and the automatic valves arranged as detailed on the drawings.

G. All valve installations shall be in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

H. Valves in finished portions of the building, except in mechanical equipment rooms, or where otherwise indicated on the Drawings shall be concealed and provided with access doors.

I. All piping shall be carefully graded so as to eliminate traps and pockets. Where water traps cannot be avoided, provide drain valves.

J. All valves throughout the building shall be thoroughly and substantially supported with approved hangers and support devices.

K. All valves shall be installed according to the Local Authority rules and an inspection certificate furnished.

L. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Balanced Check Valves (center-guided): In horizontal or vertical position, with stem upright and plumb.

M. Install pressure-relief valves as required by code, where shown on the drawings and/or in the following locations:

1. In each step of each pressure-reducing station.

2. Both the shell and tube side of all steam-to-water heat exchangers.

3. The hot water discharge of each hot water heater, pre-heater and heater exchanger.

N. Relief piping shall be sized according to outlet size of relief valve.

O. The pressure drop between the protected vessel and/or pipe shall not be greater than 3% of the set pressure.

P. Elbows on the discharge of pressure-relief valves shall be supported to withstand reaction forces and the weight of the piping.

3.3 CLEANING

A. Before final connections are made and before operation of all valves, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all valves in condition suitable for finish painting, before final acceptance.

3.4 INSPECTION AND STARTUP SERVICE

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that material composition is suitable for service, and that it is free from defects and damage.

E. Defective valves shall be replaced with new valves.

F. Verify that pressure settings for all relief valves and pressure-reducing valves are correct.

3.5 FIELD TESTS

A. Integrated Test

1. Verify that all valves have been properly lubricated and left ready for operation.

2. All alarms (BMS, fire alarms, etc.) shall be tested to fulfill satisfactory operating conditions. Verify proper operation of electrical safety interlocks and limit switches.

3.6 ADJUSTING AND BALANCING

A. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

B. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

C. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

D. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

E. The building fire alarm system devices shall be properly adjusted and left in good working condition.

F. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

G. Where required, adjust pressure setting of all relief valves and pressure-reducing valves as necessary prior to being put into service.

H. Adjust valve stops to ensure positive shutoff.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all hangers, supports and anchors required for piping and equipment as indicated on and in accordance with the requirements of the Contract Documents.

B. The Division 22 Subcontractor shall assume complete responsibility for the anchoring of the equipment, piping systems, specified hereinafter to the concrete foundation pads, to the concrete inertia bases, and to the supporting structural steel and concrete beams.

C. Section includes:

1. Pipe hangers and supports.

2. Attachments to structure.

3. Formed steel channel supports and accessories.

4. Concrete pads for equipment.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All hangers and supports, including all components shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Fuel Gas Code.

c. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American Society of Mechanical Engineers

1) ASME B31.1: Power Piping.

2) ASME B31.9: Building Services Piping.

b. ASTM International

1) ASTM A 36: Standard Specification for Carbon Structural Steel.

2) ASTM A 47: Standard Specification for Ferritic Malleable Iron Castings.

3) ASTM A 48: Standard Specification for Gray Iron Castings.

4) ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

5) ASTM A 240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

6) ASTM A 283: Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

7) ASTM A 536: Standard Specification for Ductile Iron Castings.

8) ASTM A 575: Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

9) ASTM A 668: Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.

10) ASTM A 1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

11) ASTM B 633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

12) ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials.

13) ASTM E 119: Method for Fire Tests of Building Construction and Materials.

14) ASTM E 814: Test Method of Fire Tests of Through Penetration Firestops.

15) ASTM F 708: Standard Practice for Design and Installation of Rigid Pipe Hangers.

c. American Welding Society

1) AWS D1.1: Structural Welding Code - Steel.

d. FM Global

1) FM - Approval Guide, A Guide to Equipment, Materials & Services Approved by Factory Mutual Research for Property Conservation.

e. Manufacturers Standardization Society of the Valve and Fittings Industry

1) MSS SP 58: Pipe Hangers and Supports - Materials, Design and Manufacturer.

2) MSS SP 77: Guidelines for Pipe Support Contractual Relationships.

3) MSS SP 89: Pipe Hangers and Supports - Fabrication and Installation Practices.

4) MSS SP 90: Guidelines on Terminology for Pipe Hangers and Supports.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Provide shop drawings indicating system layout with location showing critical dimensions, sizes, pipe hanger and support locations and detail of trapeze hangers.

2. Method of attachment to and load imposed on building structures by hangers, anchors, supports, guides and supplemental steel shall be submitted for review and approved by the project Architect and Structural Engineer.

3. Shop drawings indicating support methods, point loadings to the building structure and hanger locations shall be submitted for review sufficiently in advance of concrete pouring schedules to permit evaluation, critique and any necessary changes to hanging and support methods.

B. Product Data: Submit manufacturer’s literature including general assembly,

1. Hangers and Supports: Submit manufacturer’s catalog data including load capacity and sizing schedules specific to this project.

2. Inserts: Submit manufacturer’s catalog data including load capacity.

C. Design Data: Indicate load-carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load-carrying capacity of trapeze, multiple pipe, and riser support hangers. Submit sizing methods and calculations sealed by a Professional Engineer

D. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

E. Manufacturer’s Installation Instructions: Submit support details, installation instructions, connection requirements, for the system.

1. Hangers and Supports: Submit special procedures and assembly of components.

2.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All hangers, rods, supports and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

1.8 COORDINATION

A. Coordinate with other trades to use common means of support. Submit for approval all pertinent design data relating to the support as well as verification of the responsibility for the support.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a five (5) year manufacturer's warranty for all pipe hangers and supports.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Anchors and Inserts (Wedge Type)

1. Allfasteners
2. DeWalt.
3. Hilti.
4. ITW Red Head.
5. MKT Fastening, LLC.
6. Simpson Strong-Tie.

D. Anchors and Inserts (Adhesive Type)

1. Allfasteners
2. DeWalt.
3. Hilti.
4. ITW Red Head.
5. Simpson Strong-Tie.

E. Formed Steel Channel Supports

1. Allfasteners
2. Anvil International.
3. Cooper B-Line.
4. Carpenter & Patterson.
5. Empire Industries, Inc.
6. Erico - Caddy.
7. Hilti.
8. National Pipe Hanger Corporation.
9. PHS Industries, Inc.
10. Piping Technology and Products.
11. Thomas & Betts - Kindorf.
12. Tolco Inc.

F. Pipe Hangers, Supports and Guides

1. Allfasteners.
2. Anvil International.

3. Cooper - B-Line.
4. Carpenter & Patterson.
5. Empire Industries, Inc.
6. Erico - Caddy.
7. Hilti.
8. National Pipe Hanger Corporation.
9. PHS Industries, Inc.
10. Piping Technology and Products.
11. Thomas & Betts - Kindorf.
12. Tolco Inc.
13. Witch Co.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

2.3 PIPE HANGERS AND SUPPORTS

A. Provide suitable and substantial hangers and supports for all piping and equipment. Hangers and supports shall be of the type, size and spacing specified or as required by the Authority Having Jurisdiction.

B. Comply with maximum load ratings with consideration for allowable stresses prescribed by ASME B31.1 or MSS SP-58.

C. Pipe hangers, anchors, supports and guides shall be manufactured, selected, fabricated and installed in accordance with MSS SP-58, MSS SP-69 and MSS SP-89.

D. Provide supports, guides and anchors that do not transmit unacceptable vibration to building structure.

E. The support systems shall provide for, and control, the free or intended movement of the piping, including its movement in relation to that of connected equipment.

F. In addition to the short-term frame shortening anticipated during the initial construction period, all systems shall be installed with provisions to accommodate long-term frame shortening

equivalent to 1/16 in. (1.6 mm) per foot in addition to any expansion and/or contraction of the systems as a result of thermal changes.

G. Provide for vertical adjustments after installation of supported material and during commissioning, where feasible, to ensure pipe is at design elevation and slope.

H. Select hangers and supports to perform under all conditions of operation, allowing free expansion and contraction, and to prevent excessive stresses being introduced into piping system and connected equipment.

I. Where piping is required to be seismically restrained, the yoke on clevis hangers and/or roller hangers shall be reinforced to prevent the yoke from deforming. In the case of clevis hangers providing nuts on the inside and outside of the threaded rod connecting the yoke and clevis is acceptable.

J. Anchorage shall be provided to restrain drainage piping from axial movement. Piping sizes greater than 4 in. (100 mm), restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two (2) pipe sizes. Braces, blocks, rodding and other suitable methods as specified by the coupling manufacturer shall be utilized.

K. Piping subject to shock loads, such as thrust or water hammer, shall include shock absorbing and sway suppressing devices of approved design and construction.

L. Provide drawings indicating pipe loads, including method of suspension and hanger location, and submit them for approval prior to proceeding with installation. Provide all the supplementary steel required to support, guide and anchor piping within shafts, Mechanical Equipment Rooms and all the other floors.

M. Particular care shall be taken to support all pipes in a manner approved by the Architect, including the providing of supplementary steel, if required.

N. Where insulation is provided, protect the insulation, the length of the sleeve with a galvanized 20 gauge shield (360 deg.).

O. Support vertical risers from the building construction by means of pipe clamps at every floor. Provide channels of approved sizes where pipe clamps are too short to connect to the building construction.

P. Provide rigid support sway bracing for all horizontal piping 4 in. (100 mm) and larger and piping which is supported greater than 2 ft. (610 mm) from the slab above, measured from the top of the pipe.

Q. Provide additional support for all sanitary and storm house drain offsets consisting of riser clamps and threaded rod to anchor all fittings in the horizontal offset. This method of anchoring and support shall be provided in addition to the sway bracing described in the paragraph above.

R. Finishes

1. Hangers and clamps for uninsulated copper pipes shall be coated with copper-colored epoxy paint and an additional PVC coating.

2. Hangers, anchors, inserts, supports and guides (swivel ring, split ring, roller, wrought pipe clamp, or adjustable wrought clevis-type hangers, roller supports, floor stands, wall

brackets, etc.) installed within the building shall be hot dipped galvanized in accordance with ASTM A123 or stainless steel.

3. All hangers, supports, inserts, etc., utilized to support piping below the slab on grade or buried shall be stainless steel.

4. Strut channels installed indoors shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90.

5. Hangers, anchors, supports, guides and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123 or stainless steel. All hanger hardware shall be hot-dip galvanized or stainless steel. Zinc-plated hardware shall not be acceptable for outdoor or corrosive use.

S. Hangers

1. Pipes 2 in. (50 mm) and smaller shall be supported with one of the following:

   a. Adjustable steel swivel ring (band type) hanger.

   b. Malleable iron split ring hanger.

   c. Adjustable steel clevis hanger.

2. Pipes 2-1/2 in. (63.5 mm) and larger shall be supported with one of the following:

   a. Adjustable steel swivel ring (band type) hanger.

   b. Adjustable steel clevis hanger.

3. Insulated pipes shall be supported adjustable steel clevis hangers and pre-insulated sheet metal insulation shields.

T. Trapeze Hangers

1. Shall be constructed of one of the following:

   a. 12 gauge roll-formed 1-5/8 in. (40 mm) by 1-5/8 in. (40 mm) minimum structural steel channel.

   b. Two (2) structural steel channels secured together with 1/2 in. (12.5 mm) or 3/4 in. (20 mm) steel pipe sections.

2. Pipes shall be secured to trapeze by one of the following methods:

   a. Uninsulated Pipe: 2-piece pipe straps with thermoplastic elastomeric liner sized for outside diameter of pipe.

   b. Insulated Pipe: 2-piece pipe straps sized for outside diameter of pipe and insulation using insulation shields.

U. Floor and/or Roof Supports

1. Shall be one of the following:

   a. Adjustable pipe saddles and nipples welded or screwed to steel base stands secured to floor or roof.

   b. Adjustable roller stands with base plates secured to floor or roof.

2. Pipes shall be secured to supports by one of the following methods:

   a. Uninsulated Pipe: 2-piece pipe straps with thermoplastic elastomeric liner sized for outside diameter of pipe.

   b. Insulated Pipe: 2-piece pipe straps sized for outside diameter of pipe and insulation using insulation shields.

V. Accessories

1. Pipe protection saddles shall be formed from carbon steel, 1/8 in. (3 mm)_minimum thickness, sized for insulation thickness.

2. Preinsulated shields shall be 180 degree, 18 gauge minimum galvanized sheet metal, minimum 12 in. (305 mm) long, with high density water-repellant Kaylo insulation, foam glass or high-density polyisocyanurate inserts minimum thickness to match outside diameter of the insulated pipe.

2.4 ATTACHMENTS TO STRUCTURE

A. All piping shall be carried by pipe hangers and supports attached to building structure. All supports and restraints requiring connections to steel-plated building construction shall be welded to steel plating.

B. Method of attachment to and load imposed on building structures by hangers, anchors, supports, guides and supplemental steel shall be submitted for review.

C. In no case shall hangers be supported by means of vertical expansion bolts.

D. Powder and power-actuated devices, grip nails, and/or expansion nails shall NOT be permitted.

E. Structural Steel Attachments

1. Center-loaded beam clamps or welded beam attachments shall be used where piping is to be suspended from building steel. Clamp shall be forged steel or malleable iron with cross bolts sized as required to fit beams and selected on the basis of load configuration and load to be supported.

2. Where allowed by Structural Engineer, C-clamps with locknuts, cup point set screws and retaining straps shall be used. Top flange C-clamps shall be used when attaching a hanger rod to the top flange of structural shapes. Set screw torque shall be in accordance with manufacturer’s recommendation.

F. Concrete Inserts

1. Cast-in-place continuous or spot concrete inserts shall be used where applicable.

2. Continuous inserts shall be made of 12 gauge, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs./ft. in concrete.

3. Spot inserts shall be constructed of one of the following:

   a. Malleable iron or pressed steel having a space for rods of all sizes. All inserts for pipes 3 in. (75 mm) and larger in size shall be installed with a reinforcing rod 5/8 in. (16 mm) in diameter, run through a slot in the insert specifically provided for this purpose.

   b. Internally threaded machined steel insert with large, flanged heads suitable for installation on wood forms and/or formed metal decking.

G. Post Installed Anchors

1. Contractor shall submit each anchor's ICC-ES report to the Structural Engineer of the project for review.

   a. Anchors shall be installed in accordance with the manufacturer's ICC-ES report and published installation instructions.

   b. All post-installation anchors shall be listed in the manufacturer's ICC-ES report for use in cracked concrete.

2. Contractor shall review the structural composition of all concrete slabs where post-installation anchors will be used and only anchor models/types approved for use in the specific structural slab type shall be permitted, in accordance with the manufacturer's ICC-ES report and per approval of the project's Structural Engineer.

3. Each post-installation anchor shall be sized for the worst-case operating loads imposed to the structure.

4. Post-installed anchors may be installed in the vertical position under any of the following conditions:

   a. When used in concrete having gravel or crushed stone aggregate to support pipes 4 inches or less in diameter.

   b. When post-installed anchors are alternated with hangers connected directly to the structural members, such as trusses and girders, or to the sides of concrete beams to support pipe 5 inches and larger.

   c. When post-installed anchors are spaced not over 10 ft. apart to support pipes 4 inches or larger.

5. Post-installed anchors shall not be used in ceilings of gypsum or other similar soft material.

6. Post-installed anchors shall not be used in cinder concrete, except for branch lines where the post-installed anchors are alternated with through-bolts or hangers attached to beams.

7. Where through-bolts or hangers attached to beams is not feasible, the Contractor is responsible for providing hangers certified by a registered Professional Engineer capable of complying with the following:

   a. These points of support shall be adequate to support the system.

   b. Hanger components shall be ferrous.

   c. Detailed calculations shall be submitted, when required by the reviewing authority, showing stresses developed in hangers, piping, and fittings and safety factors allowed.

8. Where periodic/continuous Special Inspections are required, coordinate with the Special Inspector prior to and during the installation of anchors.

2.5 FORMED STEEL CHANNEL SUPPORTS AND ACCESSORIES

A. Formed steel channel supports shall be capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3 requirements.

B. Channel shall be made of minimum 12-gauge ASTM A570 Grade 33 steel electro galvanized after fabrication. Channel sections may be formed by single or factory welded multiple sections of any of the following:

1. 1-5/8 in. (41.25 mm) x 1-5/8 in. (41.25 mm) channel.

2. 2-7/16 in. (62 mm) x 1-5/8 in. (41.25 mm) channel.

3. 3-1/4 in. (82.5 mm) x 1-5/8 in. (41.25 mm) channel.

C. Grip/Lock nuts shall be made of 3/8 in. (10 mm) thick case hardened mild steel bars electro galvanized after fabrication.

D. All angle brackets connectors and washers shall be made of 1/4 in. (6.35 mm) steel plate electro galvanized after fabrication.

2.6 CONCRETE PADS FOR EQUIPMENT

A. Pumps for the service listed below shall be installed on reinforced concrete pads with minimum thickness as specified below and designed for support of the pump and pump elbows as listed hereinafter. The following pumps and equipment require this type of installation:

1. Domestic water house pumps.

2. Domestic water booster pumps.

3. Cooling tower make-up pumps.

4. Grey water supply pumps.

5. Domestic hot water heaters.

6. Hot water storage tanks.

7. Pneumatic tanks.

8. Water filtration pumps.

9. Laboratory air compressors.

10. Laboratory vacuum pumps.

B. Concrete pads for various pieces of equipment will be furnished under another section. Pads shall be provided in all Equipment Rooms. This shall include floor mounted equipment, equipment mounted on legs and pipe support stands. Equipment pads shall generally conform to the shape of the piece of equipment it serves with a minimum 3 in. (75 mm) margin around the equipment and supports.

C. General equipment pads shall be a minimum of 4 in. (100 mm) high, with all external corners bull-nosed to a tooled radius.

D. Shop Drawings stamped “REVIEWED” shall be used for dimensional guidance in sizing pads and anchor bolt locations.

E. Furnish and install hot-dipped galvanized anchor bolts for all equipment placed on concrete equipment pads, inertia blocks, or on concrete slabs.

F. Bolts shall be of the size and number recommended by the manufacturer of the equipment and as required for seismic restraint. Anchor bolts shall be located by means of suitable templates.

G. When equipment is placed on vibration isolators, the equipment shall be secured to the isolator and the isolator secured to the floor, pad, or supported as recommended by the vibration isolation manufacturer.

H. Wherever vibration isolation devices and/or concrete inertia blocks are specified, these items shall in all cases be mounted upon or above the concrete pads.

I. Pumps with vibration isolation devices shall be bolted and grouted to a spring supported concrete inertia base reinforced as required

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

3.2 INSTALLATION

A. Hanger, rods, supports and accessories shall be installed in accordance with the manufacturer's recommendations and the Authorities Having Jurisdiction.

B. Furnish and install all necessary supports for equipment furnished under this section. To meet the varying conditions in each case, these supports shall consist of pipestands, steel angle or strap hangers, saddles, brackets, as required for a complete installation.

C. All such supports shall have substantial flanges bolted to floor construction; hangers shall be supported from the framing as described hereinabove. Supports shall be properly located with reference to any supporting pads, legs of the equipment carried and must be distributed as not to bring any undue strains to the equipment.

D. All hanger and support details shall be submitted for review and approval.

E. Guarantee that the work, as installed under this section of the specifications, will not result in the transmission of objectionable noise or vibration to any occupied parts of the building, and take full responsibility for any necessary modifications of this equipment, or of the foundations and supports for the same, necessary to secure this result.

F. Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom beam flanges.

G. Proper care and ventilation should be given when welding galvanized components.

H. Clamps on Riser Piping

1. Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

2. Bolt tightening torques shall be to industry standards.

3. Cast Iron Pipes: Install clamp below joint.

4. Steel Pipes: Clamp is fitted preferably below coupling or welded pipe lug.

5. Clamps on riser piping shall maintain the insulation and vapor barrier as piping passes through the support.

I. Support from Structural Members: Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

J. Field welding of supports should be done by qualified welders using qualified welding procedures.

K. Support cast iron bell and spigot and No-Hub pipe and fittings with a minimum of two (2) hangers per each length of pipe. The maximum hanger spacing shall be in accordance with the hanger spacing schedule herein below. Hangers shall be installed on each side of joint. Where an excessive number of fittings are installed between hangers, provide additional hangers, channel supports or reinforcing as required. Securely anchor fittings to the building construction at changes of direction to eliminate all horizontal movement.

L. Horizontal piping shall be supported in accordance with the following schedules:

SINGLE ROD SUPPORT - STEEL AND CAST IRON PIPE		
Pipe Size	Maximum Hanger Spacing	Rod Size
1 to 2 inches (25 mm to 50 mm)	10 feet 0 inches (3,048 mm)	3/8 inch (10 mm)
2-1/2 and 3 inches (63 mm to 75 mm)	12 feet 0 inches (3,658 mm)	1/2 inch (12.5 mm)
4 to 5 inches (100 mm to 125 mm)	12 feet 0 inches (3,658 mm)	5/8 inch (16 mm)
6 to 10 inches (150 mm to 250 mm)	12 feet 0 inches (3,658 mm)	3/4 inch (20 mm)
DOUBLE ROD SUPPORT		
Pipe Size	Maximum Hanger Spacing	Rod Size
6 to 8 inches (150 mm to 200 mm)	12 feet 0 inches (3,658 mm)	1/2 inch (12.5 mm)
10 to 12 inches (250 mm to 300 mm)	12 feet 0 inches (3,658 mm)	5/8 inch (16 mm)

SINGLE ROD SUPPORT - COPPER PIPE		
Pipe Size	Maximum Hanger Spacing	Rod Size
1 to 1-1/4 inches (25 mm to 32 mm)	7 feet 0 inches (2,133 mm)	3/8 inch (10 mm)
1-1/2 to 3 inches (37 mm to 75 mm)	8 feet 0 inches (2,438 mm)	1/2 inch (12.5 mm)

M. Maximum hanger spacing may not be exceeded; however, actual installed spacing will depend on location of structural framing and floor slab construction. Where building construction does not permit the above spacing, provide additional steel supports.

N. Install lock nuts at the bottom of all hanger rods.

O. Vertical pipe risers shall be supported independently of connected horizontal piping.

P. Support vertical risers from the building construction by means of pipe clamps, Grinnell Model No. 261, at every story height;

Q. Where hangers cannot be supported from building framing, they may be supported from concrete inserts, subject to the approval of the Structural Engineer. Furnish, locate and set such inserts and make sure that such inserts are in place when the concrete is poured.

R. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

S. Smaller pipes may be suspended from cross-pieces of pipe or steel angles, which, in turn, shall be hung from building concrete construction by means of rods and inserts. The intention is to provide supports which, in each case, shall be amply strong and rigid for the load, but which shall not weaken or unduly stress the building construction.

T. Provide approved roller supports, floor stands, wall brackets, etc., for all lines running near the floor or near walls, which can be properly supported or suspended by the floors or walls. Pipelines near walls may also be hung by hangers carried from approved wall brackets at a higher level than the pipe.

U. No piping shall be hung from other piping or ductwork. In no case shall hangers be supported by means of vertical expansion bolts.

V. Hangers for piping shall support the pipe without piercing the insulation. Pre-insulated pipe shields shall be used to protect the insulation on pipes. It is the intent that the insulation shields shall bear only on the insulation, which is of such density that the insulation will not be compressed, crushed or deformed.

3.3 CLEANING

A. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all hangers and supports in condition suitable for finish painting, before final acceptance.

B. Touch up, repair or replace damaged products before Substantial Completion.

3.4 INSPECTION AND STARTUP SERVICE

A. Inspect each hanger, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

3.5 FIELD TESTS

A. Performance Test: All hanger and support devices and components shall be tested in accordance with the latest applicable industry standards.

3.6 ADJUSTING AND BALANCING

A. Adjust all pipe hangers, miscellaneous supports and equipment supports to equalize load for the piping and equipment they carry and to ensure that rods are vertical under operating conditions.

B. Hangers at equipment shall be adjusted to ensure that there are no loads imposed on the equipment by the piping connected to the equipment.

C. Hangers and Supports

1. Ensure that rod is vertical under operating conditions.

2. Equalize loads for all piping and equipment supports.

D. Adjustable Clevis

1. Tighten hanger load nut securely to ensure proper hanger performance.

2. Tighten upper nut after adjustment.

E. Beam Clamps: Tighten all set screws and lock nuts.

F. Riser Clamps

1. Ensure all riser clamps are securely resting on the concrete slab or kindorf after system is tested and pressurized.

2. Tighten riser clamp nuts after vertical adjustments are made.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all domestic water piping required for the project as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Materials of piping systems.

2. Miscellaneous accessories.

3. Pipe joints and fittings.

4. System material schedule.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, *25,* 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All domestic water piping shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York..

a. New York City Building Code.

b. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American Society of Mechanical Engineers

1) ASME B16.15: Cast Bronze Threaded Fittings

2) ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.

3) ASME B16.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

4) ASME B16.23: Cast Copper Alloy Solder Joint Drainage Fittings DWV.

5) ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tubes.

6) ASME B16.29: Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings DWV.

7) ASME B31.9: Building Services Piping.

8) ASME Section IX: Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

b. American Society of Sanitary Engineers

1) ASSE 1010: Performance Requirements for Water Hammer Arresters.

2) ASSE 1018: Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied.

c. ASTM International

1) ASTM A312: Specification for Seamless and Welded Austenitic Stainless Steel Pipes.

2) ASTM A778: Specification for Welded Unannealed Austenitic Stainless Steel Tubular Products.

3) ASTM B42: Specification for Seamless Copper Pipe, Standard Sizes.

4) ASTM B43: Specification for Seamless Red Brass Pipe, Standard Sizes.

5) ASTM B75/B75M: Standard Specification for Seamless Copper Tube.

6) ASTM B88/B88M: Standard Specification for Seamless Copper Water Tube.

7) ASTM B251: Specification for General Requirements for Wrought Seamless Copper and Copper Alloy Tube.

8) ASTM B302: Specification for Threadless Copper Pipe, Standard Sizes.

9) ASTM B447: Specification for Welded Copper Tube.

10) ASTM B813: Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.

11) ASTM B828: Standard Specification for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

12) ASTM F1476: Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

d. American Water Works Association

1) AWWA C104: Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.

2) AWWA C110: Standard for Ductile-Iron and Gray-Iron Fittings, 3 Inches through 48 Inches, for Water.

3) AWWA C115: Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Fittings.

4) AWWA C151: Standard for Ductile-Iron Pipe Centrifugally Cast for Water.

5) AWWA C153: Standard for Ductile-Iron Compact Fittings for Water Service.

e. American Welding Society

1) AWS A5.8: Specification for Filler Metals for Brazing and Braze Welding.

f. Manufacturers Standardization Society

1) MSS SP6: Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2) MSS SP9: Spot Facing for Bronze, Iron and Steel Flanges.

3) MSS SP43: Wrought Stainless Steel Butt-welding Fittings.

4) MSS SP44: Steel Pipe Line Flanges.

5) MSS SP-73: Brazing Joints for Copper and Copper Alloy Pressure Fittings.

6) MSS SP-83: Steel Pipe Unions Socket-Welding and Threaded.

7) MSS SP-97: Forged Carbon Steel Branch Outlet Fittings-Socket Welding, Threaded and Butt-welding Ends.

8) MSS SP104: Wrought Copper Solder Joint Pressure Fittings.

9) MSS SP106: Cast Copper Alloy Flanges and Flanged Fittings (Class 125, 150 and 300).

10) MSS SP 123: Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube.

g. National Sanitation Foundation

1) NSF Standard 61: Drinking Water System Components.

h. Plumbing and Drainage Institute

1) PDI WH201: Water Hammer Arresters.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of pipe and fitting materials, complete with typical mill reports.

2. Schedule of pipe and fitting materials identifying the system and location, which the products are intended to be used.

3. Pipe cleaning certification.

4. Copper, brass, stainless steel and ductile iron pipe and fittings.

5. Cut or roll grooved couplings and fittings.

6. Threaded brass or bronze fittings.

7. Copper, brass, stainless steel and ductile iron pipe flanges and gaskets.

8. Schedule of locations where water hammer arresters shall be installed.

9. Schedule of locations where trap primer valves shall be installed.

B. Product Data: Submit manufacturers literature including general assembly, for each type of product indicated. Include all piping, fittings, water hammer arresters, trap primer valves, mechanical couplings, flanges, solder, materials of construction and dimensional characteristics.

C. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

D. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for all products submitted.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

B. All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

C. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

D. Make every effort to furnish all equipment of any equipment type from one manufacturer.

E. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A Materials Safety Data Sheet (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

F. To ensure uniformity and compatibility of piping components in grooved in piping system all grooved products and grooving tools must be the products of a single manufacturer.

G. The manufacturer of grooved piping fittings shall provide on-site training for Contractor's field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

H. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All piping, fittings, flanges, couplings and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. All pipe, fittings, mechanical couplings, flanges and accessories shall be tested in accordance with the latest applicable industry standards before accepting delivery at the jobsite.

2. All water hammer arresters, trap primer valves and accessories shall be tested in accordance with the latest applicable industry standards before accepting delivery at the job site.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water and construction debris.

D. Store all products and materials off floors on raised platforms to protect from water damage.

E. Products and materials, which have been exposed to water damage shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Certain materials will be furnished, installed, or furnished and installed, under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general Construction Drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

E. Should the Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Contractor to coordinate, protect and schedule his work with other trades in accordance with the construction sequence.

B. Architectural drawings shall be checked for ceiling height requirements.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a one (1) year manufacturer's warranty for the entire domestic water system.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate, and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Copper Pipe, Tube and Fittings

1. American Brass Co.
2. Bridgeport Brass.
3. Chase Brass.
4. Elkhart Products Corp.
5. Lewin Matheis.

6. Mueller Industries
7. Phelps Dodge.
8. Reading Tube Corp.
9. Revere.
10. Wolverine Tube Co.

D. Trap Primer Valves

1. Precision Plumbing Products.
2. Watts Regulator.
3. Sioux Chief.

E. Water Hammer Arresters

1. Precision Plumbing Products.
2. Watts Regulator.
3. Sioux Chief.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. All piping materials, fittings and couplings shall be of Unites States origin and manufactured in accordance with the latest applicable standards for its intended use.

E. All trap primer valves and water hammer arresters shall be manufactured in accordance with the latest applicable standards for its intended use.

2.3 MATERIALS OF PIPING SYSTEMS

A. Use the following materials in the various piping systems, in accordance with the Construction Documents.

B. Pressure Copper Tubing (P.C.T.): Copper Tubing shall be seamless drawn or extruded tubing Type “L” or “K” as scheduled, hard temper in accordance with ASTM Specification B42 and or ASTM Specification B88/B88M.

2.4 MISCELLANEOUS PIPING ACCESSORIES

A. Trap Primers

1. Furnish and install trap primer valves for all floor drains, which are subject to evaporation and as identified on the Construction Documents.

2. Provide trap primer distribution unit in at least 5 feet (0.5 m) when supplying floor drains requiring trap priming.

3. Interior trap primer piping shall be Type L copper tubing as scheduled.

4. Buried piping below the slab on grade or encased in concrete shall be Type K copper tubing, insulated in rubber foam insulation or installed in split tile conduit as scheduled herein below.

5. Trap primer valves shall be manufactured by Precision Plumbing Products, Inc. as listed below:

a. Automatic Pressure Type Trap Primer for up to two (2) floor drains shall be Model No. PR-500 Prime Rite or PRO1-500.

b. Automatic Pressure Type Under-Lav Trap Primer shall be Model No. PRO1-ULP500.

c. Electronic TRAP PRIMER for four (4) to thirty (30) floor drains shall be Model No. PT Series Prime Time Electronic Trap Priming Manifold. The number of outlets shall be coordinated based on the number of floor drains served.

B. Water Hammer Arresters

1. The Contractor shall install sufficient water hammer arresters throughout the system to prevent pulsation, vibration and water hammer.

2. Furnish and install water hammer arresters on the following:

a. Hot and cold domestic water branches to every fixture or group of fixtures with quick-closing valves.

b. Top of each domestic hot and cold riser.

c. Each heat exchanger and hot water heater.

d. Domestic water booster pumps.

e. Boiler water makeup supplies.

f. Cooling tower water makeup supplies.

g. Humidification water makeup supplies (CRAC units).

h. Individual branch water lines to clothes washers, dishwashers, pot washers, glass washers, laundry machines and/or equipment controlled by solenoid valves, electrically operated ball valves and other quick-closing valves.

3. All water hammer arresters shall conform to ASSE 1010 and/or PDI WH201 specifications.

4. Water hammer arresters shall be provided in accordance with the Authority Having Jurisdiction and in accordance with the Construction Documents.

5. Water hammer arresters shall be sized and selected per ASSE 1010 and/or PDI Standard WH201, and shall have adequate displacement volume to dissipate the kinetic energy generated by the domestic water piping system.

6. Install all water hammer arresters in the vertical position.

2.5 PIPE JOINTS AND FITTINGS

A. All fittings shall be of a type, which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends.

B. Use the following materials in the various piping systems, in accordance with Article 2.7 - System Material Schedule and the Construction Documents.

C. Pressure Copper Tubing (P.C.T.)

1. Solder Fittings for Use with P.C.T. shall be wrought or cast brass fittings in accordance with ASME B16.18 or ASME B16.22.

2. Soldered joints for copper tubing shall be made with 95-5 (tin and antimony) solder in accordance with ASTM Specification B32. No other solder is to be used for any purpose on the job.

3. Solder must meet the requirements of the Federal Safe Drinking Water Act and NSF Standard 61.

4. Fittings for P.C.T. or brass pipe where brazed joints are required shall be bronze fittings or wrought copper fittings designed for use with the scheduled pipe or tubing in accordance with ASME B16.18 and ASME B16.22.

D. Flanges and Flanged Fittings

1. The pressure-temperature rating of the pipe flanges shall match the pressure-temperature rating of the flanges on the equipment to which the piping connects.

2. Flanges for stainless steel piping shall be Class 150, forged one-piece raised face weld neck steel flanges. Slip-on flanges will not be accepted.

3. Copper piping flanges shall be Class 150, slip-on bronze flanges.

4. Flanged fittings for D.I.W.P. shall be in accordance with AWWA C-115.

5. Flanges and flanged fittings for bronze pipe shall be of the required working pressure, as scheduled.

6. Do not use cast iron screw-on flanges in pump discharge piping. For this service, use cast steel, ductile iron or copper flanges.

E. Elbows

1. All elbows shall be of long radius pattern except where space conditions do not permit.

2. Copper elbows shall be full-flow type wrought copper in accordance with ASTM B-75 alloy C12200. Fittings for 5 in. (125 mm) and 6 in. (150 mm) copper pipe shall be cast bronze in accordance with ASTM B-584-7 requirements.

F. Gaskets: Gaskets used in domestic cold, hot water systems shall be Grade “E” EPDM rated for a maximum temperature of 230°F (110°C) and maximum pressure of 400 psig (27.5 bar).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify existing conditions prior to starting work.

C. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto.

D. Wherever this Contractor’s work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to ensure that all Contractors have the information necessary to properly install all the necessary connections and equipment. Identify all work items in an approved manner in order that the Ceiling Trade may know where to install access doors and panels.

E. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

3.2 INSTALLATION

A. All piping and materials shall be as specified herein and shall be installed in accordance with the latest industry standards, per the manufacturer’s recommendations, and as indicated on the drawings.

B. All piping shall be made up and installed in a manner that permits expansion and contraction caused by changes in temperature and pressure. This shall be accomplished by the use of expansion loops as required and as shown on the drawings, and by installation of supports that will permit the movement of the pipe without undue stress, and by any other precautions that might be deemed necessary by the Engineer.

C. Run and arrange piping approximately as indicated on the Construction Documents and as coordinated with other trades.

D. Install piping as neatly spaced, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes.

E. Erect all risers plumb and true, parallel with walls and other pipes.

F. Ream all pipe smooth before installation. Do not bend, split, flatten nor otherwise injure pipe.

G. The Contractor shall provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

H. The Contractor shall provide all water hammer arresters necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

I. The Contractor shall provide all trap primers for floor drains necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

J. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

K. It is the responsibility of this Contractor for accurately laying out the work. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

L. No piping shall pass over high voltage (440V) electrical bus duct or switchgear equipment. Where required, provide protective pans under or over individual pipes and construct the pans of 16 gauge stainless steel with a 6 in. (150 mm) lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-O-Leum paint and support with pipe hangers and drain clear of the equipment below.

M. Route piping in an orderly manner parallel and perpendicular to walls maintaining gradient and headroom without interfering with use of space or taking more space than necessary. Whenever practical group piping at common elevations.

N. Furnish and install sleeves for pipe passing through roofs, partitions, walls and floors. Piping penetrating roofs must maintain integrity of roof assembly.

O. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

P. Provide clearance in hangers and from structure and other equipment for installation and access to water hammer arresters and trap primers.

Q. Install valves in accordance with the specifications and provide access where valves and fittings are not accessible. Coordinate size and location of access doors with valves.

R. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

S. All trap primers shall be of the sizes indicated and shall be routed as indicated on the drawings, or as required, to prevent trap evaporation of floor drains.

T. All water hammer arresters shall be of the sizes indicated according to the manufacturer's requirements and shall be installed as required by the Authority Having Jurisdiction, as indicated on the drawings, or as required to avoid water hammer in the system due to quick-closing devices, equipment and solenoid valves.

U. All piping shall be carefully graded so as to eliminate traps and pockets. Provide means for drainage by valved connections with pipe plugs for water traps.

V. A gate or ball valve shall be installed on each domestic hot and/or cold water riser and for each branch off the riser.

W. Piping exposed in all rooms shall be installed as nearly as possible parallel with or at right angles to the building walls. Install all pipe straight and true. Springing or forcing piping into place will not be permitted unless specifically called for. Install piping in such a manner as to prevent strain on equipment connections. Install piping in such a manner as to eliminate all static and dynamic conditions of loading on equipment connections.

X. Piping in finished portions of the building, except in mechanical equipment rooms or where otherwise indicated on the Drawings, shall be concealed.

Y. Install unions or flanges at all equipment connections and elsewhere as indicated on the Drawings. Unions shall be of the same pressure rating as the respective piping system and shall be of the ground joint type.

Z. All piping shall be of the sizes indicated and shall be routed as indicated on the Drawings, or as required, to serve all equipment and systems.

AA. Provide valves and drain valves on branches to wall hydrants and sill cocks.

BB. Pitch all piping to low points. Provide all low points and any pockets caused by changes in elevation required by structural or other interferences with 1/2 in. (13 mm) drain valve capped with a screwed nipple. Provide drain valves at the base of all risers.

CC. Where hot and cold water supply pipes connect to a combination supply fitting with a shutoff valve on its discharge, or the combination supply fitting is equipped with manual or thermostatic mixing valve, equip each hot and cold water supply pipe with composition disc, swing check valve ahead of the supply fitting.

DD. Install approved type of vacuum breakers and/or check valves or backflow preventers, as herein specified, on all equipment and fixture connections required by code, indicated on the drawings, as specified, or as required for the proper functioning of the equipment. Provide all hose threaded faucets and serrated tips with vacuum breakers.

EE. Brazed Piping

1. Filler metal shall conform with the requirements of the latest edition of ANSI/AWS A5.8 Specifications for Brazing Filler Metal with the following classifications: BCuP-2, BCuP-3, BCuP-4, BCuP-5, BAg-5 or BAg-7.

2. Flux shall be compatible with the materials brazed and with the filler metal used and shall conform to the requirements of the latest edition of ANSI/AWS A5.31 Specifications for fluxes for Brazing and Braze Welding. All flux residue must be removed after joint is completed.

3. Brazing shall be performed in accordance with the Copper Tube Handbook of the Copper Tube Development Association as well as the latest edition of ANSI/AWS B2.2 Standard for Brazing Procedure and Performance and ANSI/AWS C3.4 Specifications for Torch Brazing.

4. All joints shall be made by personnel meeting the requirements of ASME Boiler Pressure Vessel Code, Section IX.

FF. Soldered Piping

1. Filler metal shall conform with the requirements of the latest edition of ASTM B 32 Specifications for Solder Metal.

2. All joints, except for refrigerant piping, shall be made with 95% tin and 5% antimony solder, having a melting point of not less than 460°F (238°C). Refrigerant piping joints shall be made with silver solder.

3. All soldered joints shall be thoroughly cleaned before the application of the solder. Flux shall be compatible with the materials brazed and with the filler metal used and shall conform with the requirements of the latest edition of ASTM B 813 Specifications for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Tube. All flux residue must be removed after joint is completed.

4. Soldered joints shall be assembled in accordance with the Copper Tube Handbook of the Copper Tube Development Association and ASTM B 828 Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

5. All soldered joints for tubing larger than 2 in. (50 mm) in size shall be made with the simultaneous application of two or three blow torches.

3.3 CLEANING

A. During construction, properly cap all lines, so as to prevent the entrance of sand, dirt, etc. Each system of piping shall be blown through after completion (for the purpose of removing grit, dirt, sand, etc., from coils and piping), for as long a time as required to thoroughly clean the apparatus.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all domestic water piping and appurtenances in suitable condition, before final acceptance.

C. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting to prevent obstruction and damage.

D. Protect the system against freezing in cold weather.

E. The Contractor shall furnish all required pipe cleaning chemicals, chemical feed equipment, materials, and labor necessary to sterilize the domestic water piping as herein specified. In addition, the Contractor shall permanently install necessary chemical injection fittings complete with stop valves, etc.

F. After each hydrostatic leak testing procedure is complete, drain the system until empty. Liquid for hydrostatic testing of domestic water systems shall be clean domestic water from the municipal water supply.

G. All domestic water piping and tanks shall be thoroughly flushed.

H. Upon completion of the flushing operation, samples shall be tested by a Department of Health recognized laboratory. If samples show bacterial contamination, sterilize the potable water system in accordance with the New York City Plumbing Code, Chapter 6, Section PC610.

I. Under no circumstances shall the Contractor permit the use of any portion of the domestic water system until it has been properly sterilized and certified same by the local water department or the Authorities Having Jurisdiction.

J. A minimum of two (2) weeks' notice shall be given to the Engineer and Owner prior to testing and sterilization.

3.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations, and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all piping, hangers, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

D. Inspect all water hammer arresters and trap primers for installation according to the manufacturer's instructions.

E. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

F. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

G. Notify the Architect and Inspectors Having Jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

H. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these specifications for such equipment.

3.5 FIELD QUALITY CONTROL

A. Quality control must comply with Section 01 40 00 - Quality Requirements *and* Section 01 73 00 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.

3.6 FIELD TESTS

A. Performance Test

1. Allow sufficient time to perform all tests, adjustments, necessary to place the various systems in final operation condition, verify performance requirements and check all safety devices. Labor and instruments, required for various tests shall be provided. See that all manufacturers' representatives necessary to check and adjust various systems are present with sufficient labor to perform all this work without delay. All test data shall be recorded on suitable forms and submitted to the Owner for approval.

2. A qualified representative of the equipment manufacturer shall be present at the test. The Engineer may witness tests, if he so desires. The Contractor shall notify the Engineer and Owner in writing, at least two (2) weeks prior to the day of the test.

3. Test all systems before any paint is applied, piping is insulated, furred in or otherwise covered.

4. Test all systems in full accordance with applicable Municipal requirements, but in no case shall the system be tested at less than 150 psig (10.5 bar) hydrostatic pressure or 50 psig (3.5 bar) above the normal operating pressure, whichever is greater. Apply the test for a minimum of two (2) consecutive hours with no loss in pressure. Prior to applying the hydrostatic test, the system shall be tested with 50 psig (3.5 bar) compressed air for a period of ten minutes with no loss in pressure.

5. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors Having Jurisdiction.

B. Integrated Test

1. Reserved.

C. Final Acceptance Test

1. The Owner and/or the Owner's representatives will make final check of all systems only after the Contractor has completed and returned to the Owner or Owner's representatives all recorded test data, together with letter that his work is to the best of his knowledge 100% complete. Field performance tests will be required by the Owner and/or the Owner's representatives at this time to verify performance and workmanship, and to make final system component adjustments.

2. Points and areas for recheck shall be selected by the Owner's representative.

3. Measurements and tests shall be same as the original test procedures.

4. After satisfactory passing of the field tests and after all necessary adjustments have been made, test the complete systems for a minimum of seven (7) days under regular operating conditions or as long as may be required to establish compliance with Contract Documents.

5. The Contractor shall demonstrate to the Engineer and the Owner, prior to acceptance by the Owner, that all systems and/or equipment has been balanced and adjusted properly, and that the system and/or equipment is in compliance with the Contract Documents.

6. Test all trap primer valves for proper operation and filling of floor drain traps before final acceptance by the Owner.

7. Test all water hammer arresters to ensure there is no pulsation or water hammer in the system due to equipment operation and other quick-closing devices before final acceptance by the Owner.

D. Commissioning: Owner or Commissioning Agent shall witness all hydrostatic tests.

3.7 ADJUSTING AND BALANCING

A. Upon completion of piping, hangers for piping and at equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping or the equipment that it is connected to.

B. Securely tighten clevis hanger load nuts first to ensure proper hanger performance. Tighten top nut after adjustment.

C. All equipment, valves, quick closing devices and the like shall be adjusted in accordance with manufacturers' recommendations to function properly with capacities required and/or specified.

D. Adjust all fixture stops so that flush valves, faucets, equipment and other fixtures work quietly and efficiently before final acceptance by the Owner.

E. Adjust circulating system balancing valves so that the system is properly balanced and design temperatures are maintained under closed system conditions, before final acceptance by the Owner.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all sanitary waste, vent and indirect waste piping required for the project as indicated on and in accordance with the requirements of the Contract Documents.

B. Section includes:

1. Material of piping systems.

2. Pipe joints and fittings.

3. Specialty pipe fittings.

4. System material schedule.

5. Traps.

1.2 RELATED SECTIONS

A. Refer to Divisions 01, 14, 21, 23, 25, 26, 27 and 28 for the scope of work furnished and installed under those divisions on which work in this division may be dependent.

1.3 REFERENCES

A. All sanitary waste, vent and indirect waste piping shall be designed, manufactured, tested and installed in accordance with the latest applicable codes and reference standards including, but not limited to, the following:

1. Codes: Perform all work in accordance with the latest applicable codes and standards for the City of New York.

a. New York City Building Code.

b. New York City Plumbing Code.

2. Reference Standards: Perform all work in accordance with, but not limited to, the following standards:

a. American Society of Mechanical Engineers

1) ASME A112.3.1: Stainless Steel Drainage Systems for Sanitary DWV, Storm and Vacuum Applications, Above and Below Ground.

2) ASME B16.1: Cast Iron Pipe Flanges and Flanged Fittings.

3) ASME B16.3: Malleable Iron Threaded Fittings.

4) ASME B16.4: Gray Iron Threaded Fittings.

5) ASME B16.5: Pipe Flanges and Flanged Fittings.

6) ASME B16.12: Cast Iron Threaded Drainage Fittings.

7) ASME B16.15: Cast Bronze Threaded Fittings.

8) ASME B16.18: Cast Copper Alloy Solder Joint Pressure Fittings.

9) ASME B16.22: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

10) ASME B16.23: Cast Copper Alloy Solder Joint Drainage Fittings DWV.

11) ASME B16.26: Cast Copper Alloy Fittings for Flared Copper Tubes.

12) ASME B16.29: Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings DWV.

13) ASME B31.9: Building Services Piping.

14) ASME Section IX: Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

b. ASTM International

1) ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

2) ASTM A74: Standard Specification for Cast Iron Soil Pipe and Fittings.

3) ASTM A888: Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary, Storm Drain, Waste and Vent Piping Applications.

4) ASTM B42: Specification for Seamless Copper Pipe, Standard Sizes.

5) ASTM B43: Specification for Seamless Red Brass Pipe, Standard Sizes.

6) ASTM B75/B75M: Standard Specification for Seamless Copper Tube.

7) ASTM B88/B88M: Standard Specification for Seamless Copper Water Tube.

8) ASTM B251: Specification for General Requirements for Wrought Seamless Copper and Copper Alloy Tube.

9) ASTM B302: Specification for Threadless Copper Pipe, Standard Sizes.

10) ASTM B306: Standard Specification for Copper Drainage Tube (DWV).

11) ASTM B813: Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.

12) ASTM B828: Standard Specification for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

13) ASTM C564: Standard Specification for Rubber Gaskets for Joining Cast Iron Soil Pipe and Fittings.

14) ASTM C1277: Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

15) ASTM C1540: Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

c. American Welding Society

1) AWS A5.8: Specification for Filler Metals for Brazing and Braze Welding.

2) AWS D1.1: Structural Welding Code - Steel.

d. Cast Iron Pipe Institute

1) CISPI 301: Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary, Storm Drain, Waste and Vent Piping Applications.

2) CISPI 310: Standard Specification for Couplings in use with Hubless Cast Iron Soil Pipe and Fittings for Sanitary, Storm Drain, Waste and Vent Piping Applications.

e. Manufacturers Standardization Society

1) MSS SP-6: Contact Faces of Pipe Flanges and Connecting-end Flanges of Valves and Fittings.

2) MSS SP-9: Spot Facing for Bronze, Iron and Steel Flanges.

3) MSS SP-43: Wrought Stainless Steel Butt-welding Fittings.

4) MSS SP-44: Steel Pipe Line Flanges.

5) MSS SP-73: Brazing Joints for Copper and Copper Alloy Pressure Fittings.

6) MSS SP-83: Steel Pipe Unions Socket-Welding and Threaded.

7) MSS SP-97: Forged Carbon Steel Branch Outlet Fittings-Socket Welding, Threaded and Butt-welding Ends.

8) MSS SP-104: Wrought Copper Solder Joint Pressure Fittings.

9) MSS SP-106: Cast Copper Alloy Flanges and Flanged Fittings (Class 125, 150 and 300).

10) MSS SP-123: Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube.

f. National Sanitation Foundation

1) NSF Standard 61: Drinking Water System Components.

1.4 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Contract, Division 01, and Section 22 00 00 and shall include, but not be limited to:

1. Schedule of pipe and fitting materials, complete with typical mill reports.

2. Schedule of pipe and fitting materials identifying the system and location, which the products are intended to be used.

3. Copper, brass, stainless steel, cast iron and ductile iron pipe and fittings.

4. Heavy duty no-hub couplings and gaskets for cast iron soil pipe.

5. Cut or roll-grooved couplings and fittings.

6. Threaded brass or bronze fittings.

7. Copper, brass, stainless steel, cast iron and ductile iron pipe flanges and gaskets.

B. Product Data: Submit manufacturer's literature including general assembly, for each type of product indicated. Include all piping, fittings, mechanical couplings, flanges, solder and dimensional characteristics.

C. Test Reports: Indicate procedures and results for specified factory and field acceptance testing and inspections.

D. Manufacturer's Installation Instructions: Submit support details, installation instructions and connection requirements for all products submitted.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. The quality assurance requirements of Division 01 and Section 22 00 00 shall apply to all work specified herein.

All products and equipment specified herein shall be fabricated by companies whose primary business expertise is the manufacturing of commercial and industrial products and equipment with a minimum of ten (10) years documented experience.

B. Each submittal shall be provided with documentation certifying that all materials, products, components and test reports are in compliance with the design requirements for this project.

C. Make every effort to furnish all piping material from one manufacturer.

D. After completion of installation, but prior to Final Completion, this Contractor shall certify in writing in a format acceptable to the Owner that products and materials installed, and processes used, do not contain asbestos, or polychlorinated biphenyls (PCB's) or other hazardous materials as determined by the Owner. A Materials Safety Data Sheet (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

E. To ensure uniformity and compatibility of piping components in grooved in piping system all grooved products and grooving tools must be the products of a single manufacturer.

F. The manufacturer of grooved piping fittings shall provide on-site training for Contractor's field personnel by a factory trained representative in the proper use of grooving tools, application of groove, and product installation. In addition, the manufacturer's representative shall periodically visit the job site and inspect installation. Contractor shall remove and replace any improperly installed products.

G. Furnish all equipment, materials and accessories new and free from defects.

1.6 FACTORY TESTING

A. All piping, fittings, flanges, couplings and accessories shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:

1. All pipe, fittings, mechanical couplings, flanges and accessories shall be tested in accordance with the latest applicable industry standards before accepting delivery at the jobsite.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Accept all material and equipment on site in factory packing. Inspect for damage. Comply with the manufacturer's rigging and installation instructions.

C. Protect all components from physical damage, including effects of weather, water, and construction debris.

D. Store all products and materials off floors on raised platforms to protect from water damage.

E. Products and materials, which have been exposed to water damage shall be replaced by the Contractor at no additional expense to the Contract.

1.8 COORDINATION

A. Certain materials will be furnished, installed, or furnished and installed, under other sections of the specifications. Examine the Construction Documents to ascertain these requirements.

B. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto. Finished suspended ceiling elevations are indicated on the general construction drawings.

C. Transmit to trades doing work of other sections all information required for work to be provided under their respective sections (such as foundations, electric wiring, access doors, and the like) in ample time for installation.

D. Set all inserts for all pipes in ample time to allow the work of the other trades to be performed on scheduled time.

E. Should the Contractor neglect to perform preliminary work and should cutting be required in order to install equipment, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

F. Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Contractor to coordinate, protect and schedule his work with other trades in accordance with the construction sequence.

G. Architectural drawings shall be checked for ceiling height requirements.

1.9 WARRANTY

A. Comply with the requirements of Division 01 and Section 22 00 00.

B. Furnish a one (1) year manufacturer's warranty for the entire sanitary waste, drainage and venting system.

C. Warranty period shall commence upon final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment that does not comply with the performance and/or physical characteristic requirements of the Contract Documents.

B. All substitutions must be identified in the Base Bid as a voluntary Deduct Alternate and must be accompanied by a Letter of Equivalency certifying the product's equivalency in all performance and physical characteristics to the products listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the Contract Documents will be revised to reflect the substitution.

C. Copper Pipe, Tube and Fittings

1. American Brass Co.
2. Bridgeport Brass.
3. Chase Brass.
4. Elkhart Products Corp.

5. Lewin Matheis.
6. Mueller Industries.
7. Phelps Dodge.
8. Reading Tube Corp.
9. Revere.
10. Wolverine Tube Co.

D. Cast Iron Pipe and Fittings

1. ABI Foundry Company.
2. Charlotte Pipe & Foundry.
3. Tyler Pipe & Foundry.

E. No-Hub Heavy Duty Couplings

1. Husky Heavy Duty Couplings.
2. Mission Heavy Weight Couplings.

2.2 GENERAL REQUIREMENTS

A. All materials and equipment shall be new, in good condition and free from defect. The commercially standard items of equipment and the specific names mentioned herein are intended to identify standards of quality and performance necessary for the proper functioning of the Work.

B. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Engineer retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any alternative submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents be furnished.

C. Materials and equipment, which are found to have factory defects shall be replaced or repaired in a manner acceptable to the Owner and Engineer at no additional cost to the Owner. The Contractor shall be responsible for all costs associated with testing, replacement or repair, including but not limited to, all replacement or repair costs, preparations prior to testing, all testing costs, extended warranties, re-commissioning of the equipment, etc.

D. All pipe material shall be as specified herein and shall be installed as specified. The Contractor shall submit to the Engineer for review a list of the proposed manufacturers of pipe and fittings.

E. All piping materials, fittings and couplings shall be of Unites States origin and manufactured in accordance with the latest applicable standards for its intended use.

2.3 MATERIALS OF PIPING SYSTEMS

A. Use the following materials in the various piping systems, in accordance with Article 2.7 - System Material Schedule and the Construction Documents.

B. Cast Iron No-Hub (C.I.N.H.)

1. Cast Iron Hubless Pipe shall be standard weight coated cast iron hubless pipe manufactured from gray cast iron with a tensile strength not less than 21,000 psi, in accordance with ASTM Specification A74 and CISPI 301.

2. Each length shall be marked with the size, weight per foot and manufacturer's name clearly cast or stamped on each length.

3. Pipe shall be manufactured by a member of the Cast Iron Soil Pipe Institute (CISPI).

C. Cast Iron Soil Pipe (C.I.S.P.)

1. Cast Iron Soil Pipe shall be service weight coated cast iron soil pipe, hub and spigot type manufactured from gray cast iron with a tensile strength not less than 21,000 psi, in accordance with ASTM Specification A74.

2. Each length shall be marked with the size, weight per foot and manufacturer's name clearly cast or stamped on each length.

3. Pipe shall be manufactured by a member of the Cast Iron Soil Pipe Institute (CISPI).

D. Non-Pressure Copper Tubing (N.P.C.T.)

1. Indirect waste copper tubing shall be seamless drawn or extruded tubing Type "L" or "K" as scheduled or hard temper DWV copper drainage tubing.

2. Seamless drawn or extruded tubing shall be in accordance with ASTM Specification B42 and or ASTM Specification B88*/B88M*.

3. Non-pressure hard temper Type DWV copper drainage tubing shall be furnished in 20 foot straight lengths, in accordance with ASTM Specification B306.

2.4 PIPE JOINTS AND FITTINGS

A. All fittings shall be of a type, which maintains full wall thickness at all points, ample radius and fillets, and proper bevels or shoulders at ends.

B. Use the following materials in the various piping systems, in accordance with construction documents.

C. Cast Iron No-Hub (C.I.N.H.)

1. Cast iron no-hub fittings shall be standard weight coated cast iron hubless drainage fittings manufactured from gray cast iron with a tensile strength not less than 21,000 psi, in accordance with ASTM Specification A74 and CISPI 301.

2. Cast iron no-hub fittings shall be joined with "Heavy Duty" no-hub couplings constructed of a shielded coupling.

3. Couplings shall be constructed of Type 304 stainless steel with 305 stainless steel worm drive screws and comply with ASTM Specification C1540.

4. The gasket material shall be neoprene and conform to ASTM Specification C564,

5. The coupling assembly shall be torqued to manufacturer's specified requirements.

6. Heavy duty no-hub couplings shall be Husky "Heavy Duty" SD4000 coupling.

D. Cast Iron Soil Pipe (C.I.S.P.)

1. Cast iron soil pipe fittings shall be service weight, coated cast iron bell and spigot type manufactured from gray cast iron with a tensile strength not less than 21,000 psi, in accordance with ASTM Specification A74.

2. Cast iron soil fittings shall be joined by elastomeric compression gaskets.

3. Gaskets shall be Tyler "TY-Seal" neoprene elastomeric compression type gaskets conforming to ASTM Standard C564.

E. Non-Pressure Copper Tubing (N.P.C.T.)

1. Solder Fittings for Use with N.P.C.T. shall be wrought, cast brass or DWV drainage fittings in accordance with ASME B16.18, ASME B16.22, ASME B16.23 or ASME B16.29.

2. Soldered joints for copper tubing shall be made with 95-5 (tin and antimony) solder in accordance with ASTM Specification B32. No other solder is to be used for any purpose on the job.

3. Fittings for N.P.C.T. or brass pipe where brazed joints are required shall be bronze fittings or wrought copper fittings designed for use with the scheduled pipe or tubing in accordance with ASME B16.18, ASME B16.22, ASME B16.23 or ASME B16.29.

2.5 SYSTEM MATERIAL SCHEDULE

Service	Size	Pipe Type	Weight	Fitting Type
Sanitary and Vent Branch Piping	2 in. (50 mm) through 10 in. (250 mm)	Cast Iron No-Hub	Service Weight	Heavy Duty No-Hub Couplings
Indirect Waste Branches (DWV)	All	Seamless Drawn Copper Tube	Type L	Wrought Copper - Soldered

2.6 TRAPS

A. Sanitary Systems

1. Traps greater than 2 in. (50 mm) used in the sanitary system shall be cast brass, cast iron and/or galvanized cast iron, one-piece pattern, 3 in. (75 mm) minimum seal, of the same material and coating and/or finish as the piping system in which they are installed.

2. All traps buried in earth shall be cast iron, one-piece pattern with a 3 in. (75 mm) minimum seal.

3. Traps less than 2 in. (50 mm), not buried in earth shall be cast brass.

4. Fixture traps shall be cast brass one-piece “P” traps with 2 in. (50 mm) minimum trap seal and gasketed cleanout plugs made of machined bar stock.

5. Locate traps per code requirements.

6. Floor drain traps for use with pressurized waste discharge shall be cast iron and/or galvanized cast iron, one-piece pattern, 3 in. (75 mm) minimum seal, of the same material and coating and/or finish as the piping system in which they are installed. Each trap shall be provided with additional support consisting of unistrut or kindorf, two (2) hanger rods, and be supported from the slab above.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Accept all materials and equipment in factory packaging and examine for visible damage. All damaged material and equipment shall be removed from the job site and replaced by the manufacturer.

B. Verify existing conditions prior to starting work.

C. Carefully check space requirements with other trades to ensure that all material can be installed in the spaces allotted thereto.

D. Wherever this Contractor’s work interconnects with work of other Contractors, this Contractor shall coordinate his work with these Contractors to ensure that all Contractors have the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items in an approved manner in order that the Ceiling Trade may know where to install access doors and panels.

E. Maintain all existing benchmarks, monuments and other reference points and perform all field engineering required to ensure that work under this section shall conform with grades, elevations and lines required.

3.2 INSTALLATION

A. All piping and materials shall be as specified herein and shall be installed in accordance with the latest industry standards, per the manufacturer’s recommendations, and as indicated on the drawings.

B. Run and arrange piping approximately as indicated on the construction documents and as coordinated with other trades.

C. Install piping as neatly spaced, straight and direct as possible, forming right angles or parallel lines with building walls and other pipes.

D. Erect all risers plumb and true, parallel with walls and other pipes.

E. Ream all pipe smooth before installation. Do not bend, split, flatten nor otherwise injure pipe.

F. The Contractor shall provide all equipment and appurtenances necessary to complete the installation according to code requirements, whether indicated on the drawings or not.

G. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the doors.

H. It is the responsibility of this Contractor for accurately laying out the work. Should it be found that any work is laid out so that interferences will occur, report that to the Architect before commencing work.

I. No piping shall pass over high voltage (440V) electrical bus duct or switchgear equipment. Where required, provide protective pans under or over individual pipes and construct the pans of 16 gauge stainless steel with a 6 in. (150 mm) lip, the corners being welded to make the pans watertight. Give each pan three (3) coats of Rust-O-Leum paint and support with pipe hangers and drain clear of the equipment below.

J. Route piping in an orderly manner parallel and perpendicular to walls maintaining gradient and headroom without interfering with use of space or taking more space than necessary. Whenever practical group piping at common elevations.

K. Furnish and install sleeves for pipe passing through roofs, partitions, walls and floors. Piping penetrating roofs must maintain integrity of roof assembly.

L. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

M. All piping shall be carefully sloped so as to eliminate traps and pockets.

N. Piping exposed in all rooms shall be installed as nearly as possible parallel with or at right angles to the building walls. Install all pipe straight and true. Springing or forcing piping into place will not be permitted unless specifically called for. Install piping in such a manner as to prevent strain on equipment connections. Install piping in such a manner as to eliminate all static and dynamic conditions of loading on equipment connections.

O. Piping in finished portions of the building, except in mechanical equipment rooms or where otherwise indicated on the Drawings, shall be concealed.

P. All piping shall be of the sizes indicated and shall be routed as indicated on the Drawings, or as required, to serve all equipment and systems.

Q. Fixtures shall be vented as indicated on the drawings and as required by local codes.

R. In each change of direction of soil and waste piping, provide a clean-out plug connected to same with Y fittings and 45° ell made flush with floor or wall.

S. In all horizontal straight runs more than 50 feet (15.25 m) of length, provide at least one clean-out for each 50 feet (15.25 m) of length.

T. Where pipe is buried, cleanouts shall be brought up flush with floor or grade unless otherwise shown on the drawings. The locations of all clean-outs shall be verified with the Architect.

U. All cleanouts shall be of the same size as the pipe up to and including pipe 4 inches in diameter.

V. Provide access doors in general construction for clean-outs installed in concealed locations.

W. All back vents shall be taken off as near traps as possible and permitted by code.

X. All drainage lines shall have at least the minimum slope toward the main sewer as required by the local plumbing code. Pipe must be so laid that the slope will be continuous. Permission shall be secured from the engineer before proceeding with any work where existing conditions prevent the installation at the minimum grade specified.

Y. The sewage and drainage work shall be complete and ready for use including all reducers, increases, special flanges and fittings, where required between the piping work and fixtures.

Z. All horizontal pipe throughout the building, including that in pipe spaces and attics, shall be thoroughly and substantially supported from the building construction by means of approved expansion ring hangers or clevis hangers at each joint. Hangers shall be spaced in accordance with Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

AA. All pipe shall be straight and have uniform fall.

BB. All vertical pipes shall be substantially supported at each floor level with approved steel or iron riser clamps.

CC. Provide sway bracing for all sanitary house drain piping which is supported greater than 2 ft. (0.6 m) from the slab above, measured from the top of the pipe.

DD. Provide additional rod and banding at each joint for all sanitary house drain offsets consisting of riser clamps and threaded rod to anchor all fittings in the horizontal offset. This method of anchoring and support shall be provided in addition to the sway bracing described in the paragraph above.

EE. Bell and Spigot Piping

1. Bell and spigot piping shall be joined with elastomeric compression gaskets as specified.

2. Joints shall be cleaned free from dirt, mud, sand, gravel or foreign materials.

3. The gasket shall be folded and inserted into the hub completely, with the flange of the gasket remaining outside of the hub.

4. Lubricate the joint and compress the piping into the joint so the spigot end of the pipe bottoms out in the hub.

FF. Hubless Cast Iron Piping

1. Hubless cast iron piping shall be joined with heavy duty no-hub couplings as specified.

2. Joints shall be cleaned free from dirt, mud, sand, gravel or foreign materials.

3. The gasket shall be installed on one end of the pipe or fitting and the stainless steel clamp and shield on the other end.

4. Firmly seat the pipe or fitting ends against the center stop of the gasket and slide the shield into position over the gasket.

5. The stainless steel bands shall be tightened using a calibrated torque wrench set to the manufacturer's recommended settings. Bands shall be in sequence according to the manufacturer's recommendations.

GG. Soldered Piping

1. Filler metal shall conform with the requirements of the latest edition of ASTM B 32 Specifications for Solder Metal.

2. All joints, except for refrigerant piping, shall be made with 95% tin and 5% antimony solder, having a melting point of not less than 460°F (238°C). Refrigerant piping joints shall be made with silver solder.

3. All soldered joints shall be thoroughly cleaned before the application of the solder. Flux shall be compatible with the materials brazed and with the filler metal used and shall conform with the requirements of the latest edition of ASTM B 813 Specifications for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Tube. All flux residue must be removed after joint is completed.

4. Soldered joints shall be assembled in accordance with the Copper Tube Handbook of the Copper Tube Development Association and ASTM B 828 Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

5. All soldered joints for tubing larger than 2 inches (50 mm) in size shall be made with the simultaneous application of two (2) or three (3) blow torches.

3.3 CLEANING

A. During construction, properly cap all lines, so as to prevent the entrance of sand, dirt, etc. Each system of piping shall be blown through after completion for as long a time as required to thoroughly clean the apparatus.

B. Before final adjustments are made and before operation of equipment, clean and remove all accumulation of dirt, chips or other deleterious material. Leave all sanitary piping and appurtenances in suitable condition, before final acceptance.

C. Cover and protect all openings left in floor for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug fitting to prevent obstruction and damage.

D. Protect the system against freezing in cold weather.

E. After each hydrostatic leak testing procedure is complete, drain the system until empty. Liquid for hydrostatic testing of sanitary systems shall be clean domestic water from the municipal water supply.

3.4 INSPECTION AND STARTUP SERVICE

A. All inspections, examinations, and tests required by the authorities and/or agencies specified hereinbefore shall be arranged and paid for by this Subcontractor, as necessary to obtain complete and final acceptance of the system as installed.

B. The certificates of inspection shall be provided in quadruplicate and shall be delivered to the Architect for distribution.

C. Inspect all piping, hangers, rod and support for piping and equipment for proper installation according to the manufacturer's instructions.

D. Repair, or if required by the Architect replace, defective work with new work without extra charge to the Owner. Repeat tests as directed, until all work is proven satisfactory.

E. Restore to its original condition any work damaged or disturbed by tests, engaging the original trades to do the work of restoration.

F. Notify the Architect and Inspectors having jurisdiction at least 48 hours in advance of making the required tests, so that arrangements may be made for their presence to witness the tests.

G. Test equipment in service and demonstrate that the equipment performs the work intended for it and that it complies with the requirements of these Specifications for such equipment.

3.5 FIELD TESTS

A. Performance Test

1. Allow sufficient time to perform all tests, adjustments, necessary to place the various systems in final operation condition, verify performance requirements and check all safety devices. Labor and instruments, required for various tests shall be provided. See that all manufacturers' representatives necessary to check and adjust various systems are present with sufficient labor to perform all this work without delay. All test data shall be recorded on suitable forms and submitted to the Owner for approval.

2. A qualified representative of the equipment manufacturer shall be present at the test. The Engineer may witness tests, if he so desires. The Contractor shall notify the Engineer and Owner in writing, at least two (2) weeks prior to the day of the test.

3. Test all systems before any paint is applied, piping is insulated, furred in or otherwise covered.

4. Furnish and pay for all devices, materials, supplies, labor and power required in connection with tests. Make all tests in the presence and to the satisfaction of the Architect, Insurance Underwriters and City Inspectors having jurisdiction.

5. Hubless Cast Iron and Bell and Spigot Cast Iron

a. Subject the drains, waste, and vent piping inside the building to a water test. The water test shall include the entire system from the lowest point to the highest pipe above the roof.

b. Water test shall be made in accordance with all local requirements.

c. The system shall be tested to a hydrostatic pressure equivalent to at least a 10 foot (3 m) head of water.

d. After filling, shut off water supply and allow it to stand two (2) hours, under test, during which time there shall be no loss or leakage.

6. Drainage Piping with Mechanical or Welded Joints

a. Subject the drainage piping to a hydrostatic test, but in no case shall the system be tested at less than 150 psig (10.5 bar) hydrostatic pressure where mechanical or welded joints are installed.

b. Apply the test for a minimum of two (2) consecutive hours with no loss in pressure.

c. Prior to applying the hydrostatic test, the system shall be tested with 50 psig (3.5 bar) compressed air for a period of ten minutes with no loss in pressure.

B. Final Acceptance Test

1. The Owner and/or the Owner's representatives will make final check of all systems only after the Contractor has completed and returned to the Owner or Owner's representatives all recorded test data, together with letter that his work is to the best of his knowledge 100% complete. Field performance tests will be required by the Owner and/or the Owner's representatives at this time to verify performance and workmanship, and to make final system component adjustments.

2. Points and areas for recheck shall be selected by the Owner's representative.

3. Measurements and tests shall be same as the original test procedures.

4. After satisfactory passing of the field tests and after all necessary adjustments have been made, test the complete systems for a minimum of seven (7) days under regular operating conditions or as long as may be required to establish compliance with Contract Documents.

5. The Contractor shall demonstrate to the Engineer and the Owner, prior to acceptance by the Owner, that all systems and/or equipment has been balanced and adjusted properly, and that the system and/or equipment is in compliance with the Contract Documents.

C. Commissioning: Owner or Commissioning Agent shall witness all hydrostatic tests.

3.6 ADJUSTING AND BALANCING

A. Upon completion of piping, hangers for piping and at equipment shall be adjusted to ensure that the loads are distributed evenly and that there are no loads imposed by the piping or the equipment that it is connected to.

B. Securely tighten clevis hanger load nuts first to ensure proper hanger performance. Tighten top nut after adjustment.

END OF SECTION

SECTION 23 05 12

GENERAL PROVISIONS FOR HVAC WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinated with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK INCLUDED

A. Work Included:
1. The work includes providing all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all Heating, Ventilating and Air Conditioning Work as shown on the Drawings and hereinafter specified, including, but not limited to the following:
   a. All motor starters and controllers for equipment furnished by this Contractor. Packaged type units shall be furnished completely prewired with panels mounted on the units as specified. All other motor starters and controllers will be turned over to the Electrical Contractor for installation and wiring.
   b. Custom air handling units used for single duct systems, DX cooling coils and glycol reheat coils where indicated.
   c. Pumps and controls.
   d. Filters.
   e. Humidifiers.
   f. Fans.
   g. Cabinet and unit heaters, finned tube radiation and convectors.
   h. Provide isolation valves where tying new piping into the existing system. Refer to the valve's specifications for the proper valve type for the service. Refer to the Drawings for the pipe/valve size. In addition to the isolation valves at the tie-in points, also provide a balancing valve on the supply side for chilled water, chilled glycol/brine, condenser water and heating/reheat hot water system tie-ins.
   i. Hot water specialties such as expansion tanks, air vents, air separators, reducing and safety valves, etc.
   j. Accessories such as V-belt drives, flow measuring devices, draft gauges, machinery guards, thermostats, pressure gauges.
   k. Inertia blocks and vibration isolation equipment.
   l. Piping, fittings, and valves.
   m. Sheet metal ductwork and accessories such as dampers, access doors, etc.
   n. Registers, grilles and diffusers.
   o. Fire dampers and smoke dampers.
   p. Installation of smoke detectors in ductwork.
   q. Acoustical duct lining.
   r. Pipe, duct and equipment insulation.
   s. Temperature Control: A complete system of temperature control shall be installed in connection with the HVAC systems, including all thermostats, control valves, damper motors and dampers for the outdoor air intakes and fan discharges. All control wiring for

automatic temperature controls, including interlocking wiring for fans, condenser, pumps, etc. by this Contractor.

t. Painting and pipe, duct and equipment identification for all work by this Contractor is previously specified under "Special Requirements for Mechanical and Electrical Work".
u. Test and balancing.
v. Sleeves, pipe inserts and anchor bolts, escutcheons, prefabricated roof curbs, etc., as hereinafter specified.
w. Identification, name plates, tags and charts.
x. Cutting and rough patching.
y. Furnishing and setting of electric motors.
z. Furnishing of starters as specified under "Special Requirements for Mechanical and Electrical Work".
aa. Templates and anchor bolts for equipment bases.
bb. Removal, relocation and/or demolition of existing HVAC work in conjunction with the existing buildings in order to erect the new buildings as indicated on the Contract Drawings.
cc. Energy Management Building Automation System.
dd. Concrete pads for all HVAC work.
ee. All demolition work associated with HVAC systems.
ff. Installation of fire and smoke dampers in the existing ductwork and fan systems.

1.03 QUALITY ASSURANCE

A. Perform work in accordance with quality established in Section 01 31 46 "Special Requirements for Mechanical and Electrical Work", and hereinafter specified. All work performed shall comply with local codes.

1.04 SUBMITTALS

A. Submit shop drawings covering the following items:
1. Coordination drawings.
2. Internal cleaning and treating of piping.
3. Sleeve and ductwork penetration drawings.
4. Identification schedule and samples.
5. Air handling units.
6. Air filters and draft gauges.
7. Coils.
8. Humidifiers.
9. Condensing unit.
10. Air diffusers, registers and grilles.
11. Schedule of ductwork, joints, gauges, supports, flexible connections, fire dampers, access doors, etc.
12. Inline fans.
13. Sheet metal fabrication drawings.
14. Schedule of piping and fitting materials.
15. Piping shop drawings.
16. Schedule of valves, strainers, vacuum breakers.
17. Schedule of steam pressure reducing valves.
18. Flow metering devices and systems.
19. Thermometers and pressure gauges.
20. Schedule of pipe and ductwork supports, including inserts, escutcheons, etc.
21. Heating systems, including unit heaters, cabinet heaters, fin tube radiation, convectors, etc., as specified.

22. Water pumps including pump curves.
23. All motor starters, motor control devices and motor control centers.
24. Cooling towers including sound criteria.
25. Water treatment equipment and systems.
26. Schedule of insulation types and samples of each type.
27. Vibration isolation schedule including inertia block details.
28. Templates for equipment bases.
29. Acoustic material.
30. VAV and constant air valve boxes.
31. Building Automation System.
32. Air vents, air separators, water strainers, reducing and safety valves for water systems.
33. Automatic Temperature Control System.
34. Concrete pad locations and sizes.

B. All shop drawings being submitted that include electrical work shall be submitted with all internal and external wiring diagrams.

C. The previously listed items are major equipment and do not limit this Division's responsibility to submit shop drawings for all equipment and accessories which are to be provided under this Division of the Specifications.

PART 2 - PRODUCTS

2.01 SPARE PARTS

A. Chilled water, condenser water, condensate return pumps and hot water pumps - For each pump listed, unless otherwise specified:
1. One set of wearing rings.
2. One set of bearings.
3. One set of packing glands complete with rings, nuts and bolts.
4. Three gaskets for casing joint.
5. Sufficient stuffing box packing for four packings.
Where pump specifications do not require packing glands of stuffing boxes, items #3 & 5 shall be omitted. Inline pumps w/stuffing box design, item #1 & 2 shall be omitted. Inline pumps w/standard mechanical seal spaces listed above except item #4 shall be omitted.

B. Filters:
1. The Contractor shall furnish a minimum of two complete spare filter sets for the filters for all air handling and AC units.

C. Spare Lamps:
1. Furnish ten (10) spare lamps for each size and type of lamp on instrument panels.

D. Miscellaneous Spare Parts:
1. Water column glasses shall be provided for each tank utilizing one.
2. Furnish one complete set of V-belts for each belt driven unit installed.
3. Electrical equipment - two spare starter fuses identified for each type and size for all starters including pumps, supply, return and exhaust fan.
4. One set of bearings properly identified for each type and size supply, return and exhaust fan.
5. For each type and size pump furnished under this section of the contract, furnish as applicable for each type and size of pump, one set of wearing rings, one set of mechanical seals, one set of

bearings, one set of shaft sleeves, one set of stuffing box bushings, one set of packing glands with rings, nuts and bolts and sufficient stuffing box packing for four packings.

E. Furnish tools required for equipment as follows:
1. One set of high grade tools as recommended and approved by the respective manufacturer for pumps, fans, refrigeration equipment and other equipment. Tools shall be furnished in a suitable hardwood or other approved container with lock and two (2) keys. Pasted on the inside cover shall be a list of all tools provided in container.
2. One pressure grease gun of approved design and size, complete with necessary adaptors to fit all lubricating fittings on installed equipment.
3. One pitot tube, complete with required manometers, to read static pressure and velocity pressure simultaneously. Provide 6'-0" of rubber tubing.

2.02 LIST OF MANUFACTURERS

A. The manufacturer's name appearing first on this list is the manufacturer the project design was based upon. However, the additional manufacturers listed herein are also acceptable with the provision that they meet the requirements of these Specifications, ratings, and/or space allocations listed in the Specifications or shown on the Drawings.
1. Water Pumps
   a. Bell & Gossett
   b. Armstrong
   c. Taco
   d. Weinman
   e. Goulds
   f. Paco
   g. Grundfos
   h. Patterson
2. Air Conditioning Units
   a. Coolbreeze
   b. York
   c. Trane
   d. Envirotech
   e. Carrier
   f. Or approved equal
3. Fan Coil Units
   a. International
   b. Williams
   c. Titus
   d. Envirotech
   e. Carrier
   f. Trane
4. Fresh Air Supply Units
   a. American Air Filter
   b. Trane
   c. Carrier
   d. Envirotech
5. Water Coils
   a. Greenheck
   b. American Air Filter
   c. Trane
   d. York

6. Air Filters
   a. American Air Filter
   b. Camfill Farr
   c. Cambridge
   d. or approved equal
7. Draft Gauges
   a. Dwyer
   b. or approved equal
8. Propeller Fans
   a. Greenheck
   b. Peerless
   c. ACME
   d. or approved equal
9. Cabinet & Unit Heaters
   a. Price Industries
   b. Titus
   c. Greenheck
   d. or approved equal
10. Finned Tube Radiation and Convectors
    a. Zehnder Rittling
    b. Vulcan
    c. Trane
    d. Sterling
    e. or approved equal
11. Coolers
    a. Russell
    b. or approved equal
12. Louvers & Dampers
    a. Greenheck
    b. Ruskin
    c. Titus
    d. or approved equal
13. Water Specialties
    a. Bell & Gossett
    b. Taco
    c. Armstrong
    d. or approved equal
14. Flow Measuring Devices
    a. Greenheck
    b. Barco Division; Aeroquip Corp.
    c. Pres O Ind.
    d. or approved equal
15. Thermometers & Pressure Gauges
    a. Ashcroft
    b. Weiss Instruments
    c. or as specified in Section 23 05 80
16. Motors
    a. Toshiba
    b. General Electric
    c. Westinghouse
    d. Allis Chalmers
    e. or approved equal

17. Starters, Motor Control Centers, Switches
    a. Allen Bradley / Rockwell
    b. Square D
    c. General Electric
    d. Westinghouse
    e. Cutler-Hammer
    f. or approved equal
18. Diffusers, Registers & Grilles
    a. Titus
    b. Price
    c. Anemostat
    d. Acutherm
    e. Nailor
19. Valves
    a. Milwaukee Valve
    b. Crane
    c. Hammond Valve
    d. or as specified under paragraph on "Valves".
20. Insulation and Acoustic Lining
    a. Owens-Corning Fiberglass Corp.
    b. CSG Snap-on
    c. Johns Manville
    d. or approved equal
21. Vibration Isolation
    a. VMC East
    b. Mason Industries
    c. Korfund Corp
    d. or approved equal
22. Automatic Temperature Controls
    a. Distech
23. Water Treatment
    a. Heating Economy Services, Co., Inc.
    b. Astro Pak Corp.
    c. Okite Chemical Corp.
    d. Drew Chemical Corp.
24. Product Refrigeration
    a. Dunham-Bush
    b. or approved equal
25. Internal Cleaning & Treating of Piping
    a. Heating Economy Services Co., Inc.
    b. Tower Water Management
    c. The Metro Group, Inc.
    d. Drew Chemical Co.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 23 05 23

VALVES FOR HVAC

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

C. Section 23 20 00 – Piping for HVAC.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all Valves as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. "Manufacturers" - Firms regularly engaged in manufacture of valves, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide valves produced by the manufacturers, which are listed in Section 23 05 12, "Approved Manufacturer's List".

C. Provide valves whose performance under specified conditions, is certified by the manufacturer.

D. To assure uniformity and compatibility, all grooved end valves and adjoining couplings shall be supplied by a single manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 VALVES

A. Valves- General: All valves shall be of a design which the manufacturer lists for the service and shall be of materials allowed by the latest edition of the ASME Code for pressure piping for the pressure and

temperature contemplated, unless a higher grade or quality is herein specified. All valves of the same type shall be of the same manufacturer, except for special applications.

B. The system shall be supplied with valves in all branch mains and risers, at all pumps, tanks, reducing and control valves, heating and cooling surfaces and at all apparatus; so located, arranged and operated as to give complete shut-off. Except where flanged valves are used, each connection to equipment shall be made with screwed unions, flanged unions, or grooved couplings on the equipment or discharge side of the valve.

C. All valves shall be installed and arranged so that they are easily accessible.

D. Each valve shall have the maker's name or brand, the figure or list number and the guaranteed working pressure cast on the body or stamped on the bonnet, or shall be provided with other means of easy identification.

E. Provide valve steam handle extensions on all ball valves and/or butterfly valves, where insulated, when insulation thickness would otherwise cause the insulation to be damaged as a result of the 90 degree handle movement.

F. Check valves installed in the horizontal position shall be swing checks; valves installed in the vertical position shall be silent checks for 2½" and above, and lift check for 2" and smaller, except that all check valves in pump discharges shall be silent checks.

G. Provide isolation valves where tying new piping into the existing system. Refer to the valves specifications for the proper valve type for the service. Refer to the Drawings for the pipe/valve size. In addition to the isolation valves at the tie-in points, also provide a balancing valve on the supply side for chilled water, chilled glycol/brine, condenser water and heating/reheat hot water system tie-ins.

H. Provide capped blow-off valves at all strainers, and where shown on the Drawings.

I. Provide valve operating chain on all gate, globe, butterfly and plug valves in Mechanical Equipment Rooms - 4" and larger, which are more than 7'-0" above the operating floor. Unit shall be complete with adjustable sprocket, chain and guide (Crane "Babbit" type). Provide hook to keep chain out of the way.

J. Generally, all valves are to be of the gate type, except that globe valves shall be used for balancing service, throttling services and on traps, and pressure reducing and control valve bypasses. Globe valves used on bypasses shall have monel metal mountings. Pumps shall have globe type balancing flow measuring & shut off valves on discharge piping.

K. All valves 2 inches in diameter and smaller shall be all bronze with bronze bodies. Valves 2½ inches in diameter and larger shall have iron bodies with bronze mountings (except where otherwise noted).

L. All flanged-end valves shall have renewable metal seat rings and discs. On gate valves these parts shall be of bronze, on all globe valves they shall be of bronze and suitable for throttling service.

M. All screwed-end globe valves shall be of the union bonnet type with renewable teflon discs.

N. All valves shall have their bonnets back-seated to provide for packing under pressure. All gate valves shall be of the solid tapered wedge type.

O. Drain valves shall be provided on tanks, receivers, risers and where they may be required or necessary, for draining the lines and equipment. Drain valves or plug cocks shall be provided at the low points for proper drainage. Cocks and valves shall be provided with threaded ends for those connections.

P. All valves up to 2 inches in diameter shall have screw ends, 2½ inches in diameter and over shall have flanged ends. Valves 2½" and larger which are non-rising stem, shall have position indicators.

Q. All bronze and iron valves shall be furnished with Teflon impregnated packing.

R. All handwheels shall be of malleable iron.

S. No Asbestos shall be used in construction of valves including the gaskets.

T. All valves shall be of type and number as specified below: For all services, except as otherwise noted.

TYPE	SIZE	NIBCO NO.	CRANE NO.	HAMMOND NO	MILWAUKEE NO.	ABZ No.	REMARKS
Gate Valve	2" & Smaller	T-134	428UB	IB629	1151		150 lb. WSP, Bronze
	2 ½" & Larger	F-617-O	465 ½	IR1140HI	F2885M		Rising Stem 125 lb. WSP, Bronze Trimmed, Iron Body, OS&Y
Globe Valve	2" & Smaller	T-275Y (Teflon) T275-B (Steam) T276-AP (SS Full-Plug)	14 ½ P	IB444	572 593A		300 lb WSP, Bronze
	2 ½" & Larger	F-718B	351	IR116	F2981M		125 lb, WSP, Bronze Trimmed, Iron Body OS&Y
Angle Valve	2" & Smaller	T375-Y (Teflon) T375-B (Steam) T376-AP (SS Full-Plug)	16 ½	IB454T	582		300 lb. WSP, Bronze
	2 ½" & Larger	F-818-B	353				125 lb. WSP, Bronze Trimmed, Iron Body, OS&Y
Butterfly Valve (High Performance)	2 ½" & Larger	LCS-6822 LCS-7822		HP1LCS4212 HP1LCS4213	HP1LCS4212 HP1LCS4213	400 Series	300 psi Grooved DI, EPDM 285 psi Lug, DI, SS Disc, EPDM

TYPE	SIZE	NIBCO NO.	CRANE NO.	HAMMOND NO	MILWAUKEE NO.	ABZ No.	REMARKS
Swing Check	2" & Smaller	T-433-Y	137	IB946	515	900	150 lb WSP, Bronze
	2 ½" & Larger	F-918-B	373	IR1124HI	F2974M	900	125 lb WSP, Bronze Trimmed, Iron Body
Silent Check	All Sizes	F-910 / w-910 (CI) G-920-W (DI)	-----	IR9253 IR9354	1400 1800	900	Williams-Hager Fig. 636, 125 WSP Semi-steel.
Drain Valves	2" & Smaller	T-113-HC	451				200 lb. OWG, Non- rising stem, Hose end, Bronze with Bronze Cap & Chain
Blow-Off Valves	2" & Smaller	T-585-70-HC (Ball) T-174-A (Gate)	----	8501H (Ball) IB652 (Gate)	BA100H (Ball) 1182 (Gate)		300 lb. WSP, Bronze Y-Type
Strainers	2" & Smaller	T-221/222-A					125 lb, WSP, Bronze
	2 ½" & Larger	T-751-A F-721-A					250 lb, WSP, Iron Body, 125 lb, WSP, Iron Body

U. Valves for radiation service shall be as follows:

V. Hot Water Radiation Shut-off all sizes, 200 psi water, Sarco No. 740A with lock shield.
1. Fig. 1 Angle Pattern
2. Fig. 3 straight thru
3. Fig. 4 Lock shield type

W. Radiation Balancing - All sizes, 200 psi water, bronze, male union outlet, combination balancing, shut off and flow measuring, Sarco metered balance master valve, or approved equal. Provide model flow test kit.

2.02 VALVES IN COPPER TUBING

A. Except where otherwise noted, all valves for use with copper tubing shall be as follows

TYPE	SIZE	NIBCO NO	CRANE NO	VICTAULIC NO	HAMMOND NO	MILWAUKEE NO	REMARKS
Gate Valve	2" & Smaller	S-111	1320	----	IB635	149	125 lb. WSP, Bronze
	3" & Smaller	S-134	----	----	IB648	1169	300 lb. Non-Shock

TYPE	SIZE	NIBCO NO	CRANE NO	VICTAULIC NO	HAMMOND NO	MILWAUKEE NO	REMARKS
	2 ½" & Larger	F-617-O	428	----	IR1140HI	F2885M	125 lb, WSP, Bronze trimmed, rion body, OS&Y
Globe Valve	2" & Smaller	S-211-Y	1310	----	IB418	1502	125 lb WSP, bronze
	3" & Smaller	S-235-Y	----	----	IB423	1590T	300 lb. Non-shock CW Bronze with solder joint adapter
	2 ½" & Larger	F-718-B	14 ½ P	----	IR116HI	F2981M	125 lb. WSP, bronze trimmed, iron body OS&Y
Angle Valve	2" & Smaller	S-311-Y	1311	----	IB463	504	125 lb WSP, Bronze with solder joint adapter
	3" & Smaller	S-335-Y	----	----	IB454T	595T	300 lb. Non-shock CW Bronze with solder joint adapter
	2 ½" & Larger	F-818-B	16 ½ P	----			125 lb WSP, bronze trimmed, iron body OS&Y
Swing Check	2" & Smaller	S-413-B	1303	----	IB912	1509	125 lb WSP, Bronze
	3" & Smaller	S-433-B	----	----	IB945	1515	300 lb Non-shock CW Bronze with solder joint adapter
	2 ½" & Larger	F-918-B	34	----	IR1124HI	F2974M	125 lb WSP, bronze trimmed, iron body
Balancing Valves	½" to 2"		Tour and Anderson	786 787 78K			125 lb, WSP, bronze body, globe style, integral test, point, thrd or swt.
	2 ½" to 12"						125 lb. WSP, iron body, non-rising stem, flg or grv

2.03 REFRIGERANT VALVES

A. All refrigerant valves shall be silver brazed joint as follows:
1. Globe Valves - 1⅛" O.D. and smaller: packless, Henry type 626; 1⅜" O.D. and larger: packed, wing cap, Henry type 203.
2. Angle Valves - 1⅛" O.D. and smaller: packless, Henry type 647 and 642; 1⅜" O.D. and larger: packed, wing cap, Henry type 216.
3. Check Valves - ⅞" O.D. and smaller: brass, Henry type 116A; 1⅛" O.D. and larger: bronze, Henry type 205.
4. Charging and Purging Valves - Line valve, Henry type 623; angle valve, Henry type 643.
5. Relief Valves - Angle type, brass, Henry type 52.
6. Gate Valves - All sizes: Globe Valves.

2.04 LUBRICATED PLUG VALVES

A. Full port opening tapered plug suitable for lubrication under service pressure with plug in any position.

B. Lubricating Guns:
1. One for every 10 valves.
2. Extra heavy, lever type, hydraulic hand gun.
3. 15,000 psi gauge and 12" long connection hose.

C. Lubricant:
1. Manufacturer's recommendations.
2. One year supply, each valve.

D. Operators:
1. 4" with wrench, except as noted.
2. Wrench set for each size valve.
3. Wrench for every 10 valves, each size
4. 6" and larger: gear operated.
5. Permanently installed handwheel.

2.05 VALVE CONSTRUCTION

A. Piping less than 100 psi: 200# WOG Class, cast iron body.

B. Piping 100 psi to 250 psi: ANSI Class 150, carbon steel.
1. 4" and larger: flanged, ANSI Class 150 rated.

C. Piping over 250 psi: ANSI Class 300, carbon steel body.
1. Up to 2": screwed
2. 2½" and larger: flanged, ANSI Class 300 rated.

2.06 BALANCING VALVES

A. All balancing valves shall be combination balancing, flow measuring and shut off valves. Valves shall be globe style design and shall have a position indicator and memory stop or locking device so that the valve can be closed without disturbing the setting and returned to the balanced position without further adjustment.

B. Valves shall be as manufactured by Tour and Andersson, Inc. or approved equal.

C. Nominal working pressure for the valves shall be 250 psig or greater at 250°F.

D. Provide portable flow measuring instruments which shall be turned over to the Owner at the completion of work.

E. Butterfly valves can be used for only shutoff valves and shall not be used for balancing.

F. Coil Hook-Up Assembly: Install with Tour & Andersson balancing valves 2” and smaller, Victaulic Series 799 or 79V Koil-Kit™ to complete terminal hookup at coil outlet and to reduce space requirements. Assembly shall consist of Victaulic Series 78U union port fitting, Series 78Y strainer/ball valve or Series 78T union/ball valve combination and flexible hoses.

2.07 BALL VALVES

A. Ball Valves up to 2½" may be used for all water services as an alternate to gate valves.

B. Ball valves shall be bronze body, bronze ball and stem, Teflon seats and seals threaded ends, 400 psig cold W.O.G. Worchester No. 411T-SE or equal. "APOLLO" 70 - 100 Series.

C. Provide valve stem handle extensions per para. 2.01.

2.08 HIGH PERFORMANCE BUTTERFLY VALVES

A. Butterfly valves may be used for as an alternative to gate valves for sizes 2½" and above for chilled water, and condenser water only.

B. Valves shall be similar to Milwaukee HP1LCS (ANSI Class 150) or Fig. HP3LCS (ANSI Class 300) lug type body; or similar to NIBCO Fig. # LCS6822 (ANSI Class 150) or NIBCO Fig. # LCS7822 (ANSI Class 300). Butterfly valves shall not be directly connected to equipment without a spool piece. All valves shall be capable of bi-directional dead end service.

C. Valves in insulated piping shall have necks extending 2" above the flange to accommodate full thickness of insulation.

D. Operators:
1. Valves to 4" shall have lever operators with 10 locking positions and adjustable memory stop.
2. Valves larger than 4" shall be equipped with manual hand wheel gear operators.
3. In Mechanical Equipment Rooms, provide chain wheel operators on all valves located at or above 7'-0" AFF.

E. Bodies: Shall be A216-WCB carbon steel lug style.

F. Stems: Shall be 17-4PH stainless steel for maximum strength and corrosion resistance and must be blow out.

G. Discs: Shall be 316 stainless steel and double offset for tight shutoff, ease of operation and maximum seat life.

H. Seats: Shall be of reinforced PTFE and held in place by bolted on seat retainers to assure bi-directional dead end service. Seats retained by spring clips are not acceptable.

I. Shaft Bushings: Shall be PTFE impregnated 316 stainless steel on either side of the disc.

J. Packing: Shall be underneath drawn design to allow direct mounting of actuators eliminating brackets and couplings. Packing shall be a stack of multiple PTFE rings.

K. Factory Test Pressure: 120% of above working pressures.

L. Dead End Test: 100% of above working pressures.

M. Where high performance butterfly valves are used in piping with mechanical couplings (Victaulic, etc.), provide transition fittings from grooved couplings to flanges.

N. Provide valve stem handle extensions per para. 2.01.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where valves are to be installed and determine space conditions and notify architect in writing of conditions determined to proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install valves where shown or specified, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that valves comply with requirements and serve intended purposes.

B. Provide isolation valves immediately upstream and downstream of control valve.

C. Contractor is responsible for final valve orientation. Valves shall be installed in such a manner to avoid leakage through their stem seals, while still orienting valve handles to provide suitable accessibility and operability. Valve orientation shall be in compliance with the valve manufacturer’s installation instructions. Valve handle orientation shall be indicated on the piping shop drawings. Valves orientation and handles not shown on the piping shop drawings will be subject to possible removal and reorientation in the field based on the Engineer’s observations following the completion of construction.

D. Provide chain operators on all isolation valves located in mechanical rooms where valve is more than 7 feet above the operating floor. Provide hook on nearest wall or column to tie back chain.

E. Coordinate with other work as necessary to prevent interference of valves with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of valves, test valves to demonstrate compliance with requirements. When possible, field correct malfunctioning valves, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION

SECTION 23 05 48
VIBRATION ISOLATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The Work includes providing all labor, materials, equipment, accessories, services and tests to complete and make ready for operation by the Owner, all vibration isolations as shown on the Drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture of this equipment with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than ten (10) years.

B. Provide products produced by the manufacturers which are listed in Section 23 05 12, "Approved Manufacturer's List".

C. Provide equipment whose performance under specified conditions is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.07 TECHNICAL REQUIREMENTS

A. All mechanical equipment shall be mounted in accordance with the specifications below and for the specific requirements shown in the equipment schedule.

B. The isolation manufacturer shall supply all unit isolators, complete rails, fan and motor bases and structural steel forms for concrete inertia blocks, where called for and shall be responsible for the selection of all vibration eliminators and shall guarantee to meet the requirements of these Specifications.

C. Wherever rotational speed is mentioned as the disturbing frequency, the lowest such speed in the system shall be used. All isolation devices shall be selected for uniform static deflections according to distribution of weight. Lateral motion of all isolators shall be ¼" maximum during start-up and shut-down.

D. All metal parts and hardware on outdoor isolators shall be constructed of Type 304 stainless steel. Galvanized, zinc-coated and painted steel will be rejected.

E. Isolators shall be equipped with limit stops to resist wind velocity.

F. All fan units and air handling units (except fans with wheels under 27") shall be isolated as follows:
1. Up to 450 RPM: 75% efficiency (3½" maximum deflection)
2. 450 RPM to 850 RPM: 90%
3. 850 RPM and over: 95%

G. Submittals shall show disturbing frequency, required efficiency, designed deflection and outside diameter of springs, when pertinent.

H. Weight of concrete inertia blocks shall be as follows:
1. Fans and air handling units (up to 5" s.p.) driven by 75 HP and larger motors: 1½ times weight of equipment.
2. High pressure fans and air handling units (5" s.p. and over) driven by 30 HP motors: 1½ times weight of equipment.
3. High pressure fans (5" s.p. and over) driven by 75 HP and larger motors: 2 times weight of equipment.

I. All horizontal pipe runs within the mechanical equipment room area, but not less than 50 feet from connected equipment shall be isolated from building structure by means of units designed for insertion in rods.

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATION

A. Mountings:
1. Type A:
   a. Double deflection neoprene mountings shall have a minimum static deflection of 0.35. All metal surfaces shall be neoprene covered to avoid corrosion and have friction pads both top and bottom, so they need not be bolted to the floor.
   b. Bolt holes shall be provided for those areas where bolting is required. On equipment such as small vent sets and close coupled pumps, steel rails shall be used above the mounts to compensate for the overhang.
   c. Manufacturer/Type:
      Mason Industries, Inc.: ND or Rails RND
      Vibration Eliminator Co.: T44 or D-Rails
2. Type B:
   a. Spring isolators shall be free-standing and laterally stable without any housing and complete with 3" neoprene acoustical friction pads between the base plate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment.

b. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.
c. Submittals shall include spring diameters, deflections, compressed spring height and solid spring height.
d. Manufacturer/Type:
Mason Industries, Inc.: SLFH, on rails type ICS
Vibration Eliminator Co. OSK

3. Type C:
a. Equipment with operating weight different from the installed weight such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, shall be mounted on spring mountings as described under Type "B" of this paragraph, but a housing shall be used that includes vertical resilient limit stops to prevent spring extension when weight is removed. The housings shall serve as blocking during erection and cooling tower mounts shall be located between the supporting steel and roof or the grillage and dunnage. The installed and operating heights shall be the same. A minimum clearance of ½" shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Mountings used out of doors shall be hot dipped galvanized.
b. Manufacturer/Type:
Mason Industries, Inc. SLR
Vibration Eliminator Co. KW

4. Type D:
a. Vibration hangers shall contain a steel spring and a double deflection neoprene element in series. Neoprene elements shall have a minimum deflection 0.35". The neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection and be seated in a neoprene cup with an integral molded bushing that passes through the lower hanger box.
b. Manufacturer/Type:
Mason Industries, Inc. DNHS
Vibration Eliminator Co. SNRC

5. Type E:
a. Vibration hangers shall be as described under Type "D" of this paragraph, but they shall be pre-compressed to the rated deflection so as to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after installation is complete and the hanger subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include an isolation layout hanger drawing showing the proper location of each isolator, tagging its actual loading.
b. Manufacturer/Type:
Mason Industries, Inc. PCDNHS
Vibration Eliminator Co. PR

6. Type F:
a. Vibration hangers shall contain a double deflection neoprene element manufactured as an integral part of the element design to prevent short circuiting of the rod as it penetrates the housing body. Minimum static deflection shall be .35".
b. Manufacturer/Type:
Mason Industries, Inc. HD
Vibration Eliminator Co. SNC

7. Type DE:

a. Elastomer hanger rod isolators shall incorporate the following:
   1) Molded unit type neoprene elements with projecting bushing, lining rod clearance hole.
   2) Neoprene element to be minimum 1¾" thick.
   3) Steel retainer box encasing neoprene mounting.
   4) Clearance between mounting hanger rod and neoprene bushing shall be minimum of 1/8".
   5) Minimum static deflection of 0.35".
b. Mason Type HD or approved equal.

B. Bases:
1. Type G:
   a. Vibration isolator manufacturer shall furnish integral structural steel bases for both driver and driven machines.
   b. Bases shall be rectangular in shape for all equipment other than centrifugal refrigeration machines and pump bases which may be "tee" or "L" shaped. Pump bases for split case pumps shall include supports for suction and discharge base ells. All perimeter members shall be WF beams with a minimum depth equal to 1/10th of the longest dimension of the base. Beam depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of one inch.
   c. Bases shall be WF bases as manufactured by Mason Industries, Inc. or approved equal.
2. Type H:
   a. Vibration isolator manufacturer shall provide steel members welded to height-saving brackets to cradle machines having legs or bases that do not require a complete supplementary base.
   b. Members shall be sufficiently rigid to prevent strains in the equipment.
   c. Inverted saddles shall be ICS as manufactured by Mason Industries, Inc. or approved equal.
3. Type J:
   a. Vibration isolator manufacturer shall furnish structural channel concrete forms for floating foundations.
   b. Bases for split case pumps shall be large enough to provide support for suction and discharge base ells. The base depth shall be a minimum of 1/10th of the longest span, but not less than 6" or greater than 14". Forms shall include minimum concrete reinforcement consisting of ½ on 6" centers running both ways and a layer 1½" above the bottom and a top layer of reinforcing steel as above for all bases exceeding 120" in one direction. Isolators shall be set into pocket housings which are an integral part of the base construction and set at the proper height to maintain a 1" clearance below the base. Bases shall be furnished with templates and anchor bolt sleeves as part of this system.
   c. Manufacturer/Type:
      Mason Industries, Inc. KIPWF
      Vibration Eliminator Co. SN Frames
4. Type Y:
   a. Rooftop packaged air handling units shall be installed on a spring supported isolation curb which shall combine the manufacturer's curb and the isolation base into one assembly. The system shall be designed with 1", 2" or 3" static deflection steel springs which are both adjustable, removable and interchangeable after the rooftop unit has been installed. The system shall maintain the same operating and installed height both with and without the equipment load and shall be fully restrained during wind load conditions allowing no more than ¼" motion in any direction. The isolation curb shall be designed to accept and utilize outer placement of standard 2" roof insulation to act as a sound attenuation system for the inside of the curb. The entire unit shall become an integral part of the membrane

waterproofing. The entire assembly shall be dry galvanized or PVC coated. The isolation curb shall be model P-6000 as manufactured by Mason Berger East. Options for the system include an elevation kit model EK-1 and a sound barrier pack framing kit complete with offset plenum for lightweight roof deck areas model SBC-3. Note: Where this option is utilized, General Contractor is to furnish and install sound barrier material.

b. Manufacturer/Type:
Mason Industries, Inc.: Model P-6000
Vibration Eliminator Co.:

5. Type R:
a. Rooftop fans, condensing units, exterior ducted air handling units, etc. shall be installed on continuous equipment support piers which shall combine a regular equipment support and an isolation system into one assembly. The system shall be designed with 1", 2" or 3" static deflection steel springs which are both adjustable, removable and interchangeable after equipment has been installed. The system shall maintain the same operating and installed height both with and without the equipment load and shall be fully restrained during wind load conditions allowing no more than ¼" motion in any direction. The isolation pier shall be designed to accept 2" rigid insulation and to be an integral part of the membrane waterproofing. The entire assembly shall be dry galvanized or plastic coated. The isolation rail pier system shall be model R-7000 as manufactured by Mason Berger East, Inc.
b. Manufacturer/Type:
Mason Industries, Inc. R-7000
Vibration Eliminator Co.

C. ISOLATION SCHEDULE:

Vibration Eliminator Specification Type for Equipment Location:		
Type of Equipment	With No Occupied or Unoccupied Spaces Below	Above Occupied or Unoccupied Spaces
Self-Contained Air Conditioning Units	Type A 0.4" deflection)	Type B (1.0" deflection)
Refrigeration Reciprocating Compressors, Condensing Units or Chillers	Type A (0.4" deflection)	Type B (1.0" deflection)
Cooling Towers	Type A (1.0" deflection)	Type C (3.0" deflection)
Heat Pumps (ceiling mounted)	Type D (1.0" deflection)	
Pumps:		
Through 15 HP	Type A (Rail Type) (0.4" deflection)	Type B (Rail Type) (1.0" deflection)
20 HP thru 30 HP	Type G-B (0.4" deflection)	Type G-B (1.0" deflection)
40 HP and over	Type J-B (1.0" deflection)	Type J-B (2.0" deflection)
Factory Assembled, Air Handling Equipment:		
Suspended Units	Type D (1.5" deflection)	Type D (2.0" deflection above 600 rpm)
Floor Mounted Units	Type B (1.0" deflection)	Type B (2.0" deflection above 600 rpm)

Vibration Eliminator Specification Type for Equipment Location:		
Type of Equipment	With No Occupied or Unoccupied Spaces Below	Above Occupied or Unoccupied Spaces
		Type B-H (2.5" deflection below 600 rpm)
Class I Fans (Arrangement 1 & 3)		
Floor Mounted:	Type B-G (1.0" deflection)	Type B-G (2.0" deflection above 600 rpm)
		(3.0" deflection below 600 rpm)
		(4.0" deflection below 400 rpm)
Suspended:	Type F (1.5" deflection)	Type F (2.0" deflection)
Class I Fans (Arrangement 9)		
Floor Mounted:	Type B (1.0" deflection)	Type B (2.0" deflection)
Suspended:	Type F (1.5" deflection)	Type F (2.0" deflection)
Class II and III Fans	Type B-J (1.0" deflection)	Type B-J (2.0" deflection above 600 rpm)
		(3.0" deflection below 600 rpm)
		(4.0" deflection below 400 rpm)

2.02 FLEXIBLE CONNECTIONS

A. Provide a flexible pipe connector at pumps, chillers and other vibrating equipment.

B. Flexible connector shall be:
1. Manufacturer of nylon tire cord and EPDM, both molded and cured with hydraulic presses.
2. Straight connectors to have two spheres reinforced with a mold-in external ductile iron ring between spheres.
3. Elbow shall be long radius reducing type.
4. Rated 250 psi at 170°F. Dropping in straight line to 170 psi at 250°F for sizes 1½" to 12". Elbows shall be rated no less than 90% of straight connections.
5. Sizes 10" and 12" to employ control cables with neoprene end fittings isolated from anchor plates by means of ½" bridge bearing neoprene bushings.
6. Minimum safety factor, 4 to 1 at maximum pressure ratings.
7. Submittals to include test reports.
8. Mason Type MFTNC Superflex, or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION AND COORDINATION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the Work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

C. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades following work, such as plastering or electrical, to avoid any contact which would reduce the vibration isolation.

D. Bring to the Architect's attention, prior to installation, any conflicts with other trades which may result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the responsible Contractor's expense.

E. Bring to the Architect's attention, any discrepancies between the Specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the Contractor's expense.

3.02 INSTALLATION

A. Mount floor-mounted equipment on 4" concrete housekeeping pads over complete floor area of equipment. Mount vibration isolating devices and related inertia blocks on concrete pad.

B. Each fan and motor assembly shall be supported on a single structural steel frame. Flexible duct connections shall be provided at inlet and discharge ducts.

C. The machine to be isolated shall be supported by a structural steel frame or concrete inertial base.

D. Brackets shall be provided to accommodate the isolator. The vertical position and size of the bracket shall be specified by the isolator manufacturer.

E. The minimum operating clearance between the equipment frame or rigid steel base frame and the housekeeping pad or floor shall be 1". Minimum operating clearance between concrete inertia base and housekeeping pad or floor shall be 2".

F. The equipment structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine or isolators.

G. The isolators shall be installed without raising the machine and frame assembly.

H. After the entire installation is complete and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.

I. Isolation mounting deflection shall be (minimum) as specified or scheduled.

J. Install equipment with flexibility in wiring connection.

K. Verify that all installed isolator and mounting systems permit equipment motion in all directions. Adjust or provide additional resilient restraints to flexibly limit start-up equipment lateral motion to ¼".

L. Prior to start-up, clean out all foreign matter between bases and equipment. Verify that there are no isolation short circuits in the base isolators or seismic restraints.

M. All piping and ductwork to be isolated shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork and maintain ¾" to 1¼" clearance around the outside surfaces. This clearance space shall be tightly packed with firestopping or fiberglass and caulked airtight after installation of piping or duct ductwork.

N. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation system herein specified.

O. The contractor shall not install any equipment, piping or conduit which makes rigid contact with the "building" unless permitted in this Specification. Building includes, but is not limited to, slabs, beams, columns, studs and walls.

P. Obtain inspection and approval of any installation to be covered or enclosed, prior to such closure.

Q. Diagonal thrust restraint shall be as described for Type D hanger with the same deflection as specified for the spring mountings. The spring element shall be designed so it can be pre-set for thrust and adjusted to allow for maximum of ¼" movement at start and stop. Diagonal restraints shall be attached at the centerline of thrust. Restraint shall be Mason Type WB or approved equal.

3.03 PIPING ISOLATOR INSTALLATION

A. The isolators shall be installed with the isolator hanger box attached to, or hung as close as possible to, the structure.

B. The isolators shall be suspended from substantial structural members only.

C. Hanger rods shall be aligned to clear the hanger box.

D. Horizontal suspended pipe 2" and smaller and all steam piping shall be suspended by Type DE isolator with a minimum 3/8" deflection. Water pipe larger than 2" shall be supported by Type E isolator with minimum 1" or same static deflection as isolated equipment to which pipe connects, whichever is greater.

E. Horizontal pipe floor supported at slab shall be supported via Type B, with a minimum static deflection of 1" or same deflection as isolated equipment to which pipe connects, whichever is greater.

F. Vertical riser pipe supports shall utilize neoprene elements.

G. Vertical riser guides, if required, shall avoid direct contact of piping with building.

H. Pipe sway braces, where required shall utilize two (2) neoprene elements.

3.04 FIELD QUALITY CONTROL

A. Obtain inspection and approval of any installation to be covered or enclosed, prior to such closure.

B. Upon completion of installation of all vibration isolation devices herein specified, the local representative of the isolation materials manufacturer shall inspect the completed system and report, in writing, any installation error, improperly selected isolation devices, or other faults in the system that could affect the performance of the system. Contractor shall submit a report to the Architect, including the manufacturer's representatives final report, indicating all isolation reported as improperly installed or requiring correction, and include a report by the Contractor on steps taken to properly complete the isolation work.

END OF SECTION

SECTION 23 05 80

HVAC SPECIALTIES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all HVAC Specialties as shown on the Drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Firms regularly engaged in manufacturer of this equipment with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than ten (10) years.

B. Provide products produced by the manufacturers, which are listed in Section 23 05 12, entitled "Approved Manufacturers List".

C. Provide equipment whose performance under specified conditions is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 THERMOMETERS

A. Furnish and install, where indicated on the Drawings and where specified herein, separable well-type dial or 9" mercury adjustable angle type in glass stem, thermometers, Model 50 EI60E as manufactured by Ashcroft or approved equal.

B. All thermometers shall be installed in such a manner as to cause a minimum of restriction to flow in the pipes and so that they can easily be read from the floor.

C. Dial thermometers shall be 5 inch hermetically sealed, bimetal with stainless steel cases, antiparallax dials with raised jet black figures, stainless steel stems, and separable sockets (wells) unless otherwise specified.

D. Thermometers for duct mounting shall have union connections in lieu of separable wells.

E. Separable wells shall be stainless steel for use in steel pipe and brass for use in copper pipe. Separable wells shall be standard type for uninsulated pipe and lagging extension type of proper length for insulated pipe. Stem shall extend a minimum of 3½" into the fluid, or 75% of inside clear diameter for smaller size pipes.

F. The accuracy of all thermometers shall be within 1% of the full scale range.

G. All instrument wells for controls and indicators furnished by the temperature control manufacturer shall be installed under this Section.

H. Where conditions are such that thermometers would not be readable from the floor, remote bulb dial thermometers shall be mounted on panelboards. The thermometers shall be 5 inch dials and shall be vapor actuated. The thermometers shall have separable wells. Panel mounted thermometers shall be provided with an engraved nameplate mounted below each thermometer to identify its service. The nameplates shall be chrome plated with black filled letters.

I. A thermometer shall be installed in the hot water inlet and outlet of each heat exchanger. A thermometer shall be installed in the chilled water and condenser water inlet and outlet of each refrigeration machine. Additional thermometers shall be installed where indicated on the Drawings.

J. The scale range for the thermometers shall be as follows:

Service	Temperature Range	Remarks
High Temperature Hot Water	50 deg. F to 550 deg. F	With stainless steel separable sockets
Hot Water	30 deg. F to 300 deg. F	
Chilled Water	0 deg. F to 120 deg. F	
Condenser Water	0 deg. F to 120 deg. F	
Dual Temperature Water	30 deg. F to 300 deg. F	

2.02 PRESSURE GAUGES

A. Furnish and install where indicated on the Drawings and where specified herein, 4½" Model 1279 pressure gauges with phenolic casings as manufactured by Ashcroft. Process connection shall be ½" MNPT. Acceptable equals include Weiss Model 4UGY1 or Noshok Model 660.

B. Gauges shall be liquid filled for systems under 150°F (chilled water, condenser water, fuel oil, etc.) and shall be dry for all heating systems (hot water, steam, condensate, etc.).

C. All gauges shall have black phenolic casings. The gauges shall have white faces with black filled engraved numerals and adjustable pointer. The diameter of the dial shall be 4½ inches. Gauges shall have brass bronzed brushed rotary type movement.

D. The accuracy of all gauges shall be within ½% of the scale range.

E. All gauges on water lines shall be fitted with ½" filter type pressure snubbers consisting of ⅜" dia. x ⅛" thick, micro metallic stainless steel filter, as manufactured by Operating and Maintenance Specialties or approved equal. All gauges on steam lines and high temperature hot water lines shall be fitted with ½" diameter water-filled carbon steel siphon tubes.

F. A stainless steel bar stock block-and-bleed type needle valve shall be installed on the fluid side of each gauge, similar to Noshok Model Series 704FFS (size ½" female NPT in and out). A stainless steel bar stock block-and-bleed type needle valve with a water-filled siphon tube shall be installed on the system side of each steam and HTHW gauge, with the siphon tube installed between the needle valve and the pressure gauge.

G. All gauges shall be installed so as to be easily readable from the floor. Where conditions are such that gauges on piping would not be readable from the floor, the gauges shall be installed on panelboards.

H. Panel mounted gauges shall be designed for flush mounting with back connections and shall be provided with an engraved nameplate mounted below each gauge to identify its service. The nameplates shall be chrome plated with black filled letters.

I. Differential pressure switches, pressure sensing pipe taps, furnished by temperature control manufacturers shall be installed under this Section.

J. Pressure gauges shall be installed in the suction and discharge of each hot water, chilled water, condenser water, condensate return, boiler feed and fuel oil pump. A pressure gauge shall be installed in the chilled water and condenser water inlet and outlet of each refrigeration machine. A pressure gauge shall be installed in the inlet and outlet of each heat exchanger and each air handler coil. A pressure gauge shall be installed at the inlet and outlet of each water, steam or fuel oil strainer. Additional pressure gauges shall be installed where indicated on the Drawings.

K. The scale range of pressure gauges shall be as follows:

Service	Pressure Range
Chilled Water	0 to 100 PSIG
Condenser Water	0 to 100 PSIG
Hot Water	0 to 100 PSIG
Discharge Side of Water Pressure Reducing Valve	0 to 100 PSIG

L. All other pressure gauges shall have a range at least twice the working pressure, but in no case less than 0 to 30 PSIG.

2.03 MACHINERY GUARDS

A. Moving parts of machinery exposed to contact by personnel shall be guarded by steel barrier type which complies with OSHA.

B. Exposed moving parts such as belts and couplings shall have not less than ¾" No. 16 gauge steel guards with all edges rounded and gauge, material and construction shall be in accordance with OSHA standards - paragraphs 7173.3, 7173.5 and 7174.1. Guards shall have 1¼" x 1¼" x ⅛" angle iron frame properly supported.

C. All machinery guards covering the ends of motor or equipment shafts shall have openings for the insertion of a tachometer. Machinery guards shall be painted with two coats of machinery orange enamel.

2.04 DRAFT GAUGES

A. Furnish and install at each filter, draft gauges for measuring the resistance of the air through the filters.

B. Each draft gauge shall be an inclined tube differential type for indoor units, equipped with a shut-off cock opening to atmosphere for checking zero setting, and with a shut-off cock in the lines to points where the draft is measured. The scale shall have a white background with heavy black divisions and figures; shall not be less than 8" long and shall be graduated to read by hundredths of an inch up to resistances to be encountered. Each gauge shall be provided with a bubble level gauge and with screw adjustment for zero settings.

C. Draft gauge for rooftop units and outdoor units shall be 2000 Series Magnehelic as made by Dwyer or approved equal. Gauges shall be provided complete with two static pressure tips case, fittings and means of mounting. Scale shall be as required. Set gauges to be easily readable from floor level. Gauges shall be of Dwyer make or approved equal.

2.05 AIR VENTS

A. In installing water piping systems and all equipment, carefully plan the actual installation in such a manner that high pints and air pockets are kept to a minimum and are properly vented where they are unavoidable. All air elimination devices called for on the Drawings and in these Specifications shall be provided and properly installed. In addition, furnish and install all other air elimination devices which may be required due to job conditions. Assume responsibility for a proper, continuous and automatic air elimination to assure even and balanced distribution of water to all equipment.

B. Furnish and install an Armstrong No. 1 AV or Sarco 13W automatic air vent with test petcock at each high point in the water piping mains and where indicated on the Drawings. Furnish and install a 125 PSIG rated valve on the system side of each automatic air vent. Vents on hot water, dual temperature water and chilled water lines shall have Hoke Fig. No. PY-271 valves or approved equal. Vents on all other water lines shall have Hoke Fig. No. RB-271 valves or approved equal.

C. Furnish and install manual air vents Hoffman No. 500 or approved equal, for all upfed radiation. Furnish and install a 125 PSIG rated ball valve on the system side of each manual air vent. Provide access to all air vents.

2.06 V-BELT DRIVES

A. All V-belt drives furnished under this Section shall be Gates Rubber Co., Woods, or approved equal. [1]Drives shall be designed with an overload factor of twice the fan brake horsepower but in no case less than 125% of motor horsepower rating. Machined cast iron pulleys shall be used. Manufacturer's shop drawings shall state actual transmission capacity of each drive. Provide companion sheaves for adjustable sheave drives. Companion sheaves shall be selected such that the individual belts shall not exceed a two degree misalignment of the groove center lines between the driving and driven sheaves. Sheaves shall be complete with flanges and locking devices. All sheaves shall be selected with a 1.5 minimum service factor.

B. Provide matching belts.

C. All motors up to 2½ HP shall have variable speed drives.

D. All motors 10 HP to 25 HP for speeds below 1000 RPM shall have variable speed drives.

E. Provide fixed drives above 1000 RPM for 10 to 25 HP and for all units above 25 HP.

2.07 STRAINERS FOR GLYCOL SYSTEM

A. Furnish and install a full size Y-pattern strainer on the inlet of each control valve and each water pump, and where indicated on the Drawings. For pumps, the Contractor shall install either a Y-strainer or a suction diffuser with internal screened basket. Contractor shall not install both a Y-strainer and a suction diffuser.

B. The strainers shall be as manufactured by Spence, Sarco, Barnes and Jones, Elliott, Crane or Mueller.

C. All strainers, except where otherwise noted, shall have bronze body up to 2½", semi-steel above 2½", rated at 125 PSIG for all systems with 50 PSIG max. pressure and 250 PSIG for all others. Strainers 2-inch diameter and smaller shall have screwed ends. Strainers 2½ inch diameter and larger shall have flanged ends.

D. All strainers shall have removable cylindrical or conical screens of brass construction. They shall be designed to allow blowing out of accumulated sediment and to facilitate removal and replacement of the screen without disconnecting the main piping.

E. Screens for water 1/16" for 3" inclusive, ⅛" for 4" and above.

F. An approved blow-out connection with gate valve shall be made to each strainer. The valves shall be located not higher than 8 feet above the floor. All drain connections shall be piped to floor drains.

2.08 PRESSURE AND TEMPERATURE TEST STATIONS

A. Furnish and install in each supply and return runout to each reheat coil and where indicated on the Drawings, a ¼" MPT fitting to receive either a temperature or pressure probe ⅛" OD. Fitting shall be stainless steel with valve core of Nordel (Max. 275 deg. F), fitted with a color coded and marked cap with gasket, and shall be rated at 1000 PSIG.

B. In addition, the installing Contractor shall supply the Owner with six pressure gauge adapters with ⅛" OD probe and 6 five-inch stem pocket testing thermometers; 25-125 deg. F for chilled water and six 0-220 deg. F for hot water.

C. Provide one pressure and temperature test kit consisting of one 0-60 PSI, water pressure gauge and one 0-30 PSI water pressure gauge each with No. 500 gauge adapter attached, a 25-125 deg. F pocket testing thermometer, a 0-220 deg. F pocket test thermometer, a No. 500 gauge adapter, and a protective carrying case. Provide one additional 0-60 PSI pressure gauge and one additional 0 to 30 PSI pressure gauge.

D. Test kit shall be used by the Balancing Contractor to balance the systems and then it shall be turned over to the Owner.

E. Test stations and test kit shall be manufactured by Paterson Engineering Company, Inc. or approved equal.

2.09 REFRIGERATION ACCESSORIES

A. Refrigerant Filter-Dryer: Provide, refrigerant filter-dryers. Refrigerant filter-dryers shall be replaceable core "Catch All" type, as manufactured by Sporlan Valve Company.

B. Moisture and Liquid Indicator: Provide combination liquid and moisture indicators type "See All", as manufactured by Sporlan Valve Company.

C. Refrigerant Strainers: Provide Refrigerant Strainers. Strainers shall be as manufactured by Henry Valve Company, Type 895.

D. Thermal Expansion Valves: Provide Thermal Expansion Valves. Thermal expansion valves shall be Type "MVE-G", as manufactured by Sporlan Valve Company, or approved equal, with external equalizer and remote bulb.
1. The Contractor shall submit manufacturer rating tables and/or selection charts for approval.

E. Liquid Line Solenoid Valves: Provide Liquid Line Solenoid Valves. Valves to have stainless steel diaphragm-welded and lead-proof construction, replaceable thermostatic element and tight seating. Valve shall be as manufactured by Sporlan Valve Company or approved equal.

F. Flexible Pipe Connections: Provide flexible pipe connections. Flexible pipe connectors to be all bronze construction, metal braided type suitable for the Refrigerant.

2.10 EVACUATION OF REFRIGERATION PIPING

A. When testing of refrigerant piping is completed as specified hereinafter, blow off the pressure in the system to atmosphere and provide final evacuation. Provide a vacuum pump capable of pulling vacuum of at least 1 mm Hg. absolute. Use a Zimmerli gauge to read vacuum. Remove all moisture from the system. Operate the vacuum pump until a vacuum of 2.5 mm Hg. is achieved.

B. When the system is evacuated, break the vacuum with oil pumped, dry nitrogen, open the compressor suction and discharge service valves and re-evacuate the system to 2.5 mm Hg. absolute. Stop vacuum pump and allow system to stand under a vacuum a minimum of 12 hours. If no noticeable rise in pressure has taken place after 12 hours, the system shall be charged.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where these specialties are to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install HVAC Specialties where shown, in accordance with manufacturer's written instructions and with recognized industry practices, to ensure that HVAC Specialties comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of HVAC Specialties with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of HVAC Specialties, test HVAC Specialties to demonstrate compliance with requirements. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION

SECTION 23 05 93

TESTING AND BALANCING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. All piping and equipment shall be tested. Labor including standby electrician, materials, instruments and power required for testing shall be furnished unless otherwise indicated under the particular Section of the Specification.

B. Tests shall be performed in the presence of and to the satisfaction of the Architect and such other parties as may have legal jurisdiction.

C. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their ratings.

D. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the Architects.

E. Any damage resulting from tests to any and all trades shall be repaired and damaged materials replaced, all to the satisfaction of the Architect.

F. The duration of tests shall be as determined by all authorities having jurisdiction, but in no case less than the time prescribed below.

G. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated and depends upon the operation of other equipment, systems and controls for proper operation, functioning and performance, the latter shall be operated simultaneously with the equipment or system being tested.

H. All fans and duct systems shall be completely balanced by the adjustment of sheaves, dampers, registers and other volume and diverting control devices, to obtain the air quantities indicated on the design drawings. Replace sheaves if required to meet design conditions.

I. All pumps and piping systems shall be completely balanced by the adjustment of plug cocks, globe valves or other control devices, to obtain flow quantities indicated on the design drawings.

J. Tests shall be performed in presence and to satisfaction of Architect, and such other parties as may have legal jurisdiction. Submit completed reports for approval. If air and water balancing cannot be verified in two, four hour tests (total of eight hours) the Contractor shall pay the Architect or his representative for any additional time spent to balance the system.

K. Upon completion of the work, a test shall be conducted in the presence and under the direction of a NYS Licensed Professional Engineer, retained by the Contractor, and qualified to conduct such tests. The tests shall show compliance with the code requirements for ventilation and the proper functioning of operating devices, before the system is approved. Tests shall also be conducted under the direction of the same Licensed Professional Engineer to demonstrate that all installed fire and fire smoke dampers operate properly. The Contractor shall submit a letter signed and sealed by the Licensed Professional Engineer indicating that such testing has been successfully conducted and shall make all associated controlled Special Inspections and other submissions to the Authority Having Jurisdiction (AHJ).

1.03 QUALITY ASSURANCE

A. Prior to installation of the mechanical systems, engage the services of an independent air and water balancing firm that shall be subject to the approval of the Architect. The firm shall have no affiliation with a mechanical contracting or sheetmetal company. Balancing and testing company shall be a member of the Associated Air Balance Council (AABC), National Environmental Balance Bureau (NEBB) or Testing, Adjusting and Balancing Bureau (TABB). The balancing firm shall have at least one member of its full time staff who is a licensed professional engineer who shall supervise the balancing work. Prior to balancing, a list of instruments to be used shall be submitted to the Architect. All instruments shall be calibrated within six months before tests.

B. Prior to installation of the mechanical systems, the licensed Professional Engineer for the Balancing and Testing Company shall review the contract documents to confirm that all balancing devices are provided to allow for complete balancing of the air and water systems for the project. The Balancing and Testing Company shall submit a letter confirming that they have performed this review and identifying any issues.

After the mechanical systems are installed and before the systems are enclosed behind walls and ceilings, the PE for the Balancing and Testing Company shall perform a review of the installation to verify that the required balancing devices have been installed and that the systems are ready for balancing. The Balancing and Testing Company shall submit a letter confirming that the inspection has been performed and that the system is ready for balancing.

Both letters shall be signed and sealed by the Balancing and Testing Company’s Professional Engineer.

C. When all specified testing and balancing procedures have been completed, a written report shall be submitted to the Architect for review. The report shall be tabulated in standard AABC/TABB format. As part of the Architect's review process, the accuracy of the balancing report shall be field spot checked on a random basis, with the assistance of the balancing firm's project supervisor. The HVAC Contractor shall reimburse the Architect for all time spent in excess of eight working hours, to demonstrate the accuracy of the balancing report.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 "Special Requirements for Mechanical and Electrical Work". Submit all test and balancing reports as described hereinafter.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 FIELD TEST OF PIPING

A. During construction properly cap or plug all lines to prevent the entrance of sand, dirt, etc. The system of piping shall be blown through wherever necessary after completion (for the purpose of removing grit, dirt, sand, etc., from all equipment and piping), for as long a time as is required to thoroughly clean the apparatus.

B. Use anti-freeze solution for piping to be tested in winter.

C. All piping shall be tested as hereinafter specified. Tests shall be made after erection and before covering is applied or piping painted or concealed, and as sections of mains and groups of risers are completed. The extent of the work completed before pressure tests are made shall be determined by the Architect.

D. All piping, unless otherwise specified, shall be tested to a hydrostatic pressure at least 1-1/2 times the maximum designed working pressure (but not less than 50 lbs. per square inch) for a sufficiently long time to detect all leaks and defects; and after testing shall be made tight in the most approved manner. Tests shall be repeated once after leaks and defects have been repaired. When automatic control valves, equipment and similar devices which are incapable of withstanding test pressures applied to piping, such devices shall be removed, or otherwise protected during tests. After approval of such tests, devices shall be installed and tested with operating medium to operating pressures. The following shall be tested for four consecutive hours and proved tight. Leaks shall be remedied by replacing defective work.

Item	Hydrostatic Field Test
Hot water heating	100 psi
Chilled water, dual temperature water	100 psi
Condenser water	100 psi

E. Leaks appearing during the various pressure tests shall be corrected by replacing all defective materials or welds and subsequent tests shall be made until the piping is found perfect. Caulking of screwed joints or pending of welds is prohibited. Wherever it is necessary to cut out a weld and the ends of the pipe cannot be conveniently brought together, then a short piece of pipe shall be fitted in and welded as approved by the Architect.

F. Provide all other tests required by the Building Department, Fire Department and all other Authorities Having Jurisdiction (AHJ).

3.02 RUNNING TEST OF PIPING SYSTEMS

A. When directed, any section of the work, after it has been completed and otherwise satisfactorily tested, shall be put in actual operation and operated for a period of two (2) days of 24 hours each, during which time any defects which may appear shall be remedied and any adjustment which may be necessary shall be made.

B. During the time of the tests, repack all valves, make all adjustments and otherwise put the apparatus in perfect condition for operation, and instruct the Owner's representative in the use and management of the apparatus.

3.03 TESTING, EVACUATION AND CHARGING OF REFRIGERATION PIPING

A. The Contractor shall notify the owner 24 hours in advance of any test so that the owner and/or manufacturer's representative may be present for the test if desired.

B. When the refrigeration connections have been completed, the system shall be tested at 250 psig on the low pressure side and 450 psig on the high pressure side or in accordance with the recommendation of the refrigerant equipment manufacturer. Liquid refrigerant shall be charged into the system to raise the pressure to 35 psig, and dry nitrogen added to obtain the desired test pressure. Leak testing shall be performed with an electronic leak detector. Refrigeration piping will not be acceptable unless it is gas tight. If any leaks are found, isolate the defective area, discharge the gas and repair the leaks, and then repeat the test.

C. The system shall be evacuated with a vacuum pump specifically manufactured for vacuum duty, having a capability of pulling a vacuum of 50 microns or less. The pump should be connected to both the low and the high side evacuation valves with copper or high vacuum hoses. The compressor service valves should remain closed. A high vacuum gauge capable of registering pressure in microns should be attached to the system for pressure readings. To check the system pressure, a hand valve must be provided between the pressure gauge and the vacuum pump which can be closed to isolate the system and check the pressure.

D. Evacuate each system to an absolute pressure not exceeding 1,500 microns. Break the vacuum to 2 psig with the refrigerant to be used in the system. Repeat the evacuation process, again breaking the vacuum with refrigerant. Install a drier of the required size in the liquid line, open the compressor suction and discharge valves, and evacuate to an absolute pressure not exceeding 500 microns. Leave the vacuum pump running for not less than two hours without interruption. Raise the system pressure to 2 psig with refrigerant, and remove the vacuum pump.

E. Refrigerant shall be charged directly from the original drums through a combination filter-drier each drier may be used for a maximum of three cylinders of refrigerant, and then must be replaced with a fresh drier charge the system by means of a charging fitting in the liquid line. Weight the refrigerant drum before charging so that an accurate record can be kept of the weight of refrigerant put in the system. If refrigerant is added to the system through the suction side of the compressor charge in vapor form only.

F. Condensing units will be delivered to the job with sufficient oil for the average installation. Check all compressors for proper oil level, and if necessary add sufficient oil to bring the level to the center of the crankcase sight glass. Use only the refrigeration oil recommended by the condensing unit manufacturer all oil must be delivered to the job in factory sealed, unopened containers.

G. Refrigeration piping shall be tested in accordance with the recommendations of the refrigeration equipment manufacturer or in the following sequence in the absence of manufacturer requirements, for a period of 24 hours.

High Side	- Nitrogen at 300 psi
Low Side	- Nitrogen at 150 psi
Entire System	- Refrigerant at 5 psi

H. No visible leaks, losses in pressure or increase in vacuum occur during test period.

3.04 EQUIPMENT TEST

A. Demonstrate that all equipment and apparatus fulfill the requirements of the Specifications and that all equipment shall be operated and tested for rated capacities and specified characteristics. Voltage and amperage readings shall be taken on all electric motors.

B. Operate air handlers and fans for 40 hours and demonstrate fans operating at maximum capacity, with all variable volume dampers to be at the full open position.

3.05 FIRE DAMPER AND FIRE SMOKE DAMPER TEST

A. Under this section test each and every fire damper by removing the fusible link to demonstrate that the damper properly closed.

B. Under this section test each and every fire smoke damper by removing the fusible link or alternately applying heat to the heat detector for dampers utilizing het detectors) to demonstrate full closure. Also demonstrate that the damper opens and closes properly under automatic control through the operator.

C. After the successful completion of such tests reinstall fusible links and reset heat detectors.

D. All such tests shall be conducted under direction of a NYS Professional Engineer retain by the Contractor.

3.06 TEST PREPARATION AND PROCEDURE

A. On initial startup, prior to any tests, check the rotation and running amperage of all fan and pump motors to prevent damage to equipment by overload.

B. Final balancing must be done with all systems completely installed and operating, and after the automatic temperature controls have had their final adjustment.

C. New, clean filters must be installed in all supply systems prior to balancing.

D. All water systems shall be completely filled and vented, and all strainers cleaned prior to balancing. Inspect expansion tanks for proper water level and operating of makeup water valves.

E. All main supply air ducts shall be traversed, using a pitot tube and manometer. The manometer shall be calibrated to read two significant figures in all velocity pressure ranges. Duct traverses shall be conducted using the log-Tchebycheff method. The equal area method is not acceptable.

F. A main duct is defined as either of the following:
   1. A duct serving five or more outlets.
   2. A duct serving two or more branch ducts.
   3. A duct serving a reheat coil.
   4. A zone duct from a multi-zone unit.
   5. A duct emanating from a fan discharge or plenum and terminating at one or more outlets.

G. The intent of this operation is to measure by traverse the total air quantity supplied by the fan and to verify the distribution of air to zones.

H. Submit data in support of all supply fan deliveries by the following four methods:
   1. By summation of the air quantity readings at all outlets.
   2. By duct traverse of main supply ducts and directly at the air handler or fan discharge.

3. By a rotating vane traverse across a filter or coil bank.
4. By plotting RPM and static pressure readings on the fan curve. Air density corrections must be indicated.

I. For return air and exhaust fans, the rotating vane traverse is not required.

J. Inspect all fan scrolls and remove objects or debris. Inspect all coils and remove debris or obstructions. Verify that all fire dampers are open.

K. The supply air systems shall be completely balanced prior to the final balancing of the water systems.

L. Upon completion of all air and water balancing, all duct dampers, plug valves and other throttling devices shall be permanently marked in the final adjusted position.

3.07 AIR BALANCE

A. Record the following design requirements for all fans and fan motors from the approved shop drawings.
1. Air quantities - CFM
2. Approximate fan speed - RPM
3. Fan static pressure (total or external) - inches of water.
4. Maximum tip speed - FPM
5. Outlet velocity - FPM
6. Fan brake horsepower
7. Motor horsepower
8. Volts, phases, cycles and amps at design conditions.

B. Record the following data from all fans and fan motors installed at the project:
1. Manufacturer, model and size
2. Motor horsepower, service factor and RPM
3. Volts, phases, cycles and full load amps
4. Motor starter and heaters size
5. Equipment location

C. All fans and duct systems shall be completely balanced by the adjustment of sheaves, dampers, registers and other volume and diverting control devices, to obtain the air quantities indicated on the Drawings. Outside air and return air modulating dampers shall be adjusted to admit the specified quantities of air under all cycles of operation. All final adjusted supply, return and exhaust air quantities shall be within 10% of the design requirements (while adhering to positive or negative pressure room design conditions, if and where applicable). Final adjusted minimum outside air quantity shall be -0% / +5% of the design requirement. Replace sheaves if required to meet design conditions.

D. Record the following test data for all fans and motors installed at the Project at final balanced conditions:
1. Fan speed RPM.
2. Fan static pressure (external and total) inches of water.
3. Static pressure drop across all filters, dampers, coils and other items in the supply fan casings.
4. Motor operating amps. (Measure, record and report all motor amps at minimum outside air volume and at maximum outside air volume.) This requirement applies to both constant volume and variable air volume systems where economizers are present.
5. Actual voltage
6. Fan CFM
7. Calculated brake horsepower.

E. Submit single line diagrams of all duct systems indicating all terminal outlets identified by number. Data sheets shall list all such outlets denoted by the same numbers, including the outlet's size, "K" factor, location, CFM and jet velocity.

F. Submit this data for all supply, return and exhaust air systems.

G. Adjust the outside air, relief air and return air dampers to admit the required amounts of outside air. Record and submit outside air flow measurement and the outside, return and mixed air temperatures for both cycles after final adjustments.

H. Air balancing shall be performed with filters partially blocked to simulate a pressure drop across the filters equal to that midway between the clean and the dirty condition.

3.08 ADDITIONAL REQUIREMENTS

A. Replacement of adjustable pulleys, additional balancing dampers, additional fan belts, pressure taps and fittings, hydronic balancing valves and any other devices or equipment required to effect proper testing, adjusting and balancing shall be provided at no additional cost to the Owner.

3.09 WATER BALANCE

A. Record the following design requirements for all pumps and pump motors from the approved shop drawings:
1. Water quantity - GPM
2. Total head - feet of water
3. Pump speed - RPM
4. Impeller size
5. NPSH (if required)
6. Motor horsepower
7. Volts, phases, cycles and amps at design conditions

B. Record the following data from all pumps motors installed at the project:
1. Manufacturer, model and size.
2. Impeller size
3. Motor horsepower, service factor and RPM
4. Volts, phases, cycles and full load amps
5. Motor starter and heaters size
6. Equipment location

C. All pumps and piping systems shall be completely balanced by the adjustment of plug cocks, globe valves or other control devices, to obtain the flow quantities indicated on the Drawings. Balancing shall be done with all controls set for full flow through coils. All automatic throttling valves shall be in the full-open position. All automatic three-way valves shall have the bypass port closed.

D. Record the following test data for all pumps and pump motors installed at the Project:
1. Pump speed - RPM
2. Total head at shut-off and dead-end discharge - feet of water. (Plot this value on pump curve as a verification of impeller size.)
3. Suction, discharge and total head at final adjusted flow - feet of water.

E. Balance the water flow through all chillers, condensers, coils, convertors, cabinet heaters, heat exchangers, unit heaters, induction units, fan coil units, etc., in accordance with design requirements.

F. For all orifice plates, record the pipe size, orifice size, flow factor, required differential pressure, final differential pressure and calculated final flow quantity.

G. For all venturi type, pitot tube, or other flow measuring devices record the pipe size, manufacturer and size of device, and the direct reading or the differential pressure, and calculated final flow.

H. Flow shall be balanced through all equipment and coils by means of balancing and flow measuring valves provided. In addition pressure drop shall be measured and curves obtained from the various manufacturers indicating the relationship between flow and pressure drop through the coils and equipment. Readings shall be taken on calibrated test gauges. Submit curves with the final report. Final report shall document all flow and pressure drop measurements.

I. Balance pumps to their design flow rate, within 100% and 110% of design, so long as pump and motor rating permits. Balance flow through all coils and terminal units to ±10% of design flow rate.

J. Upon completion of the water balance, reconcile the total heat transfer through all coils by recording the entering and leaving water temperatures and the entering and leaving air dry bulb and wet bulb temperatures.

K. Upon completion of balancing, adjust all differential bypasses and three-way valve bypasses for the same pressure drop or full bypass as on full flow.

END OF SECTION

SECTION 23 07 00

INSULATION FOR HVAC WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinated with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes furnishing and installing all labor, materials, equipment, accessories and services necessary to provide Piping, Ductwork and Equipment Insulation installation, which is complete in every respect and of the composition and quality as shown on the Drawings and hereinafter specified.

1.03 PIPE INSULATION

A. The following pipes shall not be insulated. Insulate all other piping:
1. Steam traps.
2. Pneumatic control air piping.
3. Unions.
4. Automatic air vent drain pipes.
5. Gas and gas vent piping.
6. Drain pipes embedded in concrete.
7. Condensation drain piping from pneumatic control air piping.
8. Drain piping from safety relief valve drip pan elbows and steam exhaust heads.
9. Vent piping from duplex condensate pumps.
10. Piping under radiation cover.
11. Instrument air piping.
12. Condenser water chemical treatment piping.
13. Refrigerant liquid and outdoor portions of refrigerant hot gas piping except where otherwise noted.

1.04 DUCTWORK INSULATION

A. Insulate all ductwork except the following portions of ductwork:
1. Ducts provided with sound absorptive lining (except where humidifier is installed and except where located outdoors) may have external insulation thickness decreased provided overall insulation R-value internal plus external complies with R-value specified herein.
2. All exhaust ductwork, except where otherwise noted.
3. Return air ductwork for heating and ventilating systems, where return air ducts pass through heated areas.

1.05 QUALITY ASSURANCE

A. "Installer": A firm with at least ten 10 years successful installation experience on projects with piping and ductwork insulation similar to that required for this project.

B. All insulation shall have composite (including insulation jacket or facing and adhesive) fire and smoke hazard ratings as tested by procedure ASTM E-84, NFPA 255 and UL 723 not exceeding:
   1. Flame Spread 25
   2. Smoke Developed 50
   3. Fuel Contributed 50

C. Accessories such as adhesives, mastics, cements, tapes and cloths for fittings shall have component ratings as listed above. All products shall bear UL labels indicating the above are not exceeded.

D. Provide certifications or other data as necessary to show compliance with these Specifications and governing regulations. Include proof of compliance for test of products for fire rating, corrosiveness, and compressive strength.

E. Provide products produced by the manufacturers which are listed in Section 23 05 12, "Approved Manufacturers List"

F. Insulation Materials: Insulating materials manufacturing facilities must be certified and registered with an approved registrar for conformance with ISO9000 quality standard.

1.06 SUBMITTALS

A. Refer to Section 01 31 46 “Special Requirements for Mechanical and Electrical Work", and submit shop drawings and samples.

1.07 GUARANTEE

A. Refer to Section 01 31 46 “Special Requirements for Mechanical and Electrical Work".

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation; remove from project site.

B. Deliver insulation, coverings, cements, adhesives and coatings to the site in factory-fabricated containers with the manufacturer's stamp, or label, affixed showing fire hazard ratings of the products.

C. Store insulation in original wrappings and protect from weather and construction traffic.

PART 2 - PRODUCTS

2.01 COLD AND DUAL TEMPERATURE PIPING INSULATION

A. The following piping shall be covered with fiberglass insulation with vapor barrier:

Service	Thickness
Chilled Water Supply & Return	
All pipe diameters	1½"
Hot-Chilled (Dual Temperature)	
Water Supply & Return	
Up to 1¼ "	1½"
1½” and above	2"
Chemical Treatment (Boiler Water,	

Hot Water, Chilled Water)	1½"
Refrigerant Suction	
All pipe diameters	1½"
Cold Water Make-Up and Air Conditioning	
Condensate Drain Piping from Cooling Coil Drain Pans	
All sizes	1"
Condenser Supply and Return	
Outside Building	2"
Condenser Water Supply Return	
Inside Building	1½"
Cooling Tower Drain Piping	
Up to Shut-Off Valve	1"

B. Insulation on any piping, fitting, flange and valve located in areas exposed to freezing (in unheated areas, at cooling towers and where noted on the Drawings as to provide "Frost Insulation") shall be increased by one inch with the same finish as specified for the particular service when not subject to freezing. Insulation shall always be a minimum of 2½" inches in thickness.

C. Insulation shall be glass fiber complying with ASTM C547, Type I with a maximum K factor of 0.23 BTU in/hr ft^2 F at 75 degrees F. mean temperature with factory-applied all service vapor barrier jacket with self seal lap meeting the requirement of ASTM C-1136 Type I.

D. Insulation shall be heavy density fiberglass sectional pipe insulation as made by Owens-Corning Fiberglass Corp. or Johns-Manville Micro-Lok fiberglass insulation.

E. Ends of pipe insulation shall be sealed off at all flanges, fittings, valves and at intervals of 21 feet on continuous runs of pipe, with Foster fire-resistant vapor barrier coating Foster 30-65 or Childers CP-34 or equal.

F. All fittings, valves and flanges for pipe sizes smaller than 4" shall be insulated with molded fiberglass fittings of same thickness as the adjoining pipe insulation, secured with No. 20 gauge galvanized annealed steel wire and covered with Zeston 2000 25/50 PVC as made by Johns Manville, applied per manufacturer's recommendation, except as specified in 2.01 H.

G. All fittings, valves and flanges for pipe sizes 4" and larger shall be insulated with fabricated mitered segments of pipe insulation of same thickness as the adjoining pipe insulation, secured with No. 20 gauge galvanized annealed steel wire and covered with Zeston 2000 25/50 PVC fitting covers as made by Johns Manville installed per manufacturer's recommendation, except as specified in 2.01 H.

H. Finish for Exposed Pipe Insulation:
1. The term "exposed" is hereby defined as any place outdoors, as well as any place indoors in Mechanical Rooms, Storage Rooms, Janitor's Closets, etc., where located within 7 feet of floor or access platforms.
2. All exposed pipe, valve and fittings insulation shall have 0.016 inch thick corrugated aluminum jacket banded with ½" s.s. bands spaced 12" o.c. Piping, fittings and valves exposed in building, within seven feet of the floor or access platform, shall have 0.016" thick aluminum jacket banded with ½" aluminum bands spaced 12" o.c. or two bands per section. Joints and jacket shall provide complete weatherproof protection either by mechanical contact or by use of Foster 95-44 or Childers CP-76 metal jacketing sealant (gallon cans only; no tubes).
3. All calcium silicate pipe insulation, all insulated condenser water piping exposed to weather and all other insulated pipe exposed to weather shall have 0.016 inch thick aluminum jacket banded with ½" s.s. bands spaced 12" o.c. This shall include pipe, fittings and valves.

I. All below ambient, coated molded fittings and mitered segments shall be vapor sealed with a layer of open weave glass fabric embedded between two 1/16" thick coats of Foster 30-65 or Childers CP-34 vapor barrier coating and lap seal at least 1" for molded type and 2" for mitered type on itself and adjoining insulation.

J. Direct contact between pipe and hanger shall be avoided. Hanger shall pass outside of a metal saddle which shall support a section of high density insulation equal thickness to adjacent insulation (such as calcium silicate) and of sufficient length to support pipe without crushing insulation. (See table below.) Hangers shall not pierce insulation and all vapor barriers shall be unbroken and continuous.

Pipe Size	Saddle & Insert Length
½”- 2"	10" Long
3"-6"	12" Long
8"-10"	16" Long
12" & Over	22" Long

K. At pipe supports, insulation shield protection saddles and matching hanger shall be used.

L. All strainers for chilled water and insulated condenser water piping shall be insulated and boxed in with galvanized sheet metal cover. The insulated metal covers shall be segmented and shall be made removable.

M. As an alternative to fiberglass insulation, on cold pipes, elastomeric closed-cell insulation may be used.
1. Insulation material shall be a flexible, closed-cell elastomeric insulation in tubular or sheet form: AP Armaflex, AP Armaflex W, AP Armaflex SS, or AP Armaflex SA. These products meet the requirements as defined in ASTM C 534, “Specification for preformed elastomeric cellular thermal insulation in sheet and tubular form.”
2. Insulation materials shall have a closed-cell structure to prevent moisture from wicking which makes it an efficient insulation.
3. Insulation material shall be manufactured without the use of CFC’s, HFC’s or HCFC’s. It is also formaldehyde free, low VOC’s, fiber free, dust free and resists mold and mildew.
4. The insulation material shall contain MICOBAN Antimicrobial additive to aid in the prevention of mold and mildew.
5. Materials shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests.
6. Materials shall have a maximum thermal conductivity of 0.25 Btu-in./h-ft2- °F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions.
7. Materials shall have a maximum water vapor transmission of 0.05 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.
8. The material shall be manufactured under an independent third party supervision testing program covering the properties of fire performance, thermal conductivity and water vapor transmission.
9. Valves, Flanges and Fittings:
    a. Armacell Fabricated Fittings can be used on all fittings. 2 and 3 Pieces 90s, 45s, Ts, P traps and couplings along with grooved fittings are available.
    b. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seam and mitered joints shall be adhered with Armaflex 520, 520 BLV or 520 Black Adhesive. Screwed fittings shall be sleeved and adhered with a minimum 1” overlap onto the adjacent insulation. Armaflex HT 625 Adhesive shall be used with UT Solaflex.

c. Valves, flanges, strainers, and Grooved couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.

10. Adhesives and Finishes
    a. Adhesive shall be the insulation manufacturer's recommended contact adhesive: Armaflex 520, Armaflex 520 BLV, Armaflex 520 Black, Low VOC Spray Adhesive or Armaflex HT 625 Adhesive.
    b. Insulation finish shall be the insulation manufacturer's recommended finish: Armaflex WB Finish.
    c. Accessories such as adhesives, mastics and cements shall have the same properties as listed above and shall not detract from any of the system ratings as specified above.

2.02 HOT PIPE INSULATION

A. The following piping shall be covered with fiberglass insulation:

Service	Thickness
Steam and Condensate Pressure above 120 psig	
Up to ¾”	4½”
1” and above	5"
Steam and Condensate Pressure between 15 and 120 psig	
Up to ¾”	3”
1 to 1¼”	4”
1½” and above	4½”
Steam Pressure below 15 psig Blowdown Vents, Sample Cooler Inlet, Steam Safety and Relief, Soot Blower Blow Off:	
Up to 1¼”	2½”
1½” and above	3"
Condensate Pump Discharge	
Up to 3½”	2½”
4” and above	3"
Hot Water Supply and Return (351 Degrees F and above)	
Up to ¾”	4½”
1" and above	5"
Hot Water Supply and Return (between 251-350 Degrees F)	

Up to ¾"	3”
1 to 1¼"	4”
1½" and above	4½”
Hot Water Supply and Return (between 201-250 Degrees F)	
Up to 3"	2½”
4” and above	3"
Hot Water Supply and Return (200 Degrees F and below)	
Up to 1¼”	1½"
1½” and above	2"
Snow Melting Supply and Return Above Ground and Hot Fuel Oil Supply and Return	1½"
Exposed L.P. Steam Safety and Relief Vent	2½”
Boiler Feed Water Suction and Discharge	2½”
Hot Gas Refrigeration Piping Exposed in Occupied Areas	1½”

B. Insulation on any piping, fitting, flange and valve located in areas exposed to freezing (in unheated areas, at cooling towers and where noted on the Drawings as to provide "Frost Insulation") shall, in addition to above covering, be increased by one inch with the same finish as specified for the particular service when not subject to freezing. Insulation shall always be a minimum of 2½" inches in thickness.

C. Insulation shall be glass fiber complying with ASTM C547, Type I with a maximum K factor of 0.23 at 75 degrees F. mean temperature. Insulation shall be suitable for 650 degree F. (2" minimum thickness above 450 degrees F.).

D. Insulation shall be sectional pipe insulation as made by Owens- Corning Fiberglass Corp., or Johns Manville Micro-Lok fiberglass pipe insulation, with all purpose white kraft reinforced jacket with self-seal lap to comply with ASTM C1136 Type I.

E. Longitudinal jacket laps and butt strips shall be smoothly secured per manufacturers recommendations.

F. All fittings, valves and flanges for pipe sizes smaller than 4" shall be insulated with molded fiberglass fittings of same thickness as the adjoining pipe insulation, secured with No. 20 gauge galvanized annealed steel wire and covered with Zeston 2000 25/50 PVC fittings as made by Johns Manville, except as specified in 2.02 H.

G. All fittings, valves and flanges for pipe sizes 4" and larger shall be insulated with fabricated mitered segments of pipe insulation of same thickness as the adjoining pipe insulation, secured with No. 20 gauge galvanized annealed steel wire and covered with Zeston 2000 25/50 PVC fittings by Johns Manville, except as specified in 2.02 H.

H. Finish for Exposed Pipe Insulation:

1. All exposed pipe, valve and fittings insulation shall have 0.016 inch thick corrugated aluminum jacket banded with ½" s.s. bands spaced 12 inches o.c. Piping, fittings and valves exposed in building, within seven feet of the floor or access platform, shall have 0.016" thick aluminum jacket banded with ½" aluminum bands spaced 12" o.c. or two bands per section. Joints and jacket shall provide complete weatherproof protection either by mechanical contact or by use of Foster 95-44 or Childers CP-76 metal jacketing sealant (gallon cans only; no tubes).
2. All calcium silicate pipe insulation, all insulated condenser water piping exposed to weather and all other insulated pipe exposed to weather shall have 0.016 inch thick aluminum jacket banded with ½" s.s. bands spaced 12" o.c. This shall include pipe, fittings and valves.
3. The term "exposed" is hereby defined as any place outdoors, as well as any place indoors in Mechanical Rooms, Storage Rooms, Janitor's Closets, etc., where located within 7 feet of floor or access platforms.

I. *All underground suction and return fuel oil piping shall be insulated and wrapped together and covered with 55 lb. roofing felt with 2" lap, with laps secured by hot asphalt sealant.

J. Insulation shall be protected by saddles from hangers, guides and rollers.

K. Strainers on hot pipes shall not be insulated.

L. Direct contact between pipe and hanger shall be avoided. Hanger shall pass outside of a metal saddle which shall cover a section of high density insulation (such as calcium silicate) of sufficient length to support pipe without crushing insulation. (See table below.) Hangers shall not pierce insulation and all vapor barriers shall be unbroken and continuous.

Pipe Size	Saddle & Insert Length
1½"- 2"	10" Long
3"-6"	12" Long
8"-10"	16" Long
12" & Over	22" Long

M. At pipe supports, insulation shield protection saddles and matching hanger shall be used.

2.03 PVC INSULATED FITTING COVERS

A. The Contractor shall use Zeston 2000 25/50 rated PVC covers as made by Johns Manville or approved equal, for concealed piping.

B. Hot Systems: Fittings shall be insulated by applying the proper factory precut Hi-Lo Temp insulation insert to the pipe fitting. The ends of the Ho-Lo Temp insulation insert shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe covering tufted and tucked in, fully insulating the pipe fitting. PVC fitting cover is then applied and shall be secured by tack fastening, banding or taping the ends to the adjacent pipe covering.

C. On fittings where the operating temperature exceeds 250 deg. F, 2 or more layers of the Hi-Lo Temp insulation inserts shall be applied prior to the installation of the PVC fitting cover. The first layer shall be applied with a few wrappings of fiber glass yarn to eliminate voids or hot spots.

D. Cold Systems: Fittings shall be insulated by applying the proper factory precut Hi-Lo Temp insulation insert to the pipe fitting. The ends of the Hi-Lo Temp insulation insert shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe covering tufted and tucked in, fully insulating the

pipe fitting. All fittings and elbows shall be coated with vapor barrier coating and reinforcing mesh before PVC covers are applied.

E. A vapor barrier mastic compatible with the PVC shall be applied around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. The PVC fitting cover is then applied and shall be secured with pressure sensitive pearl gray Z-Tape along the circumferential edges. The tape shall extend over the adjacent pipe insulation and have an overlap on itself at least 2" on the downward side.

F. 2 or more layers of the Hi-Lo Temp insulation inserts shall be applied with the first layer being secured with a few wrappings of fiberglass yarn.

G. Refrigerant systems and cold systems located outdoors: Fittings shall be insulated to a full thickness the same as the adjacent pipe insulation, with insulation which has been mitered. An intermediate vapor barrier shall be applied, completely sealing the insulation and on the fitting cover overlap seam. 0.016" aluminum cladding shall be applied and shall be secured with pressure sensitive pearl gray Z-Tape along the throat seam and the circumferential edges overlapping itself 2" on the downward side with aluminum bands on 12” intervals.

H. Qualifications for Using Insulation: When the pipe insulation thickness is greater than 1½” or the pipe temperature is greater than 250°F or less than 45°F, additional insulation inserts should be used. Use one Hi-Lo Temp insert for each additional 1" of pipe insulation.

I. Fitting cover: The temperature of the PVC fitting cover must be kept below 150°F by the use of proper thickness of insulation and by keeping the PVC cover away from contact with, or exposure to, sources of direct or radiant heat.

J. Where insulated piping is exposed (indoors up to 7 feet above the floor or platform) or any place outdoors, the PVC covers shall be omitted since the use of 0.016” thick aluminum cladding is required on all piping, fittings and valves.

2.04 FIRE STOPPING

A. Packing of openings, where ducts and pipes penetrate fire barriers, shall be done with Rockwool insulation as made by United States Gypsum, Co.

B. Insulation shall comply with Fed. Spec. HH-1-558, Form A, Class 4, K=0.24, melting point 2000 degrees F.

C. An acceptable alternative to rockwool insulation shall be 3M Product Caulk CP25 or approved equal.

2.05 DUCTWORK INSULATION

A. Insulation for Concealed Duct
1. Only if approved by the engineer, all concealed rectangular and round ductwork shall be covered with flexible duct insulation with vapor barrier complying with ASTM C553, Types I and II and of the thickness and densities indicated below.

Service	R Value	With
Cold and Hot Air Supply Ducts	6	Vapor Barrier
Return Air Ducts (only where required)	6	Vapor Barrier
Hot Supply Ducts	6	---

B. Insulation with vapor barrier shall be duct wrap insulation FRK-25, type 100 as made by Owens-Corning or Johns Manville Microlite Type 100 with FSK vapor barrier facing or standard 1 lb./cf duct insulation as made by CGG with FSK facing.

C. Adhere insulation to duct with Foster fire resistant adhesive 85-60 or Childers CP-127 or approved equal, applied in 4 inch wide transverse strips at 8 inch intervals. Insulation shall be butted with facing overlapping all joints at least 2 inches and sealed with Foster fire resistant adhesive 85-60 or Childers CP-127 or equal. For insulation with vapor barrier use Foster fire resistant vapor barrier adhesive or approved equal and joints without tabs shall be firmly sealed with aluminum foil tape adhered with same adhesive. Secure insulation with 18 gauge corrosion resistant wire spaced not more than 18 inches on center. Coat all duct taped seams, punctures and breaks with Foster 30-65 or Childers CP-34 vapor barrier coating.

D. Additionally, secure insulation to bottom of rectangular ducts over 24" wide with welded pins or stick clips on 18" centers. Cut off excess pins and seal as above.

E. Insulation for All Rectangular Duct
1. Except where otherwise noted, all Supply rectangular ductwork and plenums shall be covered with rigid duct insulation complying with ASTM C612 Types IA and IB and of the thickness and densities indicated below.

Service	R Value	With
Cold and Hot Air Supply Ducts in Mechanical Equipment Rooms	6	Vapor Barrier
Return Air Ducts in Mechanical Equipment Room	6	Vapor Barrier
Cold and Hot Air Supply Ducts Except where otherwise noted	6	Vapor Barrier
Cold and Hot Air Return Air Ducts Except where otherwise noted	6	_____
Within 5'-0" downstream and upstream of Humidifier in Ducts	6	Vapor Barrier

2. Rigid duct insulation with vapor barrier shall be 6 lbs. per cu. ft. density glass fiber with maximum K factor of 0.22 at 75 deg. F mean temperature with fire retardant vapor barrier facing all service jacket complying with ASTM C1136 Type I (white finish).
3. Rigid duct insulation with vapor barrier shall be Fiberglass Type 705 by Owens-Corning or Johns Manville, No. 817 spin-glass w/ASJ or approved equal.
4. Rigid duct insulation without vapor barrier shall be 6 lbs. per. cu. ft. density glass fiber with maximum K factor of 0.22 at 75 deg. F mean temperature with fire retardant facing foil reinforced draft. (all service jacket).
5. Rigid duct insulation without vapor barrier shall be Fiberglass type 705 by Owens-Corning, Johns Manville, No. 817 spin glass w/ASJ or approved equal.

6. Insulation shall be fastened to duct with 12 gauge welded pins and washers, or equivalent as approved. Fasteners shall be spaced 12 to 18 inches on center, a minimum of two rows per side of duct. Secure insulation in place with washers firmly embedded in insulation, or push a self-locking cap over pin after coating with fitting mastic type C by Owens-Corning or approved equal.
7. Seal all joints, breaks and impressions with Foster fire resistant vapor barrier coating Foster 30-65 or Childers CP-34, or equal, and apply 5" wide joint sealing tape to all joints. All surface must be clean and dry before applying tape.

F. Insulation for Round Duct
1. Insulation for round ductwork shall be of material as specified for concealed ductwork and shall be covered with glass cloth or all service jacket smoothly adhered with Foster 85-60/85-20 or Childers CP-82 (5 gallons cans only) adhesive. Seal joints with 5" wide tape.

Service	R Value
Cold and Hot Air Supply Ducts in Mechanical Equipment Rooms	6 with vapor barrier
Air Conditioning Return Air Ducts in Mechanical Equipment Rooms	6 with vapor barrier
Cold and Hot Air Supply Ducts Except where otherwise noted	6 with vapor barrier
Return Air Fan for Air Conditioning Units.	6 with vapor barrier

2. The Contractor shall have the option to use the following material: Insulation for round ducts shall be of thickness noted above and shall be fiberglass pipe and tank insulation having a factory applied ASJ vapor barrier jacket secured with stables and ASJ pressure sensitive tape. Pipe and tank insulation is a 3.00 p.c.f. board cut into strips, fibers oriented perpendicularly to the facing it is adhered to and it must have a UL label.

G. Weatherproofing Finishes for All Duct Insulation
1. All supply and return duct shall be finished with 0.016 Aluminum Jacketing with factory applied moisture barrier as manufactured by the Pabco-Childers Metals, smooth finish with PSMR, or approved.
2. Heavy duty 0.016 inch thick aluminum with poly-moisture barrier shall be used. All metal jacketing laps shall be sealed with 1/8” bead of Foster 95-44 or Childers CP-76 metal jacketing sealant.
3. Jacketing shall be applied with minimum 2-inch overlaps facing down from the weather and the jacketing shall be secured with aluminum bands ½ inch by 0.020 inches and aluminum wing seals applied on 12 inch centers, with bands applied directly over butt overlaps or with Pli-Grip Rivets. Where jacketing is cut out or abuts an uninsulated surfaces, the joint shall be sealed with Foster 95-44, Childers CP-76 or Insul-Coustic Sure-Joint 405 (gallon cans only; no tubes).
4. Fittings, valves and other irregular surfaces shall be protected with two coats of Foster 30-65, Childers CP-34, Marathon Vi-AC Mastic, I-C 551, with Foster Mast-a-Fab, Childers Chil Glas #10 orVi-AC open weave glass cloth membrane between the coats. The total thickness of the coats shall be .32 mils when dry.

5. All rectangular ductwork aluminum cladding shall be formed with a high point located along the top longitudinal centerline in order to ensure rain water runoff and so that no water accumulation will occur.

2.06 EQUIPMENT INSULATION

A. Over the insulation, 2" hexagonal mesh wire shall be tightly stretched in place and secured by wiring to anchors with edges tied together.

B. Equipment insulation shall be finished with .016" aluminum jacketing banded in place with ½" aluminum bands 12" on center.

C. The cooler on each refrigeration machine shall be insulated with fiberglass insulation same as specified for exposed rectangular ductwork with vapor barrier.

3" thick insulation in two 1½" thick layers shall be securely banded in place with ½" x 0.015" galvanized bands. Lap joints shall be secured with 3" wide FSK tape and adhered with Foster 85-60/85-20 or Childers CP-82 adhesive. All joints shall be staggered and sealed to prevent moisture penetration with a vapor barrier mastic, Foster 30-65, Childers CP-34 or approved equal. Apply tack coat of Foster 30-36 or Childers CP-50AMV1 lagging adhesive at 60 to 70 sq. ft. per gallon by spray or brush. Embed glass cloth into wet coating, smoothing to avoid wrinkles. Overlap cloth seams at least 2". Apply a finish coat of lagging adhesive at 60 to 70 sq. ft. per gallon by spray or brush to the entire fabric surface. Insulated removable and replaceable 20 gauge aluminum 4 section metal covers shall be used on the heads. The four sections shall be bolted together with ¼" bolts on 6" centers through an outstanding flange. The Contractor shall have the option to use 4" thick fiberglass pipe and tank insulation with vapor barrier in two 2" layers. Installation and finish shall be same as described above.

D. Chilled and dual temperature water pump casings shall be constructed by utilizing a frame of 2" wide 0.05" thick galvanized sheet metal corner angles assembled with pop rivets or welded. This frame shall encompass the lower half of the pump and shall have a split removable cover frame for the top sections of the pump. Entire top of bottom frame shall be closed with 18 gauge galvanized sheet metal either by spot welding or structural screws. Provide 2” thick 1 lb. density fiberglass blanket lining for top and bottom half of the frame. Frame sidings shall be cut for pipes, flanges, pump shaft and instrumentation/gauges. The innermost layer shall be aluminum in order to protect the insulation from damage.

E. The chilled water header of refrigeration machines shall be insulated in the field with not less than 2" thick, l lb. density fiberglass blanket insulation and boxed in four sections with removable and replaceable, 20 gauge aluminum metal cover. The four sections shall be bolted together with ¼" bolts on 6" centers through an outstanding flange.

F. Chilled water expansion tank, chilled water air separator and chemical treatment tanks other than condenser water tank shall be covered with 2" thick fiberglass U.L. labeled pipe and tank insulation with vapor barrier. Finish shall be 0.016" aluminum cladding as described above for equipment and piping insulation cladding.

G. Insulation for single inlet return air fans shall be of material as specified for concealed ductwork and shall be covered with glass cloth or all service jacket smoothly adhered with Foster 85-60/85-20 or Childers CP-82/CP-127 adhesive. Seal joints with 5" wide tape. The Contractor shall have the option to use the following material: Insulation for the fans shall be of thickness noted above and shall be fiberglass pipe and tank insulation having a factory applied fire retardant vapor barrier jacket and shall be provided with pre-sized glass cloth smoothly adhered with Foster 85-60/85.20 or Childers CP-82/CP-127 adhesive. Pipe and tank insulation is a 3.00 p.c.f. board cut into strips, and fiber perpendicularly oriented and adhered

to jacket. Finish shall be Insulating Cement or approved equal applied 3" thick in one coat, trowelled to a smooth finish. Same option of pipe and tank insulation with ASJ shall apply.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this insulation is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install insulation in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that insulation complies with requirements and serves intended purposes.

B. Coordinate with other work as necessary to interface installation of insulation with other components of systems.

C. All insulating materials shall be applied only by experienced workmen, in accordance with the best covering practice. All piping, duct or equipment shall be blown out, cleaned, tested and painted prior to the application of any covering. Adhesives, sealers and mastics shall not be applied, when the ambient temperature is below 40°F, or surfaces that are wet.

D. Insulation for factory-fabricated air handling units, furnished as part of units.

E. At all openings in insulation and acoustical duct lining, insulate edges neatly and protect with sheet metal nosing. Use sealant as well.

F. All items described in general indicate the type of covering required, however, all piping, ductwork or equipment that transmits heat or will form condensation shall be insulated.

G. Finish for Concealed Pipe Insulation:
1. Factory ASJ (All service jacket) secured in place with Bostich staples 4" o.c. or ASJ with self sealing lap as made by Johns Manville, Owens-Corning or approved equal. All fittings shall be covered with Zeston PVC covers.

H. All piping and ductwork insulation shall be continuous through non-fire rated ceiling openings and sleeves passing through non-fire rated walls or floors. Sleeves shall be packed with mineral wool or thermofiber. Discontinue insulation as it passes through fire-rated wall or floor and use mineral wool or thermofiber packing instead. Specific mastics, adhesives and coating shall be applied in strict accordance with Manufacturer's instruction, including recommended coverages.

I. Where packaged type units are called for in the Specifications, or as scheduled on the Drawings, the insulation shall be as herein specified for the specific system.

J. All valved and capped outlets left for future work shall be insulated as herein specified for the specific systems with a removable section of insulation over caps.

K. Where insulation on existing piping, equipment, etc., has been cut, removed or damaged, this Contractor shall reinsulate as herein specified.

L. All insulation of access doors shall be set in sheet metal double-pan construction.

M. All ductwork shall be insulated in the field, following complete installation of the ductwork. Installation of insulation on the ductwork in the shop (prior to delivery and installation of the ductwork) is prohibited.

N. For installation of elastomeric closed-cell insulation:

1. Piping:
   a. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armaflex 520, 520 BLV or 520 Black Adhesive. When using AP Armaflex SS, only the butt joints shall be adhered using Armaflex 520, 520 BLV or 520 Black Adhesive. Armaflex HT 625 Adhesive shall be used with UT Solaflex.
   b. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.
   c. Tape the ends of the copper tubing before slipping the Armaflex insulation over the new pipes to prevent dust from entering the pipe.
   d. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp non-serrated knives must be used.
   e. On cold piping, insulation shall be adhered directly to the piping at the high end of the run and every 18 feet, using a two-inch strip of Armaflex 520, 520 BLV or 520 Black Adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with Armaflex 520, 520 BLV, or 520 Black Adhesive. All penetrations through the insulation and termination points must be adhered to the substrate to prevent condensation migration.
   f. Sheet insulation shall be used on all pipes larger than 8” IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12” IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24” IPS, complete adhesion is recommended.
   g. Seams shall be staggered when applying multiple layers of insulation.
2. Hangers:
   a. Support piping system using high density inserts with sufficient compressive strength. The pipe support insulation shall be elastomeric foam with the same or greater thickness than the pipe insulation. All joints shall be sealed with Armaflex 520, 520 BLV or 520 Black adhesive.
   b. Standard and split hangers -- Piping supported by ring hangers shall have hangers insulated with the same insulation thickness as the adjacent pipe. All seams and butt joints shall be sealed with Armaflex 520, 520 BLV or 520 Black Adhesive. Armaflex HT 625 Adhesive shall be used with UT Solaflex. Ring hangers may be sleeved using oversized tubular insulation. On cold piping, insulation shall extend up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
   c. Clevis hangers or other pipe support systems -- Saddles shall be installed under all insulated lines at unistrut clamps, clevis hangers, or locations where the insulation may be compressed due to the weight of the pipe. All piping shall have wooden dowels or blocks of a thickness equal to the insulation inserted and adhered to the insulation between the pipe and the saddle.
      It is highly recommended for continuous insulation protection to use hanger sizes equal to the outer diameter of the pipe plus insulation thickness.
   d. Armafix IPH or Armafix NPH can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. To minimize the movement of Armafix, it is recommended that a pair of non-skid pads be adhered to the clamps. In addition, to

prevent loosening of the clamps, use of an anti-vibratory fastener, such as a nylon-locking nut, is also recommended.

3. Armaflex WB Finish
   a. All outdoor ductwork shall be finished with a minimum requirement of two coats of Armaflex WB Finish.
      1) Rectangular ductwork
         a) The surface of the insulation must be clean and dry.
         b) Apply first coat of Armaflex WB Finish at a rate of 400 square feet per gallon.
         c) Allow to dry at least four hours.
         d) Apply second coat at a rate of 400 square feet per gallon.

O. Finish for all Insulation:
   1. All pipe, valve and fittings insulation shall have 0.016 inch thick corrugated aluminum jacket banded with ½" s.s. bands spaced 12" o.c. Piping, fittings and valves exposed in building, within seven feet of the floor or access platform, shall have 0.016" thick aluminum jacket banded with ½" aluminum bands spaced 12" o.c. or two bands per section. Joints and jacket shall provide complete weatherproof protection either by mechanical contact or by use of Foster 95-44 or Childers CP-76 metal jacketing sealant (gallon cans only; no tubes).
   2. As an alternative to the use of 0.016" aluminum cladding on outdoor duct insulation, if AP Armaflex insulation is used, the ArmaTuff laminated sheet and roll insulation may be used. ArmaTuff laminated Armaflex sheet and roll insulations may be used for insulating exterior applications such as duct, tanks, vessels and large pipes. Refer to section 3.06 for further installation details. ArmaTuff is a laminate of white polymeric material on Armaflex insulations, which offers durability and resistance to weathering, ultraviolet, acid rain and chemicals. The laminate is 0.013 inches (13 mils) thick. The seams must be installed in compression and sealed with Armaflex 520, or 520 Black contact adhesive. Cover the seams using ArmaTuff 6" Seal Tape.

3.03 PROTECTION

A. The installer of the insulation shall advise the Contractor of required protection for the insulation work during the remainder of the construction period, to avoid damage and deterioration.

END OF SECTION

SECTION 23 08 00

COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The purpose of this section is to specify the Division 23 responsibilities and participation in the commissioning process.

B. Work under this contract shall conform to requirements of Division 01, General Requirements, Conditions of the contract, and Supplementary Conditions. This specification covers commissioning of HVAC mechanical systems which are part of this project.

C. Commissioning work shall be a team effort to ensure that all HVAC mechanical equipment and systems have been completely and properly installed, function together correctly to meet the design intent, and contract document system performance parameters for fine tuning of control sequences and operational procedures. Commissioning shall coordinate system documentation, equipment start-up, control system calibration, testing and balancing, and verification and performance testing.

D. The trades represented on the commissioning team shall include, but not be limited to, sheet metal, piping and fitting, controls, test and balance, and electrical. The lead person for each trade who will actually perform or supervise the work is to be designated as the representative to the commissioning team. Responsibility for various steps of the commissioning process shall be divided among the members of the commissioning team, as described in this section.

E. The Commissioning Authority shall have responsibility for coordinating and directing each step of the commissioning process.

F. HVAC Mechanical system installation, Start-up and checkout testing, balancing, preparation of O&M manuals, and operator training are the responsibility of the Division 23 Contractors, with coordination, observation, verification and commissioning the responsibility of Division 1, Section 01 91 13. The 01 91 13 commissioning process does not relieve Division 23 from the obligations to complete all portions of work in a satisfactory and fully operational manner.

G. Start-up and Checkout procedures/tests shall be those listed or detailed in other sections of the Specifications, to be performed by the Contractors or equipment manufacturer representatives. These procedures/tests shall be completely independent from the procedures and checklists (Verification and Functional Performance) called for in this Section.

H. The following are common abbreviations used in the Specifications
1. CA: Commissioning Authority.
2. A: Architect of Record.
3. E: Engineer of Record (Mechanical Design Professional).
4. TAB: Test, Adjust and Balance.
5. O&M: Operation and Maintenance.
6. O: Owner
7. MC: Mechanical Contractor.
8. EC: Electrical Contractor.
9. DDC: Direct Digital Controls

10. AC: Automatic Controls System Contractor
11. CM: Construction Manager

1.02 RELATED SECTIONS:

A. Commissioning - General Requirements Section 01 91 13.

B. Verification Test Check Lists – Commissioning of HVAC Systems Section 23 08 00.

C. Functional Test Checklist and Procedures - Commissioning of HVAC Systems Section 23 08 00.

1.03 CITIED STANDARDS:

A. ASHRAE Guideline 4-1993

1.04 SCOPE OF WORK:

A. Commissioning work of Division 23 shall include, but not be limited to:
1. Providing documentation of the Start-up and Checkout procedures and tests of the equipment.
2. Providing testing, adjusting and balancing of systems to be commissioned.
3. Cooperation with the Commissioning Authority.
4. Providing qualified personnel for participation in commissioning tests, including seasonal testing required after the initial testing.
5. Providing equipment, materials, and labor as necessary to correct construction and/or equipment deficiencies found during the commissioning process.
6. Providing operation and maintenance manuals, and as-built drawings for the equipment/system to be commissioned to the Commissioning Authority for verification.
7. Providing training and demonstrations for the systems specified in this Division.

B. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of the following components, systems, and sub-systems:
1. Pumps
2. Air Handling Units
3. VFD
4. Fans
5. Piping System
6. Ductwork System
7. TAB
8. Controls

C. Timely and accurate documentation is essential for the commissioning process to be effective. Documentation required as part of the commissioning process shall include but not be limited to:
1. Progress and status reports, including deficiencies noted.
2. Minutes from all commissioning meetings.
3. Start-up and Checkout procedures and tests.
4. Training agenda and materials.
5. As-built records.
6. Commissioning report.
7. Operation and maintenance (O & M) manuals.

D. Detailed Verification and Functional Performance testing shall be performed on all installed equipment and systems to be commissioned to ensure that operation and performance conform to Contract

Documents and Design Intent. All tests shall be witnessed by the Commissioning Authority and shall be detailed in Sections 23 08 00.

E. Comprehensive training of O&M personnel shall be performed by the Mechanical Contractor, and where appropriate by other sub-contractors, and vendors prior to turnover of building to the owner. The training shall include classroom instruction, along with hands-on instruction on the installed equipment and systems.

1.05 ROLES AND RESPONSIBILITIES

All parties involved in the construction process shall be involved in the commissioning process. Following is a description of the responsibilities of each party:

A. Owner
1. Assign maintenance personnel and schedule them to participate in meetings, training sessions and inspections as follows:
   a. Construction Phase coordination meetings.
   b. Initial Owner training sessions at initial placement of major equipment and subsequent training sessions.
   c. Maintenance orientation and inspection.
2. Attend meetings with TAB contractor as scheduled by the Commissioning Authority. Participate with the Commissioning Authority, the MC, the Mechanical Contractor, the Design Professional and the TAB Contractor to implement the TAB checklist, part of Section 23 08 00. The purpose is to verify that the TAB Contractor understands the TAB requirements. The TAB Contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.
3. Participate in final review at acceptance meeting.

B. Commissioning Authority (CA)
1. Develop the commissioning requirements and all related testing, and quality control sections.
2. Include list of all contractors for commissioning events.
3. Execute the mechanical commissioning program, through organization of meetings, tests, demonstrations, training events and performance verifications. Organizational responsibilities include preparation of agendas, attendance lists, arrangements for facilities and timely notification to participants for each commissioning event. The Commissioning Authority shall act as chairman at all commissioning events and assure execution of all agenda items. The Commissioning Authority shall prepare minutes of every commissioning event and send copies to all attendees and the Owner within 5 workdays of the event.
4. Review the design documents for their effect on the commissioning process and the final performance of the HVAC system. This includes ensuring that appropriate commissioning guidelines have been followed, and that there are adequate devices included in the design to ensure the ability to properly test, adjust, and balance the systems, and to document the performance of each piece of equipment and each system. Any items required but not shown shall be brought to the attention of the Contractor prior to submittal of shop drawings.
5. Schedule the first of the Construction Phase commissioning coordination meetings, at some convenient location and at a time suitable to the Contractor and the CM. Subsequent meetings shall be scheduled as required. These meetings shall be for the purpose of reviewing the mechanical orientation and inspections, O&M submittals, training sessions, test, adjust and balance (TAB) work.
6. Schedule the initial Owner training session so that it will be held immediately before the mechanical system orientation and inspection. This session shall be attended by the Owner's O&M personnel, the mechanical Contractor and equipment suppliers as necessary, the Design

Professional, the CM and the Commissioning Authority. The Design Professional shall conduct this session giving an overview of the system, the system design goals and the reasoning behind the selection of the equipment. Subsequent training sessions need not be attended by the Design Professional. The format shall follow the outline in the O & M manuals and shall include hands-on training.

7. Supervise and Conduct periodic inspection of work in progress to ensure that systems and equipment to be commissioned are installed according to approved shop drawings.
8. Supervise the Mechanical system orientation and inspection following the initial training session. The Mechanical system orientation and inspection shall be conducted by the mechanical Contractor. The emphasis of this Mechanical system orientation and inspection shall be an observation of the equipment location with respect to accessibility. Prepare minutes of this meeting, with a separate summary of deficiency findings by the Owner and Commissioning Authority. Distribute to attendees and the Owner.
9. Adequate accessibility for maintenance and component replacement or repair is the CM responsibility and shall be checked by the Commissioning Authority.
10. Submit detailed Verification test procedures and data sheets.
11. Submit detailed Functional Performance Test procedures and data sheets.
12. Witness the implementation of the Verification and Functional Performance Tests as indicated in the specified commissioning checklists for the equipment and system to be commissioned. Ensure the results are documented (including a summary of deficiencies), and incorporated in the O&M manuals.
13. Supervise to ensure installation of calibrated test instrumentation to monitor and record data as necessary.
14. Supervise and witness verification tests.
15. Submit the Verification test checklist report implementation to the CM for review and acceptance.
16. After the Verification Checklist test/acceptance, the Commissioning Authority shall confirm to CM that the mechanical systems are ready for Functional Performance Testing.
17. Supervise and witness Functional Performance Tests.
18. Submit Functional Performance Test checklists report implementation to the CM, for review and acceptance.
19. Supervise and witness the re-test if deficiencies are found, or corrected, and additional testing is requested.
20. Receive and review the Operation and Maintenance (O&M) manuals as submitted by the contractor, ensuring that they follow the specified outline and format. Insert systems description as provided by the Design Professional.
21. Prior to initiating the TAB work, the Commissioning Authority shall meet with the Owner, mechanical Contractor, Design Professional and TAB Contractor in preparation for implementing the TAB Plan Checklist (start-up and checkout), part of Section 23 08 00. The purpose is to verify that the TAB Contractor understand the TAB requirements. The TAB Contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.

    The TAB report, per the Specifications, shall be submitted by the TAB contractor along with the filled-in check list "Functional Performance Test-TAB Plans" Spot check verification of the TAB report shall be according to "Functional Performance Test B TAB".

22. Upon receipt of notification from the CM that the mechanical systems have been completed and are operational, the Commissioning Authority shall proceed to verify the TAB report and operation of the control systems in accordance with the Commissioning Specification.
23. Review as-built drawings for equipment and systems to be commissioned for accuracy. Request revisions to achieve accuracy.
24. Ensure that the O&M manuals, and all as-built records have been updated to include all modifications reported to CA made during the construction phase.

25. Repeat the supervision of Functional Performance Tests to accommodate seasonal tests and/or correct any performance deficiencies. Revise and re-submit the related report implementation to the CM for review and acceptance.
26. Prepare the final commissioning report.
27. Assemble the final project documentation which shall include the commissioning report, and all as-built records. Submit this documentation to the CM for review and acceptance.

C. Architect (A)
1. Provide support to all parties providing a service as a part of the commissioning process. This shall include providing adequate space for equipment installation and maintenance.
2. Include Section 01 91 13 regarding commissioning in Division 1-General Requirements alerting all parties to the need to participate.

D. Mechanical Design Professional (E)
1. Prepare contract documents, of the mechanical system.
2. The Design Professional shall specify and verify adequate maintenance accessibility for each piece of equipment in shop drawings and the actual installation.
3. The Design Professional retains responsibility for the system evaluation, adequacy of the system to meet design intent, capacity of the system, quality control check or any of the other elements of the system design.
4. Attend the initial Owner training sessions. Conduct the mechanical training session pertaining to the overview of the system design, the system design goals and the reasoning behind the selection of equipment.
5. Participate with the Commissioning Authority, the Owner, the Mechanical Contractor, the Design Professional and the TAB contractor to implement the TAB checklist, part of Section 23 08 00. The purpose is to verify that the TAB contractor understands the TAB requirements. The TAB contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.
6. Review Verification and Functional performance testing reports for deficiencies in meeting the finalized Design Intent.
7. Review as-built records as required by contract documents and turn them over to the Commissioning Authority for inclusion in final project documentation.
8. Review and comment on the final commissioning report.

E. Construction Manager (CM)
1. Ensure that cost for commissioning requirements is included in the contract price.
2. Ensure that commissioning requirements are included in the mechanical, electrical, and controls contracts, as wells as in other sub-contractors, to ensure full cooperation of all parties in the mechanical commissioning program.
3. Ensure acceptable representation, with the means and authority to prepare and coordinate execution of the mechanical commissioning program as described in the contract documents.
4. Participate in O&M personnel orientation and inspection at the final construction stage.
5. Attend the O&M training sessions. These training sessions are to be attended by the Owner, Commissioning Authority, CM, Contractors and equipment suppliers as necessary. The Design Professionals shall attend only the initial training sessions. The format shall follow the outline in the O&M manuals. This mechanical system orientation and inspection should include hands on training.
6. Participate with the Commissioning Authority, the Owner, the Mechanical Contractor, the Design Professional and the TAB contractor to implement the TAB checklist, part of Section 23 08 00. The purpose is to verify that the TAB contractor understands the TAB requirements. The TAB contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.

7. Follow up with AC to receive from him a statement that control systems have been calibrated. Distribute that statement to CA.
8. Follow up with TAB to receive from him a statement that TAB work has been completed and submit the final TAB reports to CA for review.
9. Participate in any deficiency resolution (See item 3.03).

F. Mechanical Contractor (MC)
1. Include cost to complete commissioning requirements for mechanical systems in the contract price.
2. Include requirements for submittal data, O&M data, and training in each purchase order or sub-contract written.
3. Ensure cooperation and participation of specialty sub-contractors such as sheet metal, piping, refrigeration, and TAB.
4. Ensure participation of major equipment manufacturers in appropriate training and related videotaping and testing activities.
5. Attend Construction Phase coordination meeting scheduled by the Commissioning Authority.
6. Participate with the Commissioning Authority, the Owner, the CM, the Design Professional and the TAB contractor to implement the TAB checklist, part of Section 23 08 00. The purpose is to verify that the TAB contractor understands the TAB requirements. The TAB contractor shall outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.
7. Prepare preliminary schedules for mechanical system orientation, inspections, O&M manual submission, training sessions, pipe system testing, flushing and cleaning, duct testing, equipment Start-up and Checkout, TAB Plan Meeting, Verification and Functional Performance tests and task completion schedules for same for use by the Commissioning Authority. Update schedules as appropriate throughout the construction period. Notify the Commissioning Authority a minimum of two weeks in advance of any scheduled event.
8. Provide to the CA Start-up and Checkout procedures and checklists documenting their successful completion.
9. Assist the commissioning Authority in Verification and Functional Performance tests, as indicated in the specified checklists.
10. Attend initial training session.
11. Conduct mechanical system orientation and inspection at the equipment placement completion stage.
12. Update drawings to the record condition to date, and review with the Commissioning Authority.
13. Gather O&M data on all equipment, and assemble in binders as required by the Commissioning Specification. Submit to Commissioning Authority prior to the completion of construction.
14. Participate in and schedule vendors and Contractors to participate in the training sessions as set up by the Commissioning Authority.
15. Provide written notification to the CM and Commissioning Authority that the HVAC and controls work have been completed in accordance with the contract documents, and that the equipment, systems, and sub-systems are operating as required.
16. Provide a complete set of as-built records to the Commissioning Authority.

G. Test, Adjust, and Balance Contractor (TAB Contractor)
1. Include cost for commissioning requirements in the contract price.
2. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
3. Be part of the implementation of the Verification and Functional Performance tests, as indicated in the specified Commissioning Checklists.
4. Participate with the Commissioning Authority, the Owner, the CM, the Mechanical Contractor and the Design Professional to implement the TAB Plan Checklist, part of Section 23 08 00. The purpose is to verify that the TAB contractor understands the TAB requirements. The TAB contractor shall

outline TAB procedures and get concurrence from the Design Professional and Commissioning Authority.

5. At the completion of the TAB work, and submittal of final TAB report, notify the mechanical Contractor and CM.
6. Participate in training sessions as scheduled by the Commissioning Authority.

H. Automatic Controls System Contractors. (AC)

1. Include cost for commissioning requirements in the contract price.
2. Attend commissioning coordination meetings scheduled by the Commissioning Authority.
3. Be part of the implementation of the Verification and Functional Performance tests, as indicated in the specified Commissioning Checklists.
4. Review design for controllability with respect to selected manufacturers equipment.
   a. Verify that proper hardware exists for functional performance required by specification and sequence of operation.
   b. Verify that proper safeties and interlocks are included per the design.
   c. Verify proper selection of sensor ranges.
   d. Clarify all questions of operation.
5. Provide the following submittals to the Commissioning Authority.
   a. Sequences of Operation Submittals. The Controls Contractor=s submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
      1) An overview narrative system of the system generally describing its purpose, components and function.
      2) All interactions and interlocks with other systems.
      3) Detailed delineation of control between any packaged controls and the Automatic Temperature Control (ATC) listing which points the ATC monitors only and which points it controls and which points are adjustable.
      4) Written sequences of control for packaged control equipment. (Equipment manufacturers= stock sequences may be included, but will generally require additional narrative).
      5) Start up sequences
      6) Warm up mode sequences
      7) Normal operating mode sequences
      8) Unoccupied mode sequences
      9) Shutdown sequences
      10) Capacity control sequences and equipment staging
      11) Temperature and pressure control: setbacks, setups, resets, etc.
      12) Detailed sequences for all control strategies, e.g. economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
      13) Effects of power or equipment failure with all standby component functions.
      14) Sequences for all alarms and emergency shut downs
      15) Seasonal operational differences and recommendations
      16) Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff, and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
      17) Daily weekly, and monthly schedules of start, run and end times.
      18) To facilitate referencing all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections.

b. Control Drawings Submittal
   1) The control drawings shall have a key to all abbreviations.
   2) The control drawings shall contain graphic schematic depictions of the systems and each component, superimposed on diagrams of the physical layout.
   3) The schematic will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
   4) Provide a full points list, of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand-alone control unit. The list shall have the following as a minimum included for each point:
      a) Controlled system
      b) Point abbreviation
      c) Point description
      d) Display unit
      e) Control point or setpoint (Yes/No)
      f) Monitoring point (Yes/No)
      g) Intermediate point (Yes/No)
      h) Calculated point (Yes/No)

Key:

Point Description: DB temp, airflow, etc.

Control or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)

Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset)

Monitoring Point: Point that does not control or contribute to the control equipment, but is used for operation, maintenance, or performance verification.

Calculated Point: AVirtual@ point generated from calculations of other point values.

The Controls Contractor shall keep mechanical, electrical, TAB contractors, A, E, CA and CM informed of all changes to this list during programming and setup

c. Hardware and software submittals including the logic diagram showing the logic flow of the system.
d. Control panel construction shop drawings.
e. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should also explain individual math or logic operations that are not clear from reading the software listing.
f. Hardware Operation and Maintenance manuals.
g. Application software and project applications code manuals.

6. An updated, as-built version of the control drawings and sequence of operations shall be provided for inclusion in the final controls O&M Manual submittals.
7. Verify proper installation and performance of controls/ATC hardware and software provided by others.
8. Integrate installation and programming schedule with construction and commissioning schedules.
9. Provide thorough training to operating personnel on hardware operations and programming, and the application program for the system.
10. Provide control system technician for use during system verification and functional performance testing.

11. Provide system modifications as required.
12. Provide support and coordination with TAB contractor on all interfaces between their scopes of work. Provide all devices, such as portable operators terminals, for TAB use in completing TAB procedures. This support and coordination shall be in the following manner:
    a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.)
    b. Provide qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
13. The controls contractor shall prepare a written plan indicating in a step- by-step manner, the procedures that will be followed for Start-up and Checkout and adjust the control system prior to commissioning testing. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:
    a. System name
    b. List of devices
    c. Step by step procedures for testing each controller after installation, including:
        1) Process of verifying proper hardware and wiring installation.
        2) Process of downloading programs to local controllers and verifying that they are addressed correctly.
        3) Process of performing operational operational checks of each controlled component.
        4) Plan and process for calibrating valve and damper actuators and all sensors.
        5) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
    d. A copy of the log and field checkout sheets that will document process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has Apassed@ and is operating within the contract parameters.
    e. A description of the instrumentation required for testing.
    f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the MC, A.E and TAB contractor for this determination.
14. The controls contractor shall have all required Start-up and Checkout checklists, calibrations, tests of the system completed and approved by the E. The E shall determine if this submittals meet his/her requirements and requirements of the Contract Documents. Once the E accepts these submittals, they shall be forwarded to CA who will forward them to the A for record prior to TAB.
15. Assist and cooperate with CA, MC, in the following manner:
    a. Using a licensed technician who is familiar with this building's systems, execute the Verification and Functional testing of the controls systems. Provide two-way radios during the testing.
16. List and clearly identify on the as-built duct and piping drawings the locations of all sensors utilized in the start-up and checkout and commissioning processes.

I. Equipment Suppliers and Miscellaneous Contractors
1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual section(s).
3. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
4. Participate in training sessions as scheduled by the Commissioning Authority.
5. Demonstrate performance of equipment as applicable.

1.06 DOCUMENTATION:

A. The Commissioning Authority shall oversee and maintain the development of commissioning documentation. The commissioning documentation shall be kept in three ring binders, and organized by system and sub-system when practical. All pages shall be numbered, and a table of contents page(s) shall be provided. The commissioning documentation shall include, but not be limited to, the following:
   1. A detailed description of the design intent for the project, listing operating parameters, control sequences, occupancy conditions, etc.
   2. A complete description of how the HVAC system is intended to operate.
   3. Approved TAB report.
   4. All accepted shop drawings of mechanical equipment to be commissioned. Shop drawings shall be full size sheets folded as required to fit in binders.
   5. All Start-up and Checkout procedures and tests signed.
   6. All verification and functional performance test checklists/results, signed by indicated personnel organized by system and sub-system.
   7. Three copies of the operation and maintenance (O&M) manuals specified in other sections of these specifications shall be included with the commissioning documentation. The manuals shall be incorporated in the commissioning documentation prior to commencement of O&M training required in this and other sections of the specification.

PART 2 - PRODUCTS

2.01 TEST TOOL EQUIPMENT:

A. The appropriate Contractor(s) shall furnish all special tools and equipment required during the commissioning process. A list of all tools and equipment to be used during commissioning shall be submitted to the Commissioning Authority for approval. The Owner shall furnish necessary utilities for the commissioning process.

PART 3 - EXECUTION

3.01 GENERAL:

A. The first meeting of the commissioning team members shall be held at a time and place designated by the CM. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.

B. The Contractor shall complete all phases of work so the systems can be started, tested, balanced, and acceptance procedures undertaken. This includes the complete installation of all equipment, materials, piping, ductwork, controls, etc., per the contract documents and related directives, clarifications, and change orders and Design Intent.

C. A Commissioning Plan shall be developed by the Commissioning Authority. The CM shall assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the schedule of actual equipment installation, and their tests.

D. Acceptance procedures are normally intended to begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Division 23 contractor. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule.

3.02 PARTICIPATION IN ACCEPTANCE PROCEDURES:

A. The Contractor shall provide skilled technicians to start-up and debug all systems within Division 23. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program. Work schedules, time required for testing, etc., shall be requested by the Commissioning Authority and coordinated by the CM and Contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. System testing problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians shall include expert knowledge relative to the specific equipment involved and a willingness to work with the Commissioning Authority. Contractor shall provide adequate documentation and tools for Start-up and Checkout tests and commissioning tests for the equipment, system, and/or sub-system to be commissioned.

3.03 DEFICIENCY RESOLUTION:

A. In some systems, misadjustments, misapplied equipment, and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work shall be completed under the direction of the Owner and CM, with input from the Contractor, equipment supplier, the design professional and Commissioning Authority. Whereas these members shall have input and the opportunity to discuss, debate, and work out problems, the Owner shall have final jurisdiction over any additional work done to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit the completion of the commissioning process. Experimentation to demonstrate system performance may be permitted. If the Commissioning Authority deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Authority shall notify the Owner and the CM, indicating the nature of the problem, expected steps to be taken, and suggested deadline(s) for completion of activities. If the deadline(s) pass without resolution of the problem, the Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner shall be the contractor's responsibility.

3.04 ADDITIONAL COMMISSIONING:

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The contractor(s) suppliers, and Commissioning Authority shall include a reasonable reserve to complete this work as part of their contractual obligations.

3.05 SEASONAL COMMISSIONING:

A. Seasonal commissioning pertains to testing under full load conditions during peak heating and peak cooling seasons, as well as part load conditions in the spring and fall. Initial commissioning shall be done as soon as contract work is completed, regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.

B. Heating equipment shall be tested during winter design extremes. Cooling equipment shall be tested during summer design extremes with a fully occupied building. Each contractor and supplier shall be responsible to participate in the initial and the alternate peak season tests of the systems as required to demonstrate performance.

3.06 ACCEPTANCE PROCEDURES:

A. Equipment or system shall be deemed accepted after its Verification Test and Functional Performance Test have been accepted by the Commissioning Authority.

B. Verification Tests
1. Verification tests are primarily static in nature to ascertain and prepare the equipment or system for operational modes under Functional Performance Testing. These Verification tests shall begin only after the Start-up and checkout tests have been successfully completed.
2. Tests shall be performed for the items indicated on the checklists with participants as shown. Participants shall include in their proposals all costs to do the work involved in these tests.
3. The Commissioning Authority shall coordinate and witness the Verification Tests.

C. Functional Performance Tests
1. Functional performance tests are primarily dynamic in nature and shall be performed under operation and various modes to verify all the sequences of operation and interlocks. These tests shall begin only after the Verification tests have been successfully completed.
2. Tests shall be performed for the items indicated on the checklists, with participants as shown. Participants shall include in their proposals all costs to do the work involved in these tests.
3. The Commissioning Authority shall coordinate and witness the Functional Performance Tests.

D. Instrumentation
1. The test, adjust and balance contractor shall provide all instrumentation required for the commissioning tests. Instruments shall have been calibrated within the six month period prior to these tests. The calibration shall be traceable to National Institute of Standards and Technology standards. For the accuracy of the automatic controls commissioning instrumentation, refer to Section 23 08 00.

E. Tests For Deficiencies
1. Any identified deficiencies need to be evaluated by the Design Professional and CM to determine if they are part of the contractor=s or sub-contractor=s contractual obligations. Construction deficiencies shall be corrected by the responsible contractor(s), and the specific test repeated.
2. If it is determined that the HVAC system is constructed in accordance with the contract documents, and the performance deficiencies are not part of the contract documents, the Owner must decide whether any required modifications needed to bring the performance of the HVAC system up to the finalized design intent shall be implemented, or if the test shall be accepted as submitted. If corrective work is performed, the owner shall determine if a portion or all required tests should be repeated, and a revised report submitted.

3.07 OPERATING AND MAINTENANCE MANUAL:

A. Shall be in accordance with ASHRAE Guideline 4-1993 (Preparation of Operating and Maintenance Documentation for Building Systems).

B. The operating and maintenance manual shall consist of a sturdy binder with 8-1/2" x 11" sheets containing the following major sections.
1. System Descriptions:

a. Each major system shall be described, type-written, in general terms, including major components, interconnections, theory of operation, theory of controls, unusual features and major safety precautions. This information should correlate with information provided in the manufacturers' instructions book. This section shall include, but not be limited to, the following data:
   1) Detailed description of each system and each of its components showing piping, valves, controls, and other components, with diagrams and illustrations where applicable.
   2) Wiring and control diagrams with data to explain detailed operation and control of each component.
   3) Control sequences describing start-up, all modes of operation, and shut down.
   4) Corrected shop drawings.
   5) Approved product data including all performance curves and rating data.
   6) Copies of approved certifications and laboratory test reports (where applicable).
   7) Copies of warranties.

b. Updated as-built version of the control drawings and sequences of operation, detailed in article 1.05 H. shall be reduced in size and folded to usefully fit into the Manual, and submitted.

2. Operating Instructions:
   a. Condensed, typewritten, suitable for posting, instructions shall be provided for each major piece of equipment. Where more than one (1) common unit is installed, one instruction is adequate. The instructions shall provide procedures for:
      1) Starting up the equipment/system.
      2) Shutting down the equipment/system.
      3) Operating the equipment in emergency or unusual conditions.
      4) Safety precautions.
      5) Trouble shooting suggestions.
      6) Other pertinent data applicable to the operation of particular systems or requirement.
   b. The instructions shall be suitable for posting adjacent to the equipment concerned.

      The Contractor shall provide instructions for:
      1) Equipment and systems listed under 1.04 Scope of Work.

3. Ongoing and Preventive Maintenance:
   a. Condensed, typewritten procedures for recommended ongoing and preventive maintenance actions shall be provided for each category of equipment and systems listed under 1.04 Scope of Work. This information shall include, but not be limited to the following:
      1) Maintenance and overhaul instructions.
      2) Lubricating schedule including type, grade, temperature, and frequency range.
      3) Parts list, including source of supply and recommended spare parts.
      4) Name, address, and 24 hour telephone number of each subcontractor who installed equipment and systems, and local representative for each type of system.
      5) Other pertinent data applicable to the maintenance of particular systems or equipment.
   b. These recommended preventive maintenance actions shall be categorized by the following recommended frequencies:
      1) Weekly
      2) Monthly
      3) Quarterly
      4) Semi-Annual
      5) Annual

6) Other

C. Postal Operating Instructions and Diagrams:
1. Operating Instructions:
a. Copies of operating instructions provided in the operating manual shall be posted in the near vicinity of each piece of applicable equipment. The instructions shall be mounted neatly in frames under Plexiglas, where they can be easily read by operating personnel. Instructions mounted outdoors shall be suitably protected from weather.
2. Posted Systems Diagrams:
a. Simplified one (1) line diagrams of the systems listed shall be developed of conveniently adequate size and posted neatly under Plexiglas in the main or most appropriate equipment room for easy reference by operating and maintenance personnel. These drawings shall be done in a professional manner which is acceptable to the DDC. The diagrams shall show each component including all valves installed in the system, with name and identifying number. If space does not permit valves installed in the system, with name and identifying numbers on the diagrams, valve charts shall be provided. Explanatory notes, where needed, shall be provided. This shall apply to equipment and systems listed under Article 1.04 Scope of Work.
b. These diagrams shall be suitable for reduction in size and use in the operating manual system descriptions previously covered.

3.08 AS-BUILT DRAWINGS:

A. The Commissioning Authority shall review the as-built contract documents pertaining to the equipment/system to be commissioned to verify incorporation of both design changes and as-built construction details. Discrepancies noted shall be corrected by the appropriate party.

3.09 OPERATING AND MAINTENANCE TRAINING AND VIDEOTAPING:

A. The Mechanical Contractor, TAB Contractor, Automatic Controls and appropriate sub-contractors, shall provide comprehensive operating and maintenance instructions on building systems prior to delivery. The instructions and shall include classroom instruction delivered by competent instructors based upon the contents of the operating manual. Emphasis shall be placed upon overall systems diagrams and descriptions, and why systems were designed as they were. The classroom instruction shall also include detailed equipment instruction by qualified manufacturer representatives for all equipment listed in Scope of Work for which operating instructions are provided. The manufacturer representative training shall emphasize operating instructions, and preventing maintenance as described in the operating manual. Videotaping of these instructions shall be by CA. At a minimum, the training sessions shall cover the following items:
1. Types of installed systems
2. Theory of operation
a. Design intent
b. Occupied vs. unoccupied or partial occupancy
c. Seasonal modes of operation
d. Emergency conditions and procedures
e. Comfort conditions
f. Indoor air quality
g. Energy efficiency
h. Other issues important to facility operation.
3. System operations.
4. Use of control system
a. Sequence of operation

b. Problem indicators
c. Diagnostics
d. Corrective actions

5. Service, maintenance, diagnostics and repair.
6. Use of reports and logs.
7. Troubleshooting, investigation of malfunctions, and determining reasons for the problem.

B. Each classroom training period shall be followed by an inspection, explanation and demonstration of the system concerned by the instructors. All equipment shall be started up and shut down.

C. The contractor shall be responsible for organizing, arranging, and delivering this instruction in an efficient and effective manner on a schedule agreeable to the owner.

D. The contractor shall provide, at or before substantial completion, a proposed agenda and schedule of the above training for approval by the Commissioning Authority and the Owner.

END OF SECTION

SECTION 23 09 00

AUTOMATIC TEMPERATURE CONTROLS - ELECTRIC

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical work shall apply.

C. DESCRIPTION OF WORK

D. 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.

E. 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.

F. 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).

G. The system shall have a new graphic.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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.

M. 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.

N. 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.

O. 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.

P. 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.

Q. Provide control wiring required to other equipment provided under this contract.

R. All automatic controls required for AHUs for all projects shall comply with this section.

S. 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.

T. 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.

U. Provide a display controller or panel-mounted controller with display screen with touch control or keypad, as specified herein, at each AHU and pumping/heat exchanger system and other systems provided with control under this contract. The touch/display screen shall allow hospital maintenance staff to monitor systems temperatures, pressures, and status and to modify setpoints.

1.02 QUALITY ASSURANCE

A. Only firms regularly engaged in manufacture and installation of this equipment with characteristics and capacities required and whose products have been installed by them and are in satisfactory use in similar service for not less than 10 years will be acceptable.

B. All control equipment used in this project shall have been successfully proven in actual field installations for a period of two (2) years prior to the date of submittal of said equipment to the Architect for approval.

C. The control system shall be installed completely in all respects by competent mechanics, regularly employed by the manufacturer of the control system.

1.03 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

B. Complete shop drawings shall be submitted to the Architect for approval before any field installation is started. Such drawings shall give a complete description of all control elements and shall show completed schematic piping and wiring diagrams, including functional description. Valve and damper schedules shall be included.

C. Floor plans indicating all room thermostat locations not shown on the Drawings, and samples of each type, shall be prepared and submitted to the Architect for approval before installation. Samples of unitary controls shall also be submitted for approval, and a typical assembly shall be field erected, before installation. All room controls shall be mounted five feet above finished floor.

1.04 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).

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

B. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If, within one year of acceptance by the Architect, any equipment herein described is

proved to be defective in workmanship or material, it shall be adjusted, repaired or replaced, free of charge, during the guarantee period.

PART 2 - PRODUCTS

2.01 VALVE AND DAMPER OPERATORS

A. All operators shall be of totally enclosed type in dustproof housings of pressed steel or approved cast metal. All motors shall be of a permanently lubricated type with oil immersed gear train or internal servo relief valve. An open type gear train will not be acceptable. All operators shall be of the spring return type, to provide failsafe operation and overtravel protection. Each automatic damper shall be provided with a separate damper operator. Operators to be located outdoors shall be NEMA 3R rated.

2.02 INSERTION AND IMMERSION THERMOSTATS

A. All thermostats shall have adjustable throttling ranges and shall be capable of positioning valve or damper operators in intermediate positions. The control elements of the thermostats shall be centrally mounted inside the supply duct or casing to measure the air temperature. The sensing shall be transmitted to the central mechanism located on the local control panel by means of capillary tubing or electronic transmission. Thermostats shall be capable of controlling without hunting and shall be respond to a change of plus or minus 3EF. Control point shall be adjustable 15E above and below intended setting, with a minimum scale of at least 50EF. Sensing elements shall be of proper design and material for its specific application and shall have sufficient length to cover a minimum of two-thirds of the coil or duct.

2.03 AUTOMATIC CONTROL VALVES AND 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 " 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.

G. Control dampers shall have galvanized frames of not less than 2" in width and blades of #16 galvanized steel and shall be adequately braced to form a rigid assembly, where required in galvanized ductwork. In aluminum ductwork, damper material shall be 16-gauge aluminum. No dampers shall have blades more than 10" wide. Dampers shall be painted with two coats of black enamel.

2.04 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. Ch. W. supply and return temperature
5. Air handling unit discharge
6. Each zone discharge air temperature

2.05 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.

2.06 ROOM THERMOSTATS

A. All proportioning thermostats shall have adjustable throttling range. All thermostats shall be provided with an adjustable range of 55 deg F – 85deg F., key operated, non-indicating, locked cover type. Finish and final locations shall be approved by the Architect.

2.07 FIRE PROTECTION DUCTSTATS

A. A manual reset fire protection ductstat shall be provided in the air inlet to each return air fan, and exhaust fan within 10 feet of fan motor, to stop the return fan, exhaust fan, and its respective supply fan, whenever the temperature exceeds 125°F.

2.08 LOCAL PANELS

A. Furnish and install adjacent to each water system and each H & V unit and AC unit as herein specified, locked enclosed local control panel of 14 gauge steel or a face of plywood board with bonded aluminum sheets on each side set in an extruded aluminum enclosure and with welded angle iron brackets, wall or floor type, in which shall be mounted the associated temperature controls, relays, thermostats, etc., and on which shall be flush mounted the associated switches, gauges, thermometers, etc., as previously and hereinafter described. The basic background color of the panel shall be as approved by the Architect. Provide canopy light on top of local control panel with light switch.

B. Panels shall be prewired to terminal strips.

C. Details of panel shall be submitted for approval prior to fabrication. Locations of local panel are to be convenient for adjustment and service and all such locations are to be approved prior to installation. Provide engraved nameplates beneath panel mounted control device and gauge, clearly describing the

function of said device and the range of operation. Provide a laminated color coded schematic control diagram on panel face. Provide a key for local panel.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine location where controls and equipment are to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of the automatic temperature control system and after motors have been energized with normal power source, test system to demonstrate compliance with requirement. When possible, field correct malfunctioning controls then retest to demonstrate compliance. Replace controls which cannot be satisfactorily corrected. Refer to Section - Test and Balancing

3.04 SERVICE

A. After completion of the control system installation, the control manufacturer shall regulate and adjust all thermostats, control valves, damper motors, etc., and place in complete operating condition, subject to the approval of the Architect. Complete instructions shall be given to the operating personnel. There shall be two day's instruction given for Winter cycle and two day's instruction for Summer cycle operation.

3.05 CONTROL SEQUENCE

A. Control sequence shall be as specified and/or 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.

C. Fire Alarm Shut Down: Under a fire or smoke alarm condition the FACP shall shut down the supply fans through the dry contacts provided by the electrical contractor. Upon closure of these contacts control relay shall be activated, shutting down the supply fan, closing smoke dampers, and shutting down the general exhaust fans. Current sensor switches provided for each fan shall be double pole with one set of contact for status indication at the FACP and a second set for status indication at the BAS system.

3.06 AC-7E CELLAR MER (NEW UNIT)

A. Damper Control – normal operation
1. When AC-7E is in normal operation, Control Damper MD-1 shall be open, and Control.

B. Start-up and Shutdown
1. When the supply fan is started, and MD-1 is proven open, the supply fan shall start. When the supply fan is shut down, the automatic control dampers shall close.

C. Fan speed control
1. The fan speed shall modulate to maintain the duct static pressure SP1 at setpoint 0.25”. If duct static pressure sensor SP1 fails, the fan speed shall modulate to maintain SP2 at setpoint.
2. The operator shall be able to select the duct static pressure to be used for the fan speed control.

D. Temperature Control using the DX coil for cooling and glycol coil for reheat
1. (Cooling MODE) When cooling is required as indicated by the average space temperature and Outdoor Air Temperature is above 60°F (adjustable), the control valve CV-1-1 (economizer mode) shall be OPEN, the control valve CV-1-3 (condenser) shall be OPEN, and CV-1-4 (cooling tower) shall be open and the control valves CV-1-2 (glycol reheat) shall be closed . The supply fans shall start at 30% vfd signal. The BMS shall set the DX air temperature and shall be reset from 58°F (adjustable) up to 62°F (adjustable) to maintain the average space temperature at setpoint 70°F ±1°F (adjustable).
2. (Dehumidification MODE) When the average space RH is 3% (adjustable) above the setpoint of 50% (adjustable), the BMS shall set the DX air temperature and shall be reset from 48°F (adjustable) up to 58°F (adjustable) to maintain the average space RH at setpoint 50% RH (adjustable) and the glycol/reheat coil valve shall modulate open to maintain the average space temperature at setpoint, 70° F (adjustable). As the glycol reheat control valve CV-1-2 is modulated open, the cooling tower control valve CV-1-4 shall be modulated closed in sequence with CV-1-2. CV-1-4 valve closing shall be limited to 20%(adjustable).
3. When the average space RH is at setpoint 50% (adjustable) RH or less, the unit control system shall return to average space temperature control (COOLING). The BMS shall set the DX air temperature and shall be reset from 58°F (adjustable) up to 62°F (adjustable) to maintain the average space temperature at setpoint 70°F ±1°F (adjustable).
4. (Heating MODE)
   a. When campus is in Winter mode, the fin tube radiation valves shall modulate to maintain the space temperature at space temperature setpoint minus 5 deg F (adjustable).
   b. When heating is required as indicated by the average space temperature and the glycol average temperature is above 40°F (adjustable), the unit shall operate in

HEATING MODE (heat pump). The BMS shall set the DX air temperature and shall be reset from 90°F (adjustable) down to 80°F (adjustable) to maintain the average space temperature at setpoint 70°F ±1°F (adjustable).

c. If the Unit fails to operate and maintain the space setpoint, the fin tube radiation shall operate in emergency mode and shall modulate to maintain the space temperature setpoint.

E. Humidity Control (Steam Humidifier OR Electric Humidifier)
1. The operator should be able to select which humidifier to operate from the graphic interface.
2. When the average space RH is 3% (adjustable) below the setpoint, the unit shall be in HUMIDIFICATION Mode and the humidifier shall modulate to maintain RH at setpoint using a PID controller.
3. If, while humidifying, the humidifier discharge relative humidity exceeds the high limit setpoints, 85% RH (adjustable), the humidifier control shall be overridden to maintain the discharge relative humidity at or below its high limit setpoint.
4. The humidifier shall not function unless air flow is proven by the air flow switch in the humidifier discharge air stream.

F. Economizer Control
1. When the OA temperature is below the setpoint 60°F (adjustable), the system shall enable the economizer mode and the 30 minutes (adjustable) timer shall start. After the 30 minutes timer has elapsed, in economizer mode, control valve CV-x-x (economizer) is open and CV-x-x (glycol reheat) and CV-x-x (condenser) are closed. The AC compressors are shut off. The control valves CV-x-x (economizer mode) and CV-x-x (cooling tower) shall be in control to maintain the glycol coil discharge air temperature as needed to maintain the average space temperature setpoint.
2. When the average space temperature is above set point 70°F ±0°F (adjustable), the control valves CV-x-x shall modulate open to decrease the glycol coil air discharge temperature.
3. When the average space temperature is below setpoint 70°F ±0°F (adjustable), the control valve CV-x-x shall modulate close to increase the glycol coil air discharge temperature.
4. When the control valve CV-x-x is at 80% and the average space temperature drops below setpoint 70°F (adjustable) -1°F (adjustable), the glycol water circulating pumps shall shut off and shall cycle on and off as required to maintain the average space temperature low limit setpoint 70°F (adjustable) -1°F (adjustable).
5. The economizer shall be ON until the outdoor temperature is 2°F above the setpoint.

G. Condenser Glycol Control
1. The condenser loop for AC-7E is shared with existing condenser glycol of the existing AC-2E.
2. Cooling Tower fan speed shall be controlled to maintain the condenser glycol supply temperature.
3. The fluid cooler shall have spray pumps and cooling tower fans.

H. Each fluid cooler shall be controlled to maintain the condenser glycol supply temperature of 80°F (adjustable).

I. Should the pump fail to operate, the lag pump shall operate, and an alarm condition indicate on the BMS.

J. When in Economizer Mode, the fluid cooler shall be controlled in sequence to maintain the glycol supply temperature of 62°F (adjustable).

K. When Cooling Tower Fan speed is 30%, and the condenser glycol supply temperature drops 2 deg (adjustable) below the setpoint, the cooling tower shall be turned off and the isolation valve shall remain open.

3.07 GLYCOL LOOP PRESSURE CONTROL

A. Glycol level control

B. The pressure sensor installed on the glycol loop shall indicate the glycol pressure in the loop. When the pressure is below 20 PSI (adjustable), an alarm shall be sent to the BMS and the operator shall verify the glycol level in the loop and reset the alarm.

3.08 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%

3.09 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.

3.10 ON SITE CONTROL SYSTEM OPERATOR TRAINING

A. Provide services of controls CONTRACTOR's qualified technical personnel for six (6) days, to instruct Owner s personnel in general operation and maintenance of the control systems. Training sessions shall be witnessed by the Commissioning Agent. Instruction shall be classroom setting at the project site. Requests for training shall be for contiguous or non-contiguous 8-hour days, unless otherwise mutually agreed upon by CONTRACTOR, Commissioning Agent, and Owner. The Owner's representative shall notify CONTRACTOR 1 week in advance of each day of requested training.

B. Provide four sets of approved Operations and Maintenance Manuals to be used for training.

C. The CONTRACTOR's designated training personnel shall meet and/or correspond with the Commissioning Agent and Owner s representative for the purpose of discussing and fine-tuning the training agenda prior to the first training session. Training agenda shall generally be as follows:

1. Day 1:
    a. Brief walk-through of the building, including identification of all controlled equipment and systems and condensed demonstration of Digital System Controller (DSC) capabilities.
    b. Brief overview of the various parts of the 0 & M manual, including hardware and software programming and operating publications, catalog data, controls installation drawings, and DDC programming documentation.
    c. Demonstration of workstation menu penetration and broad overview of the various workstation features.
    d. Demonstration of workstation boot-up, login/logout procedures, printer operation, password setup, and exception reporting.
    e. Demonstration of workstation graphic screens
    f. Demonstration of workstation reports
    g. Demonstration of alarm feature
    h. Demonstration of trend feature

i. Demonstration of workstation diagnostics features, program upload / download capabilities and software backup concepts. Procedures to follow after power outage.

2. Day 2:
   a. DSC programming
   b. Review sequences of operation and how it is accomplished by DSC programming.
   c. Fail modes and procedures to take in the event of a power failure.
   d. Standalone modes and procedures to take in the event of various communication failures.
   e. Demonstration of set-point optimization and fine-tuning concepts.
   f. Demonstration of DSC features, diagnostics, program upload / download.
   g. Demonstration of I/O hardware testing, calibration, and replacement.
   h. Demonstration of all remaining miscellaneous workstation features.
   i. Graphic workstation screens.
   j. Review of Owner selected topics.
   k. Question and answer period.

3.11 ATC/BAS ACCEPTANCE PERIOD

A. After approval of the ATC/BAS Demonstration and prior to Contract Close Out, the BAS system shall enter an Acceptance Period of four weeks. The Acceptance Period shall not be scheduled until all HVAC systems are in operation and have been accepted, all required cleaning and lubrication has been completed (i.e., filters changed, piping flushed, strainers cleaned, etc.), and the TAB report has been submitted and approved. Schedule the beginning of the Acceptance Period with the Owner's Representative 2 weeks in advance. During the Acceptance Period, the system shall operate properly without malfunction, without alarm caused by control action or device failure, and with smooth and stable control of systems and equipment in conformance with these specifications. At the end of the four-week period, the Commissioning Authority shall provide written notification of the pass/fail status of the Acceptance Period including documentation of problems requiring CONTRACTOR attention. Should problems occur during the initial Acceptance Period, the CONTRACTOR shall correct problems and provide notification to the Owner's representative that all problems have been corrected. The Acceptance Period shall be restarted at a mutually scheduled time for an additional one-week period. This process shall be repeated until Commissioning Authority issues notice that the ATC/BAS has passed the Acceptance Period without exception.

B. During the Acceptance Period, the Owner□s Operations staff shall maintain a hard copy log of all alarms generated by the BAS. For each alarm received, CONTRACTOR shall diagnose the cause of the alarm, and shall list on the log for each alarm, the diagnosed cause of the alarm, and the corrective action taken. If in the CONTRACTOR's opinion, the cause of the alarm is not the responsibility of the CONTRACTOR, the CONTRACTOR shall immediately notify the Owner's representative.

C. During the Acceptance Period, the CONTRACTOR shall maintain all controller network and workstation hardware and software in a state that will allow remote access by Commissioning Authority to Trend Logs as specified below.

3.12 TREND LOGS

A. Prepare controller and workstation software to display graphical format trend logs during the Acceptance Period. Trend logs shall demonstrate compliance with contract documents. Trend logs shall be set up to meet the following requirements.

B. Trend logs shall include all analog and digital input values, analog and digital output values, and set points that are on a reset schedule.

C. Lines shall be labeled and shall be distinguishable from each other by using either different line types, or different line colors.

D. Indicate engineering units of the y-axis values, e.g., degrees F., inches w.g., Btu/lb, percent wide open, etc.

E. The y-axis scale shall be chosen so that all trended values are in a readable range. Do not mix trended values on one graph if their unit ranges are incompatible.

F. Trend outside air temperature, humidity, and enthalpy during each period in which any other points are trended.

G. All points trended for one HVAC subsystem (e.g. air handling unit, chilled water system, etc.) shall be trended during the same trend period.

H. Each graph shall be clearly labeled with HVAC subsystem title, date, and times.

I. A complete set of trend logs shall consist of all required points, trended for the time period listed for each point category. Point values shall be recorded based on the change-of-value (COV) differentials listed. If the ATC/BAS does not have the capability to trend based on COV, then point values shall be trended based on the time intervals listed:

Point Category	COV	Time Interval	Time Period
Duct Pressure	0.02 in. w.g.	1 minute	4 hours
Temperature	0.2 degrees F	10 minutes	24 hours
Humidity	1 percent RH	10 minutes	24 hours
Fan Volume Control Output	1 percent	1 minute	4 hours
Valve and Damper Outputs	1 percent	10 minutes	24 hours
CO_2	50 ppm	10 minutes	24 hours

J. Provide a specific trend log report for zone temperature and humidity for use by the museum curators.

3.13 SOFTWARE OPTIMIZATION ASSISTANCE

A. The CONTRACTOR shall provide the services of a control's technician for a maximum of 40 man-hours at the project site to be at the disposal of the Commissioning Authority. The purpose of this requirement is to make changes, enhancements, and additions to controller and/or workstation software that have been identified by the Commissioning Authority during the construction and commissioning phases of the project and that are beyond the specified Contract requirements. This service shall be provided at no additional cost to the Owner. Requests for assistance shall be for contiguous or non-contiguous 8-hour days, unless otherwise mutually agreed upon by CONTRACTOR, Commissioning Authority, and Owner. The Owner's representative shall notify CONTRACTOR 2 days in advance of each day of requested assistance.

B. The controls technician provided shall be thoroughly trained in the programming and operation of the controller and workstation software. If the controls technician provided cannot perform every software task requested by the Commissioning Authority in a timely fashion, CONTRACTOR shall provide additional qualified personnel at the project site as requested by the Commissioning Authority, to meet the specified time requirement.

C. If any part of this requirement is scheduled during the Acceptance Period, such changes made because of this requirement shall not prevent approval of the Acceptance Period. However, during the Opposite Season Acceptance Period such changes shall be demonstrated to perform as documented by the Commissioning Authority.

3.14 ATC/BAS OPPOSITE SEASON ACCEPTANCE PERIOD

A. During the warranty period, but not later than 6 months from completion of the Acceptance Period, BAS shall enter an Opposite Season Acceptance Period of two weeks. Opposite Season Acceptance Period shall not be scheduled until seasonal conditions have changed to the opposite of those that occurred during the Acceptance Period. Schedule the beginning of the Acceptance Period with the Owner's representative 2 weeks in advance. All requirements specified for the Acceptance Period shall also apply to the Opposite Season Acceptance Period.

B.

END OF SECTION

SECTION 23 09 01

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. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.2 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services, and tests necessary to complete and make ready for operation by the Owner, a building automatic system as shown on the drawings and hereinafter specified.

B. The Building Automatic System shall be provided by the same manufacturer as the automatic temperature controls, Section 23 09 00 and shall be fully integrated in the existing BMS system at FIT. Fully integration means the software shall reside on the same server as the existing BMS. The existing BMS is Distech Controls system, installed and maintained by ADVANTEX Solutions; contact Giovanni Natale from ADVANTEX Solutions (T: 718-278-2290, C: 917-682-2521, E-mail: gnatale@advantexsolutions.com).

C. The Automatic System Subcontractor shall furnish and install all equipment, accessories, wiring, and instrument piping required for a complete and functioning system.

D. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems, and not custom designed especially for this project. All systems and components shall have been thoroughly tested and proven in actual use.

E. The automation system shall be of a fully modular architecture permitting expansion by adding operator peripherals and field hardware.

F. If the expansion of the automation system requires greater computer processing power, it shall be possible to transfer all existing software and databases, both vendor-supplied and user-defined, to a new more powerful computer.

G. Systems that require the existing user-defined database to be re-entered through the operator's terminal shall not be acceptable.

H. Although fire alarm and security points will not be installed or monitored, initially the system shall be installed completely ready to receive or accept these points at a later date without additional central hardware or software.

I. The system as specified shall monitor, control, and calculate all of the points and functions as listed in the Building Automation Schedule.

J. The system as installed shall have sufficient computer memory and application software for 100% point expansion above those points as listed in the Building Automation Schedule.

1.3 QUALITY ASSURANCE

A. Only firms regularly engaged in the manufacture and installation of this equipment with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years shall be acceptable.

B. The entire building automation system shall be installed by skilled electricians and mechanics, all of whom are properly trained and qualified for this work. All wiring shall be installed in accordance with the Project Electrical Specifications.

C. Supervision and checkout of the system shall be by factory-trained engineers and technicians directly employed by the automation Contractor.

D. Provide systems produced and installed by the manufacturers, which are listed in Section "Approved Manufacturer's List".

E. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work and submit shop drawings.

1.5 COORDINATE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

B. The system including all hardware and software components shall be guaranteed for a period of one year following the date of final acceptance. Any manufacturing defects arising during this warranty period shall be corrected without cost to the Owner.

C. All applicable software as detailed in this Specification shall be updated by the Automation Subcontractor free of charge during the warranty period. This will ensure that all system software will be the most up-to-date software available from the Automation Subcontractor.

PART 2 - PRODUCTS

2.1 TRANSMISSION NETWORK

A. Distributed Communication Processor:
1. The system shall use an intelligent Distributed Communication Processor. This processor shall be microprocessor-based and shall interface with Central Processing Unit and Remote-Control Units.

B. Multi-Drop Trunk(s):
1. The automation system shall include a multi-drop digital transmission network that provides the communication link between the Distributed Communication Processor and all Remote-Control Units and remote operator consoles.

2. The transmission shall be asynchronous and utilize a polled-response method. The system shall utilize a cyclic redundancy check or dual transmission with parity check to ensure signal reliability.
3. The network riser shall be fiber-optic.
4. The transmission speed shall be a minimum of 9600 baud and operate in a half-duplex mode.
5. The system shall support multiple multidrop trunks. Each multi-drop trunk shall support a minimum of 32 Remote Control Units.
6. Each multi-drop trunk shall have an allowable line length of at least 20,000 feet without signal degradation. All multidrop trunks shall be interfaced to the system via standard interfaces. With the addition of modems, the multidrop trunk shall interface to unconditioned voiceband 3002 telephone lines for remote building tie-in to the automation system.
7. Lightning protection shall be provided at all points of entry of casing into the building.

2.2 BUILDING CONTROL SYSTEM

A. The building control system specified herein shall be a direct digital control system which can, without additional equipment or software, perform all of the automatic temperature control and energy management functions as required in this Specification. Direct Digital Control shall be defined as a control technique through which the process variable is continuously monitored by a RCU panel which accomplishes loop control by calculating a control solution for output to a control device, independent of the host computer.

The system, as specified, shall independently control the building's HVAC equipment to maintain a comfortable environment in an energy efficient manner. The building operator shall communicate with the system and shall have the capability to alter the control sequence of operation within the building.

B. System Architecture: The building control system shall consist of a network of independent, stand-alone control units, RCU. Each stand-alone control unit shall be capable of performing all specified control functions in a completely independent manner. Additionally, control units shall be capable of being networked for single point programming and for the sharing of point information and control instructions between panels without the use of the host computer. All operator communication with the system shall be via operator terminals. It shall be possible for each control unit to have a dedicated local display or for a collection of control units to share a single operator terminal.

C. Remote Control Unit (RCU):

Each remote control unit shall be capable of full operation either as a completely independent unit or as a part of the building-wide control system. All RCU shall contain the necessary equipment for direct interface to the sensors and actuators connected to it.

Control strategies shall be resident at each RCU. Each RCU shall be capable of communication with each other RCU and for all RCU in the system from any one operator terminal. Each control unit shall provide the ability to support its own portable operator terminal.

2.3 FIELD HARDWARE

A. Remote Control Units (RCUs):
1. Physical Characteristics (except for terminal unit RCUs)
   a. All metal construction conforming to NEMA-12 requirements.
   b. Full-front piano hinged door with nameplates identifying the RCU.
   c. The same key lock on each RCU shall be provided with a key to the hospital master key system.
   d. All RCU shall be free standing attached to building structure or rooftop air handling unit structure. Vibration isolation shall be provided as required to protect the electronic equipment.

2. Electrical Characteristics
   a. A pilot light indicating power on
   b. Operating on 120 volt, 60 HZ power
   c. A manual by-pass switch to permit immediate isolation of the RCU for servicing, except for smaller controllers such as fan VAV boxes.
   d. A 120 volt AC service outlet.
   e. Circuit protection including surge transient protection for the data collection hardware.
   f. Factory prewired.
3. RCU shall be capable of operating in ambient temperatures between 32°F to 120°F and ambient humidity conditions of 10% RH to 95% RH (non-condensing).
4. Final locations of RCU's shall be subject to the Owner's representative approval. RCU shall not be located directly underneath valves or other areas where they may be subject to water damage. RCU shall be located in a space between 4 and 7 feet above finished floor, with a minimum 3-foot clearance in front.
5. Each RCU shall perform continuous diagnostics, and any malfunction shall be annunciated at the operator's console as well as visually indicated at the RCU.
6. Failure of any RCU on the system shall not affect the proper operation of the host and other RCU's.
7. The system shall be capable of phased startup. That is any RCU shall be capable of properly communicating with the host while remaining RCU's are being installed.
8. Surge transient protection shall be provided in each RCU for the purpose of suppressing induced voltage transients.
9. Each RCU including cabinet, power supply, function cards and termination modules shall be approved by U.L.
10. The remote-control unit shall be listed by Underwriters Laboratories (UL) against fire and shock hazard as a signal system appliance unit.

B. Sensors/Input Signals:
1. Each remote-control unit shall be capable of direct interface to a variety of industry standard sensors and input devices. it shall be possible for each remote-control unit to monitor the following types of inputs:
   a. Analog Inputs:
   - 4-20 mA
   - 0-10 vDC
   - thermistors
   - 3-15 psi

   b. Digital Inputs:
   - dry contact closure
   - pulse accumulator

C. Actuators/Output Signals:
1. The remote-control unit shall directly control pneumatic and electronic actuators and control devices. Each control unit shall be capable of providing the following control outputs:
   a. Digital Outputs (Contact Closure):
   - motor starts, sizes 1 to 4

   b. Analog Outputs:
   - 3-15 PSI
   - 4-20 mA
   - 0-16 vDC

D. Sensors:
1. All analog sensors shall utilize industry standard 4-20 milliamp signals to facilitate Owner expansion.
2. All analog signals shall be converted for digital transmission at the RCU.

E. Electric KWH and KW metering:
1. Under this section provide the necessary transponders pulse initiators, sensors, interface devices, totalizers, and current and potential transformers necessary to determine electrical demand for the building.
2. Sensor installation shall also be capable of monitoring power failure.
3. Calculation of KWH from the measured KW shall be performed through software at the host computer.
4. Refer to the electrical drawings for the number of service feeders, etc.
5. Provide separate meters for power to the chiller plant.

F. Current Sensors
Provide current sensors for fan and pump motors to indicate status at the BAS and at the fire alarm control panel.

2.4 OPERATOR INTERFACE

A. The building control system shall permit full operator communication including: obtaining information about the performance of his system; allowing the operator to change the system operation; and diagnosing system malfunctions. Operator communication shall be through the use of any one of the following operator terminals:
1. Hand-held terminal/Portable Operator Terminal (POT)
2. Printer
3. Central console PC
4. Portable PC

B. It shall be possible to have one operator's terminal at each remote control unit, or to have a single operator's device which can be connected to any panel in the network. The building control system shall permit complete operation of any remote control unit within the network from any operator terminal within the system.

C. The network shall be addressable as a whole and shall not require referencing a particular control unit for the commanding or monitoring of points on the network.

2.5 CENTRAL CONSOLE HARDWARE

A. NOT USED

2.6 SELF-DIAGNOSTICS AND ALARM REPORTING

A. Each remote-control unit shall contain self-diagnostics that continuously monitor the proper operation of the unit. A malfunction of the unit will be reported and will inform the operator of the nature of the malfunction, and the control unit affected. It shall be possible to annunciate malfunctions as well as other control unit alarms at a selected central operator's terminal.

B. The system shall also allow on-line diagnosis via internet or modem from a remote location (vendor's headquarters or local branch office or another remote site).

2.7 ENERGY CONSUMPTION MEASUREMENT

A. NOT USED.

2.8 WEB SERVER OPERATOR INTERFACE

A. Furnish a web server to allow daily operations functions to be accomplished from any network connected web browser.

B. Operators shall be able to utilize any commercially available browser such as Microsoft Internet Explorer or Netscape Navigator. No additional software shall have to be installed on the client PC for normal operation of the system.

C. All communications between the web browser and web server shall be encrypted using 128-bit SSL encryption.

D. Web server shall be able to be located on the Owner's Intranet or on the Internet.

E. Web server shall have the ability to automatically obtain an IP (Internet Protocol) address using DHCP. The use of static IP addressing shall also be supported.

F. Web server will have adequate capacity to store and serve 4000 user-defined graphics.

G. Any unlimited number of users shall be able to access the web server. A minimum of 30 users shall be able to utilize this device at the same time.

H. BACnet. The web server shall support the BACnet Interoperable Building Blocks (BIBBS) for Read (Initiate) and Write (Executable) services. These are the Data Sharing BIBBS as follows:

DS-RP-A, B
DS-RPM-A
DS-WP-A
DS-WPM-A

I. The web browser client shall support Sun Microsystems Java 2 (JRE 1.4.0 or higher) plug-in.

J. Functionality
1. Operators shall be required to enter in a valid username and password to access the system. The view of the system provided for the user will be customized based on user identity.
2. Operator security. Each operator shall be able to be assigned a unique username and password. Users shall be assigned to view, view and edit or administrative capability.
3. The web server shall display the same graphics that have been created for the Operators Workstation. Graphics shall be able to contain both static information such as floor plans, equipment schematics, etc. as well as dynamic information including space temperatures, setpoints, equipment status, etc.
4. All dynamic values shall be automatically refreshed every 10 seconds. The refresh of dynamic data shall not require a refresh of the static information on the graphic.
5. Operators with proper security shall be able to override setpoints and equipment operation.

6. System schedules shall be easily selected for display. Operators with valid security shall be allowed to make changes to schedules including modifications to start and stop times and creating exception days. These changes shall be made graphically within the web browser.
7. A log of system alarms and events shall be able to be viewed from the web browser. Operators with proper security shall be able to acknowledge alarms.
8. System trends shall be able to be selected and viewed. Trends shall be shown graphically with the proper axis scaling automatically selected.
9. Operators with proper access shall be able to configure the web server using their web browser.

K. Web Server
1. Web server shall be installed on the hospital server in the building IT server room.
2. All user-entered information (web pages, security, etc.) shall be stored in non-volatile memory. System operational information and clock functions shall be backed up by battery or other device for a minimum of seventy-two (72) hours.

L. Color Graphics

The Web Browser GUI shall make extensive use of color in the graphic panel to communicate information related to setpoints and indoor environmental comfort. Animated graphic interface files (GIFs), active setpoint graphic controls and valid web content (like local weather forecast) shall be used to enhance usability:

1. Display Size: The GUI workstation software shall graphically display in 1024 by 768 pixels 24-bit True Color.
2. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
3. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, which provide a visual display of temperature relative to their respective setpoints (see section below). The colors shall be updated dynamically as a zone's actual comfort condition changes. Locations of space sensors shall also be shown for each zone. The intent of the specification is to enable the operator to readily assess problems at a glance. The floor plan graphic shall also include the measured temperature, RH and CO_2 (RH and CO_2 as applicable) in each zone.
4. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability.
5. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
    a. Each piece of equipment monitored or controlled including each terminal unit.
    b. Each floor and zone controlled.

M. Zone Setpoint Adjustments
1. Color floor plans displayed via a web browser shall utilize a contiguous band of colors, each corresponding to actual zone temperatures relative to the desired heating and cooling setpoints. The ideal temperature shall be shown as a green color band. Temperatures slightly warmer than ideal shall be shown in yellow, and even warmer temperature band shall be shown in orange. Temperatures slightly cooler than ideal shall be light blue, and even cooler temperatures shall be shown as dark blue. All alarm colors shall be in red.
2. Active Zone Graphic Setpoint Controls: Utilizing a mouse, it shall be possible to select occupied or unoccupied setpoints (corresponding to the floor plan colors) and drag the color slide bar(s) to increase or decrease heating and cooling setpoints. In addition to the slide bars, an operator may

type the numeric value of the heating and cooling setpoints. The floor plan graphic shall then change colors on a zone-by-zone basis to reflect the actual temperature in each zone relative to the changed heating or cooling setpoint.

N. Hierarchical Schedules

1. Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with password access) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room or choose to apply a hierarchical schedule to the entire system, site, or floor area. For example, Independence Day >Holidays for every level in the system would be created by clicking at the top of the geographic hierarchy defined in the Navigation Tree. No further operator intervention would be required and every control module in the system with would be automatically downloaded with the >Independence Day= Holiday.

All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.

2. BACNET Schedules: Schedules shall comply with the BACNET standard, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled based on:
   a. Types of schedules shall be Normal, Holiday or Override
   b. A specific date,
   c. A range of dates,
   d. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any)
   e. Wildcard (example, allow combinations like second Tuesday of every month).
3. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of Athings@ to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
4. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an >individual tenant= group B who may occupy different areas within a building or buildings. Schedules applied to the >tenant group= shall automatically be downloaded to control modules affecting spaces occupied by the >tenant group=
5. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, for example, the control logic shall automatically turn on the VAV air handling unit, chiller, boiler, and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
6. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator (ex: board meeting from 6 pm to 9 pm overrides Normal schedule for conference room).
7. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules, and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
8. Schedule Distribution: For reliability and performance, instead of maintaining a single schedule in a field device that writes over the network to notify other devices when a scheduled event occurs, field devices will only keep their part of the schedule locally. The BAS server software shall determine which nodes a hierarchical schedule applies to and will create/modify the necessary schedule objects in each field device as necessary.

O. Events & Alarms

Events and alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an >Events= view. Events, alarms, and reporting actions shall have the following capabilities:

1. Events View: Each event shall display an Event Category (using a different icon for each event category), date/time of occurrence, current status, event report, and a URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address, and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, and acknowledge or force a return to normal in the Events View as specified in this section.
2. Event Categories: The operator shall be able to create, edit or delete event categories such as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each Event category, enabling the operator to easily sort through multiple events displayed using a built-in filter.
3. BACNET Event Templates: BACNET Event template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of event, acknowledgment requirements, high/low limit and out of range information.
4. Event Areas: Event Areas enable an operator to assign specific Event Categories to specific Event Reporting Actions. For example, it shall be possible for a operator to assign all HVAC Maintenance events on the 1st floor of a building to email the technician responsible for maintenance. The Navigation Tree shall be used to set-up Event Areas in the Graphic Pane.
5. Event Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
6. Event Configuration: Operators shall be able to define the type of events generated per BACNET object. A network view of the Navigation Tree shall expose all BACNET objects and their respective Event Configuration. Configuration shall include assignment of event, alarm, type of Acknowledgment and notification for return to normal or fault status.
7. Event Summary Counter: The view of events in the Graphic Pane shall provide a numeric counter, indicating how many events are active (in alarm), require acknowledgment, and total number of events in the BAS Server database.
8. Persistent Data. The system shall allow for external systems to access the event instance data. Event data shall be stored and queried in the database in a relational manner. At a minimum, the fields to be stored in the database are:

X	Event Source	X	BACNET Event Parameter
X	Event Generation Time	X	Classification of Event
X	Acknowledge Required Flag	X	Event Acknowledgment
X	Delivery Priority		
X	BACNET Event Type		
X	Event Message Text		
		X	Return to Normal Time
		X	Operator Comments
		X	Who Acknowledged the

9. Event Auto-Deletion: Events that are acknowledged and closed, shall be auto-deleted from the database and archived to a text file after an operator defined period.
10. Event Reporting Actions: Event Reporting Actions specified shall be automatically launched (under certain conditions) after an event is received by the BAS server software. Operators shall be able to fully define these Reporting Actions using the Navigation Tree and Graphic Pane in the web browser GUI. Reporting Actions shall be as follows:
    a. Print: Alarm/Event information shall be printed to the BAS server=s PC or a networked printer.
    b. Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts.
       Note: Email reporting action shall also be used to support alphanumeric paging services, where email servers support pagers.
    c. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
    d. Write Property: The write property reporting action updates a property value in a hardware module.
    e. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an event.
    f. Run External Program: The Run External Program reporting action launches specified program in response to an event.
11. Event Simulator: The web browser GUI user shall provide an Event Simulator to test assigned Reporting Actions. The operator shall have the option of using current time or scheduling a specific time to generate the Event. Utilizing the Navigation Tree and drop-down menus in the Graphic Pane, the operator shall be able to select the Event Type, Status, Notification, Priority, Message, and whether acknowledgment is required.

12. External Injection of Events. The BAS server software shall provide a CORBA interface for external injection of events, allowing the system to receive/report events generated from external source other than the BAS system.

P. Trends

Trends shall conform to the BACNET Trend Log Object specification. The system shall be able to trend and display graphically any analog, digital or calculated points. A trend log=s properties shall be editable using the Navigation Tree and Graphic Pane.

1. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the BAS server if historical trending is enabled for the BACNET object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory.
3. Resolution. Sample intervals shall be as small as one (0.1) second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for display that have different trend intervals, the system will automatically scale the axis.
4. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
5. Zoom. It shall be possible to zoom-in on a particular section of a trend for more detailed examination.
6. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.
7. Provide memory capacity for a minimum of 365 days of historical trending, events and logging.

Q. Security Access

Security access from the web browser GUI to BAS server shall require a Login Name and Password. Access to different areas of the BAS system shall be defined in terms of Roles, Privileges and geographic area of responsibility as specified:

1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of easily understood English language privileges. Roles shall be defined in terms of View, Edit and Function Privileges. Systems that use cryptic Boolean numbers to define system access are not acceptable.
   a. View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
   b. Edit Privileges shall comprise: Setpoint, Tuning and Logic, Manual Override, and Point Assignment Parameters.
   c. Function Privileges shall comprise: Alarm/Event Acknowledgment, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print, and Alarm/Event Maintenance.

2.9 FACILITY MONITORING AND CONTROL FUNCTIONS

A. Report and Logs

1. An operator shall be able to manually request reports and logs from the console keyboard. The operator shall have the capability to direct any log or report to either a report printer or CRT display.
2. It shall be possible for the automation system to automatically initiate logs and reports. These logs and reports shall be initiated on time, date, or day basis, or any combination of time, date or day.

3. Each report shall be in English language with information logically grouped in a format that facilitates easy interpretation. Reports and logs shall be attainable on a per point basis or user-defined group of points. Groups of points shall be logically combined without regard to the hardware physical locations. Example:

- Current value of a discharge temperature in a particular air handler.
- Current value of all discharge temperatures in a specific building.
- Current value of all discharge temperatures in a multi-building complex.

4. As a minimum, the following report categories shall be provided (pre-programmed by the Automation System Contractor):

- Summaries
- Access Reports
- Historical Trends
- Data Base Management Reports
- Profile Reports
- System Diagnostic Report
- Totalization Logs
- Energy Management

5. Summaries

- All Point

  A summary shall be provided detailing the current values of any and all points associated with the automation system.

- Building or System or Custom Group

  A summary shall be provided detailing the current values of any and all points within a building or system as detailed by the Owner.

- Motor Status

  A summary shall be provided detailing the current status of any and all motors connected to the system. This summary shall also have the capability of detailing the current values of points associated with any of the system motors.

- Alarm

  A summary shall be provided to detail the status of any and all the points currently in alarm.

- Alarm Limit

  A summary shall be provided to detail the operator assigned high and/or low alarm limit for any and all alarmable points on the system.

- CPA Set Point

  A summary shall be provided detailing the set point for any and all CPA points supported by the system.

- Message

  A summary shall be provided detailing the contents of any and all messages within the system.

6. Historical Trend Log

   A log shall be provided for each defined trend group which shall include as a minimum; username(s) assigned to that group, time increment in real-time, and associated values per time increment.

7. Access Reports

   - Access Level Assignments

     A report shall be provided detailing operator access level assignments. This report shall include as a minimum, operator's name, password, access level assignment and on-duty initials.

   - System Entry

     A report shall be provided detailing which operator signed on or off the building automation system. The report shall include operator's name, password, time and date, console number and elapsed time of operator access.

8. System Diagnostic Report

   A report shall be provided detailing any system hardware software errors. This report shall include as a minimum those errors occurring within the central processing unit including disk subsystem.

B. Alarm Processing

The automation system shall have the following alarm processing features, all of which shall be owner defined through the input keyboard.

1. Alarm Reporting

   Each alarm as determined by the system shall cause the following information to be logged:

   - Current time, date and initials of on-duty operator.
   - User name assigned to point.
   - Point descriptor.
   - Current value or status.
   - Appropriate engineering units.
   - Alarm designator -nature of alarm - high or low.
   - Operator instructive message.

   The operator message shall be an owner-defined message with a text capability of at least 256 characters per message. These messages shall be generated to the operator while the system is online and fully operational.

   The operator shall have the ability to direct the alarm report and message to any output device on the system.

   Any point which goes into alarm and has a graphic display associated with that point shall automatically display that graphic for operator review.

   An operator shall be able to define any alarm as being critical or non-critical.

   All critical alarms shall be displayed in a separate area of the operator's terminal display.

   In the event of multiple alarms, all alarms shall be buffered according to priority until displayed or printed.

   All operator acknowledgment of critical alarms shall be logged including time, date, operator's initials, and username of point being acknowledged. Alarms shall be acknowledged on a per point basis in the order they reported on the operator's terminal.

Return to normal of points previously in alarm shall be logged including time, date, operator's initials and username of point.

2. Analog Limits

Each analog point shall have associated high and low limits. If the measured or calculated value drops below the low limit or exceeds the high limit that point shall be considered in alarm and report as previously defined in alarm reporting.

Each high and low limit shall have an associated user defined limit differential to prevent nuisance alarms caused from floating about the alarm limit.

Any analog point shall be disable from alarm reporting if it is associated with a previously defined master point which is turned off.

3. Binary Alarms

For each binary contact alarm designated on the system, the operator shall be able to define which contact state is the alarm state.

Each binary point detected as being in alarm shall report as previously defined in alarm reporting.

Any binary point shall be disabled from alarm reporting if it is associated with a previously defined master point which is turned off. The operator shall be able to define an adjustable time delay which disables alarm checking during starting and stopping of equipment.

C. Analog/Binary Totalization

The automation system software shall support both analog and binary totalization.

The operator shall be able to:

- enable to disable individual points from totalizing.
- assign upper limits for each point enabled for totalization.
- reset a totalized value.
- display the current value of an individual point, group of points of all system points.

1. Reporting

Any point's current value exceeding its assigned upper limit shall report as a totalized alarm point.

2. Analog Points

It shall be possible to totalize analog values with appropriate engineering units such as kilowatt hours, gallons, pounds, liters, etc.

3. Binary Points

It shall be possible to totalize the accumulated -

- Run time in hours or minutes
- Contact status in hours or minutes

(Example: magnetic contact switch indicates a door open for 45 minutes).

D. History Trending

1. The system software shall provide the ability to historically trend operator selectable points.

2. The operator shall be able to assign any system point, analog or binary, real or calculated to a trend group. Trend groups shall consist of a single point or multiple point groups with a capacity of at least 50 points.
3. Operator assignments shall be through the operator's terminal in simple English language. Points assigned to a trend group shall be the point's English username.
4. Trended values shall be historically retained on the system disk for future inquiry.
5. Operator shall be able to request trended values to be retrieved from disk and printed out at operator defined time intervals.
6. Operator shall be able to define time intervals to one minute resolution.

2.10 ENERGY MANAGEMENT CONTROL FUNCTIONS

A. NOT USED.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the location where this equipment is to be installed and determine space conditions and notify the Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install equipment where shown, in accordance with 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.

3.3 SYSTEM TURN-OVER AND SERVICE

A. System Start-up and Acceptance
1. Upon completion of the installation, the Automation System Sub-Contractor shall startup the system and perform all necessary testing and debugging operations. An acceptance test in the presence of the Owner's representative, the Architect, and the Engineer shall be performed. When the system performance is deemed satisfactory in whole or in part by these observers, the system parts will be accepted for beneficial use and placed under warranty.

B. Owner's Instruction
1. The Automatic System Subcontractor shall provide two copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the system. The Automatic Subcontractor shall instruct the Owner's designated representatives in these procedures during the start-up and test period. The duration of the instruction period shall be no less than eighty hours. These instructions are to be conducted during normal working hours. The instructions shall consist of both hands-on and classroom training at the job site.

END OF SECTION

SECTION 23 20 00

PIPING FOR HVAC

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinated with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The Work includes providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all piping as shown on the Drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. "Manufacturers"-Firms regularly engaged in manufacture of pipe whose products have been in satisfactory use in similar service for not less than ten (10) years.

B. Provide pipe whose performance, under specified conditions, is certified by the manufacturer.

C. Piping systems and installation of piping shall comply with ANSI/ASME B31.9, Building Service Piping (B31.1, Power Piping).

Refrigerant piping systems shall comply with ANSI/ASME (B31.5, Refrigeration Piping).

D. All piping and fittings shall comply with the Buy American Act, shall be made in the USA and shall be labeled as such. Piping shall also be labeled with ASTM number for easy identification/verification at the site.

1.04 SUBMITTALS

A. Refer to Section 01 31 46, "Special Requirements for Mechanical and Electrical Work", and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46, "Special Requirements for Mechanical and Electrical Work".

B. Furnish fabrication detail drawings for all pipe hangers and supports for piping 2½" inches nominal size and larger.

C. Furnish hanger and support location drawings for piping 2½" inches nominal size and larger.

D. Shop Drawings and Data: Contractor shall prepare the following drawings:

1. Fabrication Detail Shop Drawings: These drawings shall show each pipe hanger or support for piping 2½" inches nominal size and larger and shall include location of hanger with reference to nearest building columns or beams, arrangements and detail of hanger, detail of concrete anchor or detail of welded or bolted attachment to structural steel, bill of materials for all components with ASTM specification numbers and direction and magnitude of movement and thrusts and weight at hanger point. Provide the load at each concrete anchor (applicable only on projects where concrete anchors are permitted).
2. Piping Erection Detail and Layout Drawings: Provide scaled detailed piping arrangement drawings showing all piping systems and connected components. Indicate piping in double line detail for all piping 2" and larger. Show piping with insulation thicknesses. Indicate all valves and valve handles, gear operators and handwheels, automatic actuators, strainers and access space, reducers, instruments, anchors/guides and supports, seismic components (if applicable) and all equipment to which piping is connected.
3. Hanger and Support Location Shop Drawings: Contractor shall mark all pipe hanger and support locations for piping 2½" inches nominal size and larger on Piping Erection Detail and Layout drawings. Contractor shall also show all structural grids and support points on these drawings.

1.06 WARRANTY

A. Refer to Section 01 31 46, "Special Requirements for Mechanical and Electrical Work".

PART 2 - PRODUCTS

2.01 PIPE

A. All pipes shall be new, free from scale or rust, of the material and weight specified under the various services. Each length of pipe shall be properly marked at the mill for proper identification with name or symbol of manufacturer.

B. All steel piping, except where otherwise rated, shall be standard or extra strong weight, in conformance with the ASTM A-53 Grade B seamless, for piping 2" and larger, as manufactured by National Tube Division, Republic Steel Corp., or approved equal. Piping shall be ASTM A-53 Type F continuous butt weld, for piping less than 2".

C. All brass piping shall be standard or extra heavy weight 85% red brass semi-annealed seamless-drawn, in conformance with the ASTM B-43, as manufactured by Anaconda, American Brass Co., Chase Brass and Copper Co., or Revere Copper and Brass, Inc.

D. All copper tubing shall be of weight as required for service specified, with conformance with ASTM B-88 for Types "L" and "K" tubing, as manufactured by Chase, Anaconda, Revere, or approved equal. Tubing and fittings shall be thoroughly cleaned with sand cloth and treated with an approved non-corrosive flux before solder is applied.

E. All galvanized steel piping shall be standard or extra strong weight, as specified, in conformance with the ASTM A-53 Grade B. Pipe shall be hot-dripped galvanized with Prime Western smelter and not wiped.

F. Generally, unless otherwise specified, joints in steel piping of sizes 2 inches and under shall be screwed, and all sized 2½" inches and over shall be welded or flanged. Brass pipe shall be screwed 2 inches and smaller and flanged 2½" inches and over. Copper tubing shall be silver-soldered or 95-5 solder as herein specified.

G. Screwed Piping
   1. All connections to apparatus with screwed piping shall be made with 250-pound brass seat unions.
   2. All screwed nipples shall be Schedule 80 nipples.

H. Welding Piping
   1. All fittings for welded piping shall be as manufactured by Tube Turn, Grinnell, Bonney Forge or equal as approved by the Architect. The fittings shall be of the same weight and material as the piping to which they are attached.
   2. For piping 2½" and larger, full size branch connection shall be made with manufactured welding tees, branch connections for less than full size, shall be made with welding tees or with Weldolet forged branch outlet fittings. Fishmouthing, shaped nipples, and stubbing is not permitted.

I. Welding outlet fittings shall be Weldolets as manufactured by Bonney Forge, Inc., or approved equal 2 or 3 and smaller branches shall be made with thredolets as made by Bonney Forge or approved equal.

J. Weld ells shall have a center line radius not less than diameter of the pipe.

K. All flanges shall be weld neck type, ANSI B16.5 ASTM 181 Grade I. All systems, except where otherwise noted, shall be 150 lbs. Class, forged steel.

L. Instrumentation connections on all systems shall be provided by welding threaded 2000# forged steel half couplings to the pipe.

M. All pipe to be welded shall be cut off clean and beveled. All welding shot shall be removed.

N. Composition of welding electrodes shall be in accordance with manufacturer's recommendations.

O. Backing rings shall be used for all welded piping for high temperature hot water (HTHW). HTHW piping to be butt welded in sizes 2" and larger, socket welded in sizes 1½" and smaller. Rings shall be carbon steel with knock off spacer pins, for Schedule 40 and/or Schedule 80 pipe dimensions, as manufactured by Tube Turn, Inc. or Robven Backing Ring Co. Smaller branches on HTHW shall be made by using "Weldolets" or approved equal fittings. Ells for HTHW systems shall be long radius. All flanges shall be welding neck flanges ASA B16,5 ASTM 181 Grade L,300 lbs. Class, forged steel.

P. Pipe welding shall comply with the provisions of the latest revision of the applicable code, whether ASME Boiler and Pressure Vessel Code, ANSI Code for Pressure Piping B31, or such state or local requirements as may supersede codes mentioned above.

Q. Before any pipe welding is performed, submit a copy of the welding procedure specifications together with proof of its qualification as outlined and required by the most recent issue of the code having jurisdiction. Submittal shall comply with ANSI/ASME B31.1/B31.9.

R. Before any operator shall perform any pipe welding, also submit the operator's qualification record in conformance with provisions of the code having jurisdiction, showing that the operator was tested and certified under the Procedure Specification as before mentioned. Submittal shall comply with ANSI/ASME B31.1/B31.9.

S. Assume responsibility for the quality of welding done and repair or replace any work not in accordance with these specifications.

T. In addition, all pipe welding procedures and procedures for qualification of pipe welding operators shall comply with the requirements of the American Welding Society.

U. Cut weld test plugs at locations selected at random by the Architect. The test plugs shall be tested by the testing agency approved for this project. Failure of the test plugs to meet the standards of the specified codes and agencies shall result in the complete removal and replacement of the joint and retesting of the operator who performed the welding. The removal and replacement of the joints shall be at no additional cost to the Owner.

V. Pipe Schedule: Pipe for the various services shall be as follows:

Service	Material	Schedule
Overflow & Drain	Galv. Steel	40
Overflow & Drain	Copper	Type K
Cold Water	Copper	Type "TP"
Hot Water (Heating) and Reheat	Steel	40 or standard
Branch runouts to radiation	Copper	Type L
Branch runouts to radiation	Steel	40
Chilled Water & Dual Temperature Water	Steel	40
Condenser Water	Steel	40
Refrigerant	Copper Tubing	ACR Type

W. The Contractor shall have the option to use Type K copper for hot water and chilled water piping up to and including 2", and brazed Type L copper for glycol water piping up to and including 2”.

2.02 FITTINGS

A. Fittings shall be specified under "Fitting Schedule" for various services.

B. Welding fittings shall be of the same material and schedule as the pipe to which they are welded. Welding elbows shall be long radius pattern unless clearance conditions necessitate the use of standard radius pattern. Welding fittings shall be as made by Tube-Turn.

C. Fittings shall be of material conforming to the following schedule:

Steel Welding Fittings	ASTM A-106
Forged Steel Fittings	ASTM A-234
Malleable Iron Fittings	ASTM A-197
Ductile Iron Fittings	ASTM A-395 & A-536
Cast-Iron Fittings	ASTM A-126
Brass Fittings	ASTM B-62
Wrought Copper Fittings	ASTM B-75 & B-152
Bronze Cast Fittings	ASTM B-584
Solder Fittings	ASTM B-88
Stainless Steel	ASTM A-403, Grade WP, Class S or W

D. All fittings used at expansion loops or bends shall be extra heavy.

E. Cast-iron, malleable-iron and bronze fittings shall be of Crane manufacturer or approved equal.

F. Flanges shall be raised face, of the same weight as the fittings in each service category. All flanges shall be drilled to "US Standard" hex nuts and washers. Bolting shall conform to ASTM 193 Grade B-7, threads Class 7 fit. Nuts shall be semi-finished hexagonal, ANSI B18.2 ASTM A194 Grade 2H.

1. Flange Adapters for grooved end pipe shall be ASTM A-395 and A-536 ductile iron, with synthetic rubber gasket. (Grade to suit the intended service.) Flange Adapters shall be CL 150, Victaulic Style 741.

G. Unions - Unions 2 inches and smaller shall be screwed. Unions 2½" inches and larger shall be flanged. Screwed unions on steel pipe, unless otherwise specified, shall be of malleable iron with bronze ground seats suitable for 300 pounds W.S.P. Screwed unions on copper or brass pipe shall be brass, ground joint suitable for 300 pounds W.S.P. Flanged unions shall be malleable iron for steel pipe, and brass for copper or brass pipe, gasket type suitable for 150 pounds W.S.P. If grooved mechanical pipe couplings are used, additional unions are not required. Couplings shall serve as unions. Unions shall be manufactured by Crane or approved equal.

H. Union shall not be used on HTHW piping. Bolts for HTHW piping shall be alloy steel studs threaded full length and fitted with two hexagon nuts per stud for all flanged joints.

I. Gaskets used on HTHW systems shall be Flexitallic Style CG spiral-wound type with compression stop and shall be certified for use in HTHW systems. Gasket pressure and temperature ratings shall exceed the operating conditions of the HTHW system in which they are being installed.

J. Brass pipe threads shall be cut with special brass treading dies, and the joints shall be made up with lubricant. Strap wrenches, or equivalent, shall be used in making up brass pipe. Wrenches which gouge or scar the pipe will not be used.

K. Solder for each solder-type fitting shall be of 95% tin and 5% antimony or silver solder, as specified herein. Refrigerant piping joints shall be made with silver solder.

L. Unless otherwise specified, all flanged joints shall be fitted with Manville or equal ring gaskets designed for the intended service.

M. Fitting Schedule: Fittings for the various services shall be as follows:

Service	Size	Material	Weight	Type
Select Yoloy, Bronze or Steel				
Overflow and Drain	ALL	Galv. M.I. Wrought Copper	150# 125#	Screwed Solder
Cold Water	ALL	Bronze Wrought Copper	125# 125#	Brazed Solder
Cold Water	ALL	Bronze Wrought Copper	125# 125#	Brazed Solder
Hot Water (Heating)	2" & Below 2½" & Above	CI Steel	125# Sch. 40	Screwed Welding
Chilled Water and Dual Temperature Water	2" & Below 2½" & Above	CI Steel DI	125# Sch. 40	Screwed Welding
Condenser Water	2" & Below 2½" & Above	CI Steel DI	125# Sch. 40	Screwed Welding
Glycol (Heating)	ALL	Steel or Wrought Copper	Sch. 40 125#	Welding Solder

Service	Size	Material	Weight	Type
Refrigerant	ALL	Wrought Copper	300#	15% Silver Solder
Vent (Water Discharge)	ALL	Wrought Copper	125#	Solder

2.03 PIPE HANGERS AND SUPPORTS

A. Provide necessary structural members, hangers and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations. In all cases where hangers, brackets, etc., are supported from metal decking and/or concrete construction, care shall be taken not to weaken decking and/or concrete or penetrate waterproofing. All hangers and supports shall be capable of screw adjustment after piping is erected. Hangers supporting piping expanding into loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction, when the supported piping is hot, or chilled, as required. Hangers in direct contact with copper or brass pipe shall be solid copper.

B. Pipe hangers shall be the clevis and pipe roll types, except where otherwise noted.

PIPE HANGER SCHEDULE				
Pipe	Type of Hanger	Make and Model		
		Grinnell Fig. No.	B-Line Fig. No.	Carpenter & Paterson Fig. No.
2" & smaller (steel)	Clevis Hanger	260	B3100	100
2" & smaller (copper)	Adjustable Wrought Iron	CT-65	B3104CT	100 CT
2½" to 4" (steel)	Adjustable Steel Yoke Pipe Roll	181	B3110	140
2½" to 4" (copper)	Adjustable Swivel Ring	CT-69	B3170CT	
5" & above	Two Rod Roller Hanger	171	B3114	142

C. Beam clamps - Hangers supported from floor steel shall be approved I beam clamps. I beam clamps for hangers shall be wrought steel. B-Line Fig. B3055 (C&P Fig. m 268) or equal.

D. Where piping is run near the floor and not hung from the ceiling construction but is supported from the floor, such supports shall be of pipe standards with base flange and adjustable top yoke similar to B-Line Fig. B3091 (C&P Fig. 247) or equal.

E. All vertical piping shall be anchored by means of heavy steel clamps securely bolted or welded to the piping, and with end extension bearing on the building.

F. All vertical piping shall be guided at each floor by use of clamps fastened to building structure. Provide 360° protective saddle at guides. Saddles shall be fastened to pipe or insulation.

G. Vertical runs of pipe not over 15 feet long shall be supported by hangers placed not over one foot from the elbows on the connecting horizontal runs.

H. Vertical runs of pipe over 15 feet long but not over 60 feet long and not over 6 inches in size, or not over 30 feet long and not over 12 inches in size, shall be supported on heavy steel clamps. Clamps shall be bolted tightly around the pipes and shall reset securely on the building structure without blocking.

Clamps shall be welded to the pipes or placed below couplings. Clamps shall be B-Line Fig. B3373 or equal.

I. For all chilled water, dual temperature water, makeup water and insulated refrigerant piping, provide "Insulshield" as made by Insulcoustic Corp. or pipe covering protection shield B-Line Fig. B3151 (C&P Fig. 265P) with steel shield min. 9 inches long, with vapor barrier jacket. For all chilled water, dual temperature water, makeup water and insulated refrigerant piping supported using standard clevises, provide a segment of rigid insulating block below the pipe in order to prevent the crushing of insulation at the clevis hanger. For steam, condensate, hot fuel oil and hot-water heating piping 2 inches and smaller, same as above. For steam, condensate and hot-water heating and HTHW piping 2½ inches and larger, provide steel pipe protection saddles such as B-Line Fig. B3160 (C&P Fig. 353 series).

J. Piping in trenches shall reset or hung from angle iron cross supports provided by the Contractor with two coatings of red primer and final coat for black asphaltum paint, unless specified in Section 23 21 13 to be an underground piping conduit system.

K. Hanger rods shall be of the following diameters:

Pipe Size	Rod Diameter	Max. Spacing
1¼ inch & below	⅜ inch	6'-0"
1½" and 2 inch	⅜ inch	10'-0" (copper 8'-0")
2½ inch 3 inch	½ inch	10'-0" (copper 8'-0")
4 inch 5 inch	⅝ inch	12'-0"
6 inch	¾ inch	12'-0"
8 inch & above	⅞ inch	12'-0"

L. Hanger rods shall be attached to preset concrete inserts with steel reinforcing rod through the insert and both ends hooked over the reinforcing mesh (when concrete inserts are permitted). For pipes 4 inches and larger, rods shall extend through concrete slab above where they shall be attached to steel bearing plates 6" x 6" x ¼".

M. All trapeze pipe supports shall be constructed of angle iron or C-channel. Uni-strut type supports are prohibited for use on HVAC piping, except insulated refrigerant piping may be supported using strut type supports as long as AP Armaflex insulation is used and the strut clamp is a Series 72 Klo-Shure by Hydra-Zorb which is intentionally oversized to match the O.D. of the insulation and includes a plastic clamp collar insert. All angle iron supports located outdoors or in loading docks (trapeze supports or vertical components) shall be hot-dipped galvanized or stainless steel, including all related support rods and hardware.

N. Piping shall not be hung from other piping, ducts, conduits or from equipment of other trades and no vertical expansion shields will be permitted. Hanger rods shall not pierce ducts.

O. All water piping connected to rotating equipment within all mechanical spaces shall be isolated from the building structure by means of vibration hangers inserted in the hanger rods. The vibration hangers shall consist of a steel spring in combination with a double deflection neoprene element within a rectangular steel housing. Combined static deflection shall be 1.375" minimum. Hangers shall have capability of supporting the piping at a fixed elevation during installation and shall incorporate an adjusting device to

transfer the load to the spring. Deflection shall be indicated by means of scale. Vibration hangers shall be type PCDNHS made by Mason Industries. Provide flexible pipe connectors at all pump suction and discharge piping.

P. All steam and condensate piping within all mechanical spaces shall be isolated from the building structure by means of vibration hangers inserted in the hanger rods. The vibration hangers shall consist of a steel spring in combination with a double deflection neoprene element within a rectangular steel housing. Minimum static deflection shall be 1.375". Vibration hangers shall be Vibratol type HESL with options 2 and 4 as made by B-Line Systems, Inc. (Type PCDNHS as made by Mason Industries.)

Q. Where additional steel is required for the support of hangers, furnish and install same subject to the approval of the Architect. Piping and ductwork shall not be suspended from concrete slab construction.

R. All piping running on walls shall be supported by means of hanger suspended from heavy angle iron wall brackets. No wall hooks will be permitted.

S. Lateral bracing of horizontal pipe shall be provided where required to prevent side sway or vibration. The lateral bracing shall be of a type approved by the Architect and shall be installed where directed by the Architect.

T. All heavy piping is defined as follows:
1. individual pipes having a nom. dia. greater than 12 inches.
2. groups of pipes consisting of more than three 8 inches, or more than two 10-inch nom. 1 dia. pipes,
3. Any combination of closely spaced pipes weighing more than the equivalent of above or 15 lb. per lin. ft., shall be supported at all cross points with overhead floor beams by fastening to the flange of such beams with steel clamps or other suitable means.

U. Where such heavy piping runs parallel with the floor beams properly designed auxiliary steel must be provided. The spacing of such auxiliary steel supports shall in no case be greater than the spacing of the floor beams running perpendicular to the corrugations of the permanent slab steel forms.

V. Assume the responsibility for the proper transfer of the loads of the piping systems to the structure. No additional cost to the Owner should be expected for any corrective work during construction.

W. Rigid type grooved mechanical couplings shall be complete with reverse-angle bolt pads to meet support and hanging requirements corresponding to ANSI B31.1, B31.9, and NFPA 13.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where the piping is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Coordinate with other work as necessary to interface installation of piping with other components of systems.

B. Provide and erect in a workmanlike manner, according to the best practices of the trade, all piping shown on the Drawings or required to complete the installation intended by these Specifications.

C. The Drawings indicate schematically the size and location of piping. Piping shall be set up and down and offset to meet field conditions and to provide adequate maintenance room and headroom in the Mechanical Rooms.

D. Study the General Construction Specifications and Plans, of the exact dimension of finished work and of the height of finished ceilings in all rooms where radiation, units, equipment or pipes are to be placed and arrange the work in accordance with the Schedule of Interior Finishes, as indicated on the Architectural Drawings.

E. All piping shall be run perpendicular and/or parallel to floors, interior walls, etc. Piping and valves shall be grouped neatly and shall be run so as to avoid reducing headroom or passage clearance. Provide min. 7'-6" headroom under passageway in Mechanical Equipment Room. All valves, controls and accessories concealed in furred spaces and requiring access for operation and maintenance shall be arranged to assure the use of a minimum number of access doors.

F. All piping with screwed fittings must be provided with a sufficient number of flanges or unions to enable the removal of piping without breakage of fittings.

G. All piping shall be erected to insure a perfect and noiseless circulation throughout the system. No bullhead tees will be permitted.

H. All valves and specialties shall be placed so as to permit easy operation and access.

I. Provide pipe supports within 12” of every elbow.

J. Approved bolted, gasketed, flanges (screwed or welded) shall be installed at all apparatus and appurtenances, and wherever else required to permit easy connection and disconnection. Screwed unions shall be used on piping 2" or less.

K. All piping connections to coils and equipment shall be made with offsets provided with screwed or welded bolted flanges arranged so that the equipment can be serviced or removed without dismantling the piping.

L. If, after plant is in operation, any coils or other apparatus are stratified or air bound (by vacuum or pressure), they shall be repiped with new approved and necessary fittings, air vents, or vacuum breakers at no extra cost. If connections are concealed in furring, floors, or ceilings, the Contractor shall bear all expenses of tearing up and refinishing construction and finish, leaving same in as good condition as before it was disturbed.

M. Steel pipe bends shall be made of the very best grade open hearth, low carbon steel, leaving a smooth uniform exterior and interior surface. Pipe bends shall be made with seamless steel pipe, having a minimum radius of not less than five (5) pipe diameters.

N. Tubing shall be erected neatly in a workmanlike manner. Bends in soft copper tubing shall be formed using benders to prevent deformation of the tubing in the bends. Approved seat-to-pipe threaded adapters shall be provided for junctions with valves and other equipment having threaded connections.

O. Vertical sections of main risers shall be constructed of pipe lengths welded together. No couplings shall be used.

P. The ends of all pipe and nipples shall be thoroughly reamed to the full inside diameter of the pipe and all burrs formed in the cutting of the pipes shall be removed.

Q. All piping shall be concealed above furred ceilings in rooms where such ceilings are provided (except where specifically indicated otherwise on the drawings, or in walls or partitions, except as otherwise indicated).

R. Piping, fittings or valves of dissimilar materials shall be connected with dielectric connectors as made by Ebco Company or approved equal.

S. Components including all fittings, valves, flow meters, steam traps, instrument taps, etc., used in stainless steel piping shall be of all-stainless steel construction.

T. Piping at all equipment and valves shall be supported to prevent strains or distortions in the connected equipment and valves. Piping shall be sufficiently supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without causing excessive stress or damage to the remaining piping, valves or equipment, without requiring additional supports after these items are removed.

U. Pipe nipples - Any piece of pipe 3" in length and less shall be considered a nipple. All nipples with unthreaded portion 1½" and less shall be extra heavy. Only shoulder nipples shall be used. No close nipples will be permitted.

V. Screw threads shall be cut clean and true. Screw joints made tight without caulking. No caulking will be permitted. A non-hardening lubricant shall be used. No bushings shall be used.

W. Reductions, otherwise causing objectionable water or air pockets, to be made with eccentric reducers or eccentric fittings. Reducers installed in horizontally oriented piping shall be of the eccentric type, where changes of size occur in horizontal piping to provide for proper drainage or venting.

X. Pitch steam and condensate lines downward one inch per 40 feet in direction of flow to ensure adequate flow and prevent noise and water hammer. Steam and return run outs to risers and to elements shall pitch ½" inch per foot. At low points of steam lines provide traps adequately sized to collect condensate. Mains shall be dripped at least every 100 feet of run. All supply mains shall be dripped and trapped on any vertical lift, except where otherwise noted. Provide capped dirt pockets at all traps, riser heels, and wherever dirt and scale may accumulate to meet job conditions, mains shall set up (with drip connections to return line) to maintain headroom, clear other pipes, etc. Steam mains are to be installed as high as possible. System is to be arranged to secure venting of air to the return line at all low points in steam mains, without permitting ingress of air. In any case, where return or drip piping, to meet job conditions, may have to set down under stoops, doors, etc., and again rise after passing these, the sets shall be made up with 45-degree fittings and with Y-laterals at each end, with brass plugs to permit easy cleaning of trapped portions of pipe. At any points where return mains have to rise again, after being depressed, provide also approved overhead "air lines" (not smaller than ¾ " in size) with adjusting valves, and connect with two high sides. Any turns in water sealed lines shall be made with crosses, with brass plugs in unused outlets to facilitate cleaning.

Y. Pitch water piping upward one inch per 100 feet in direction of flow to ensure adequate flow without air binding, and to prevent noise and water hammer. Pitch drain piping 5/8 inch per foot in the direction of flow. Branch connections to mains are to be made in such a manner as to prevent air trapping and permit free passage of air. To meet job conditions, mains shall set up to maintain headroom, and clear other trades. Provide oversized float operated automatic air vent (with valve). Avoid 90-degree lift set-ups in supply lines by using 45 degree ells. Where 90-degree lifts exceed 1½" install automatic air

vent in supply lines. All lifts in return lines shall be installed with automatic air vents. Pipe outlet of all automatic air vents to an open sight drain if the vent is concealed, or to within two feet of the floor within machine rooms. All water piping shall pitch back to low points for drainage. Low points shall be provided with capped ¾ inch hose cocks.

Z. Provide drain valves at the heel of all interior main water risers. Provide capped drain valves at the heel of all perimeter water risers.

AA. Provide isolation valves where tying new piping into the existing system. Refer to the valves specifications for the proper valve type for the service. Refer to the Drawings for the pipe/valve size. In addition to the isolation valves at the tie-in points, also provide a balancing valve on the supply side for chilled water, chilled glycol/brine, condenser water and heating/reheat hot water system tie-ins.

BB. Miscellaneous drains, vents, reliefs, and overflows from tanks, equipment, piping, relief valves, pumps, etc., shall be run to the nearest open sight drain or roof drain. Provide capped drain valves whenever required for complete drainage of piping, including the system side of all pumps.

CC. Provide domestic water connections from valved outlets to any equipment requiring same.

DD. All drain piping from condensate drain pans shall be properly trapped in accordance with the static pressures involved. Provide cleanout at first change in direction or before the trap. Condensate drain piping sizes shall, as a minimum, shall meet or exceed the connection size on the equipment and be not less than 1½" except that fan coil unit drains may be 1”.

EE. Vent piping from the HTHW system shall comply with all requirements of HTHW piping specified hereinbefore. This shall also apply for the HTHW safety valve discharge piping. Provide a 24” tall “water bottle”, of the same diameter as the pipe, at the top of all high points on HTHW piping systems. Provide a ¾” drain pipe off the top of all water bottles and run the drain line to 36” – 48” AFF, and terminate with double (in tandem) ¾” 600# globe valves and a ¾” male hose connection.

FF. Contractor shall utilize a Smog-Hog (or similar) type local exhaust system vented to the outdoors, when welding steel pipe and/or soldering pipe inside the building.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of piping (partial or complete) test piping to demonstrate compliance with requirements. Where possible, field correct malfunctioning piping, then retest to demonstrate compliance. Replace piping which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 23 21 23

PUMPS FOR HVAC

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The Work includes providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all pumps as shown and scheduled on the Drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this equipment with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than ten (10) years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12 "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work, and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 IN-LINE PUMPS

A. Furnish and install in-line pumps where shown on the plans and as specified.

B. The pumps shall be of the horizontal, oil-lubricated type, specifically designed and guaranteed for quiet operation. Suitable for 125# working pressure.

C. The pumps shall have a ground and polished steel shaft with a hardened integral thrust collar. The shaft shall be supported by two horizontal sleeve bearings designed to circulate oil. The pumps are to be equipped with a watertight seal to prevent leakage. The motor shall be non-overloading at any point on pump curve. Impellers shall be bronze construction.

D. The motor shall be of the open, drip-proof, sleeve-bearing, quiet-operating, rubber-mounted construction.

E. Motor efficiencies must meet or exceed that specified in Section 01 31 46.

F. All pumps in VFD application must have flexible couplings and inverter-duty motors.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where pumps are to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Add concrete under structural members of pump base and grout around the base as required by manufacturer's written instruction.

C. Coordinate with other work as necessary to interfere installation of equipment with other components of systems.

D. Install all pumps with a minimum of five (5) pipe diameters of straight pipe upstream of pump suction connections or provide a suction diffuser. If the suction diffuser is provided, it must contain an integral strainer and the Y-strainer required on the suction piping to the pump shall be omitted.

E. For any pump which, through balancing, the Contractor is not capable of achieving the design flow and pressure, impeller trimming, a new impeller and/or a new motor shall be provided at no additional cost. If a new motor is provided of larger horsepower, then any required electrical work shall also be included at no additional cost. If necessary, larger motor starters, VFDs or disconnects shall be provided along with any larger conduits, wire sizes or fuses.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment and after motor has been energized with normal power source, test equipment to demonstrate compliance with requirement. When possible, field correct

malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactory corrected. Refer to Section 23 05 93 - Test and Balancing.

B. All pump casings shall be hydrostatically tested at 1 ½ times design working pressure. The pump manufacturer shall be responsible for his service department aligning in the field prior to start-up of all flexibly coupled units. Alignment shall be with dial indicator with accuracy of plus or minus .002 inches. The pump manufacturer must submit a written report certifying that the alignment work had been performed by his personnel and that the pumps are ready for operation.

END OF SECTION

SECTION 23 25 00

WATER TREATMENT AND CLEANING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all water cleaning as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12, "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

B. Submit documentation of acceptability of chemicals for discharge to the sewer system.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 CHEMICAL TREATMENT - CONDENSER WATER SYSTEM

A. Circulating Condenser water system - provide complete chemical treatment program including corrosion inhibitor and pH control designed to meet the following requirements.

Phosphonate	6-8 ppm
Molybdate	8-10 ppm
pH	7.5 - 8.5
Cycles	10 Max. based upon raw water
Biocide	Non phenol, non oxidizing biocide for algae and slime Algicide and H.T.H. control fed to develop a minimum of 24 ppm in the circulating water for a period of 4 hours.

2.02 CHEMICAL TREATMENT CLOSED CHILLED AND HOT WATER SYSTEMS

A. Provide a Nitrite based material to maintain the following conditions in each closed water system.

	Hot Water (180EF. max.)	Chilled Water	Hot Water (250EF. max)
pH	7.5 - 9.0	7.5 - 9.0	7.5 - 9.0
Nitrite as NO2	1500 - 2000	300 - 400 ppm	300 - 400 ppm

2.03 CHEMICAL TREATMENT - CLEANING - DEGREASING

A. Provide a supervised program of cleaning and degreasing chemicals used in the specified systems prior to start-up. Sufficient chemicals shall be added to each system to establish a concentration of 120 ppm degreasing chemicals containing 20% dioctysulfocuccinate and a concentration of 240 ppm of cleaning chemical containing 15% polyacrilate and 25% diphosphonate in the water. Systems shall then be circulated for a minimum of 8 hours, dumped, flushed, and refilled, with the correct corrosion inhibitors added for operation. Strainers are to be hand cleaned after flushing.

2.04 PROPYLENE GLYCOL SYSTEMS

A. Propylene Glycol Product
1. Propylene glycol for the initial fill of the system shall be provided by the contractor.
An initial spare supply of one (1) 55 gallon drum of an inhibited industrial grade propylene glycol based permanent antifreeze shall be supplied. Additional quantities shall be purchased by the Owner as needed.
The product shall be 95% propylene glycol and shall contain multimetal inhibitors.

2.05 CLEANING OF PIPING SYSTEMS

A. Preliminary Cleaning:
1. Clean new piping internally by flushing prior to the application of pressure tests and before the chemical cleanout procedures specified herein. Provide temporary strainers at the inlet to the chilled water and hot water pumps before the start of cleaning procedures.
2. Block off and isolate circulating pumps, cooling coils, heating coils and steam traps during the preliminary flushing and draining process.
3. Thoroughly flush piping clear of foreign matter with City water under pressure, and then drain before proceeding with pressure testing. Blow down accumulations of grit, dirt and sediment at each strainer and each low point in the piping systems.
4. Clear compressed air piping of foreign matter by progressively blowing compressed air through the piping.
5. Provide bypass flush valves and required piping to permit full circulation of water during the washout of the piping systems. Close shutoff and balancing valves on branch piping to the

terminal equipment units during the washout operation to prevent water circulation through the automatic control valves.

B. Chemical Cleanout:
1. After completion of pressure testing, chemically clean internally each recirculating water system (including chilled water, hot water, and condenser water).
2. Provide temporary connections with valves to fill the piping and remaining equipment with water for the purpose of draining piping and equipment after completion of the chemical cleanout procedure. Provide temporary blind flanges and/or caps to isolate the piping and equipment noted herein.
3. Provide temporary piping connections, valves, strainers, bypasses, and blank connections where required to clean out systems. Line each strainer basket with a fine mesh nylon screen and replace the screens at the end of each day's circulation until each system is thoroughly cleaned.

C. Hot Water Heating System: Fill each system with City water; start circulation pump and vent high points manually until all air is released from the system.
1. All new recirculating water systems, both open and closed, to be filled and flushed with a solution of a non-foaming chemical detergent, to remove all foreign matter. Circulate the solution for a minimum of 8 hours and drain as rapidly as possible to remove suspended matter. Flush the system with fresh water, drain a second time and refill. After final filling, the pH of the water must not exceed the pH of the fresh incoming water by more than 0.5 pH.
2. Introduce the chemical solution into the system gradually by injecting into the suction side of the circulating pump, or by means of a bypass chemical feeder located on the discharge side of the permanent hot water secondary system circulating pump. Slowly raise and then maintain the temperature of the circulating water at 150 degrees F. by circulating through the hot water converter.
3. While the water is being heated and circulated, open each drain connection for a short flow. Repeat at hourly intervals. Replace any water drained during blowdown with chemical solution as required until air is eliminated from the system. The chemical cleanout procedure to be continuous in this manner for 2 full 8-hour periods.
4. At the conclusion of the chemical cleanout period, completely drain the entire system and allow to cool. Flush out with fresh City water prior to final activation of the system. Remove temporary equipment and strainers, reconnect permanent pump and replace items previously removed.

D. Chilled Water and Condenser Water Systems:
1. Clean these systems as described for the hot water heating systems with the following exceptions:
2. Circulate the chemically treated water at ambient temperature.
3. Accomplish the chemical cleanout during a minimum of three (3) 8-hour periods.

E. Filling of Water Systems:
1. After completion of the chemical cleanout, fill each water system with fresh water, air vent, and add chemical treatment.
2. If the outdoor ambient temperature drops to 32°F., and the danger of freeze-up exists, drain water systems.

2.06 INTERNAL TREATING OF PIPING

A. This work shall include the internal protective coating of all distribution systems on this construction such as, but not limited to, steam piping, hot water heating and cooling, chilled water and condenser water systems and components.

B. This method of treating is to be applied to all piping supply and return and then back to the source of equipment.

C. The Contractor shall clean the piping for the purpose of removing lime, oil, grease, oxides and other wastes therefrom. After the removal of these impurities, a protective coating shall be applied to all inner surfaces, which will inhibit oxidation as well as protect the metals against impurities that may be present in the water. This coating shall be guaranteed for five years from date of completion at no cost to the Owner, covering labor and materials. Valve-off heat exchangers to avoid coating surfaces.

D. The treating materials use for this purpose must have been in use successfully for at least five years in comparable systems.

E. It shall be compounded of non-corrosive, non-toxic, non-alkaline and non-injurious ingredients that have been investigated and reported as a "Neutral Compound" by a recognized engineering firm or laboratory, other than the submitting company's own laboratory. Brochures and unbiased test reports shall be submitted to the Architects within 90 days from job acceptance for approval. This treating firm shall show proof, that said firm has been established and accepted for this work, for a minimum of 10 years. The ingredients used shall have no deleterious effects on seals, O-rings, glands, packing, etc.

F. It shall be the sole responsibility of the approved firm for the application of this process. He shall supply all labor, materials, and equipment for this purpose. A competent supervisor and/or equipment operator shall be kept at the site from commencement of his work until completion. None but experienced men shall provide treating of piping. Any repairs or servicing of components of these systems shall be done by the Contractor.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install water treatment equipment where shown or specified, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that water treatment systems comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of water treatment equipment with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts of motors and equipment within tolerances recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, and after motors have been energized with normal power source, test equipment to demonstrate compliance with requirements. When possible, field correct

malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION

SECTION 23 31 13

SHEET METAL DUCTWORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and make ready for operation by the Owner, all Sheet Metal Ductwork as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Fabrication and installation shall be by a single firm specializing and experience in metal ductwork for not less than 10 years.

B. Comply with SMACNA's (Sheet Metal and Air Conditioning Contractors National Association) 2005 HVAC Duct Construction Standards, Metal and Flexible, Third Edition recommendations for fabrication, construction and details and installation procedures, except as otherwise indicated.

C. Comply with ASHRAE (American Society of Heating Refrigeration and Air Conditioning Engineers) recommendations, except as otherwise indicated.

D. Compliance to SMACNA and ASHRAE is a minimum requirement. In case of disagreement between sheet metal work described in this Section and SMACNA or ASHRAE, the specification shall govern.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work and submit shop drawings and coordinate drawings.

B. Before submitting any sheet metal drawings, submit a complete set of shop standards for review and approval. Sheet metal shop drawings may be submitted only after approval of the shop standards.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical work.

B. Contractor will guarantee all work for one year from the date of acceptance against all defect in material, equipment and workmanship. This guarantee shall include repair of damage to any part of the premises resulting from leaks or other defects in material, equipment or workmanship.

1.07 PRODUCT HANDLING

A. Protect shop fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Protect ends of ductwork and prevent dirt and moisture from entering ducts and fittings.

B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclosed with waterproof wrapping.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR DUCTWORK

A. Furnish and install the size, connections and run of ducts as indicated on the drawings.

B. While the Drawings shall be adhered to as closely as possible, the Architect's right is reserved to vary the run and size of ducts during the progress of the work if required to meet structural conditions.

C. Install all ductwork in strict adherence to the ceiling height schedule indicated on the Architect's Drawings. Consult with the Plumbing, Fire Protection and Electrical Contractors and, in conjunction with the above Contractors, establish the necessary space requirements for each trade.

D. The sheet metal ductwork shall, whether indicated or not, rise and/or drop and/or change in shape to clear any and all conduits, lighting fixtures, piping and equipment to maintain the desired ceiling heights and to provide adequate maintenance room and headroom in mechanical equipment rooms.

E. The ductwork shall be continuous, with airtight joints and seams presenting a smooth surface on the inside and neatly finished on the outside. Ducts shall be constructed with curves and bends so as to affect an easy flow of air. Unless otherwise shown on the Drawings, the inside radius of all curves and bends shall be not less than width of ducts in plane of bend.

F. All rectangular ductwork, unless otherwise noted, shall be built from galvanized sheet steel and thoroughly braced and stiffened.
   1. Provide 18" x 18" access doors for every 30'-0" run of supply and return air duct for cleaning purposes. For ducts whose height or width is less than 20", provide access doors which are 18" wide by a height calculated as 2" less than the height of the duct (thereby providing 1" of clearance between the bottom of the access door and the bottom of the duct, and similar for the top).

G. All air ducts exposed to the weather and not insulated shall be constructed of aluminum or stainless steel and shall be properly braced and supported and secured to the building construction. All seams shall be sealed with Foster 32-19, Childers CP-146 or 3M EC-800 sealer.
   1. The construction of ductwork shall be same as conventional ductwork except where transverse reinforcing angles not required, provide 1" x 1" x ⅛" black iron bracing angles matched angles at joint and 1" x 1" x ⅛" black iron between joints 4'-0" from joints.
   2. Provide ⅛" thick gasket (3M EC-1202 or equal) for all matched angles.
   3. Edge of ducts shall be bent ½" over matched angles to obtain watertight seal.
   4. Rivet angles to duct and seal with Foster 32-19, Childers CP-146 or 3M EC-800 sealer.
   5. Paint black iron angles after installation.

2.02 DUCT PENETRATION THRU FLOOR

A. Provide 4" high and 4" wide concrete curb all around opening at duct penetration thru floors. Fill in space between duct and floor construction with mineral wool.

2.03 DRAIN PANS

A. Drain pans for cooling coils shall be aluminum or stainless steel with welded seams and joints and shall be rigidly braced with stiffening angles.

B. Each coil section composing the coil bank of a built up unit shall have an individual drain pan extending 9" on both sides of the coil with a minimum 2" vertical lip downstream of the coil. The top edge of the lip shall be turned backward. The pans shall be connected with piping tube to permit drainage to the bottom drain pan. Pans shall be pitched to the drain. As an alternate to aluminum, 14 gauge stainless steel, all welded, may be used.

C. Provide insulation under drain pans for cooling coils, consisting of 2" thick rigid insulation.

2.04 DRIP PANS

A. Provide aluminum drip pans and gutters under all equipment subject to leaks mounted above electrical equipment. Each drip pan shall be properly pitched and a drain outlet provided and piped to drain. See "Drip Pans" under Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

2.05 AUXILIARY AND SECONDARY DRAINS

A. A secondary/auxiliary drain pan shall be provided below air handling and fan coil units providing cooling which are suspended above a hung ceiling or hung from the slab or building structure above with no hung ceiling.

B. Requirement for secondary/auxiliary drain pans shall not apply to units hung in mechanical equipment rooms.

C. The secondary/auxiliary drain pan shall comply with the following:
1. Shall have a separate drain line from the primary drain pan in the unit
2. The drain line shall be piped to the nearest floor drain or slop sink, if not, specifically routed and shown on the drawings
3. Drain pan shall have a minimum depth of 1.5 inches and shall be not less than 3 inches larger than the unit or coil dimension width and length
4. Pan shall be galvanized steel minimum thickness 0.0276 inches[1]

2.06 MISCELLANEOUS DUCTWORK

A. Where humidifier in the ductwork is called for that portion of ductwork shall be 18 gauge stainless steel 4'-0" upstream and downstream welded with flanged joints.

B. All ductwork on downstream side of terminal humidifiers including humidifier section shall be for the entire run to the diffusers, stainless steel, sealed type 304 watertight with Foster 32-19, Childers CP-146 or 3M EC-800 sealer or approved equal. Gauge of stainless steel duct shall be same as for steel duct. Terminal humidifiers are defined as humidifiers located in the branch ductwork of an air conditioning unit. Aluminum may be used as an alternate to stainless steel.

2.07 INSTALLATION OF HVAC DEVICES

A. Installation of Duct Smoke Detectors: Duct smoke detectors shall be furnished by the Electrical Contractor and shall be installed in the ductwork under this Section. Provide an access door to each smoke detector.

B. Installation of Dampers: Refer to Drawings and temperature control specification for smoke dampers and other automatic dampers and install them in ductwork.

C. Installation of variable air volume system control devices: Install in sheet metal ductwork all control devices furnished by the manufacturer of the variable air volume system controls. Provide an access door at each location.

2.08 DUCT FABRICATION

A. Ducts shall be neatly finished on the outside with all sharp edges removed.

B. Inside surfaces shall be smooth with no projections into the air stream except where otherwise indicated.

C. Longitudinal joints shall be Pittsburgh lock at corners or Acme lock on flat surfaces double seams hammered tight and shall be located above the horizontal axis of the duct. A snap lock seam shall not be permitted as a substitute for the Pittsburgh lock at corners of ducts.

D. Transverse joints shall be made airtight with all laps in the directions of air flow.

E. All fasteners and attachments shall be made of the same material as the ducts.

F. Furnish test wells 12" on the center horizontally and vertically in the suction and discharge duct of each fan. Test wells shall consist of a 1" x ¾", 125 lb., bronze, screwed hex bushing, secured to the duct with a bronze hex locknut on the inside of the duct. A ¾" x 2" long standard weight bronze, screwed nipple and cap shall be fitted to the housing on the outside of the duct. Test wells shall be No. 699 as made by Ventlok or approved equal.

G. All turns in ductwork shall be accomplished using radius elbows rather than square elbows. Square elbows will only be permitted in instances where the Contractor, through depiction on their sheet metal shop drawings, proves that only a square elbow may be installed due to such limited space availability. All radius elbows shall have a minimum centerline radius of 12 times the width of the duct.

H. All square elbows shall have factory-designed and built single thick turning vanes. Shop fabricated vanes will not be approved. Where turning vanes are in conflict with the access doors to fire dampers, they shall be made movable so that fire dampers shall be accessible.

I. Dissimilar metals shall be connected with flanged joints made up with fiber or neoprene gaskets to prevent contact between dissimilar metals. Flanges shall be fastened with bolts protected by ferrules and washers made of the same materials as the gaskets. Where an aluminum duct is to be connected to a galvanized steel duct, the end of the galvanized steel duct shall be coated with heavy black asphaltum paint before connecting it to the aluminum duct.

J. Changes in shape and dimension shall conform to the following: Except where otherwise noted, for increases in cross-sectional area, the shape of the transformation shall not exceed 1" in 7". Except where otherwise noted, for reductions in area, the slope shall not be less than 1" in 4" but 1" in 7" preferred.

K. Wherever it may be necessary to make provisions for vertical hangers of the ceiling construction passing through ducts, provide streamlined shaped sleeves around such ceiling construction hangers as to fully

protect the duct from being penetrated with holes for the passage of such hangers. Any such streamlined sleeves shall be made air tight at top and bottom of ducts. In no case shall there be more than two rods in any 9 sq. ft. area. No rods shall pierce ducts smaller than 12" in horizontal area.

L. Ductwork shall be constructed in accordance with the latest version of the SMACNA Duct Construction Standards for both rectangular and round duct. The duct Pressure Class for each duct system shall be determined from the maximum possible (shut-off) static pressure achievable by the supply, return or exhaust fans, and in no instance shall the minimum pressure class be lower than 1" WC. The Sheet Metal Subcontractor shall obtain the associated fan curves from the Mechanical Contractor in order to confirm the maximum static (shutoff) pressure of the fan(s). This pressure class shall extend from the air handlers to the first automatic damper (including fire dampers, smoke dampers and combination fire/smoke dampers). For VAV systems, the pressure class of the ductwork between the first automatic damper and the VAV or CV boxes shall be equal to the external static pressure (ESP) rating of the fan.[2]

M. Seal Class: All ductwork shall be sealed to SMACNA Seal Class A, with no exceptions.

N. Ductwork Testing:
1. The intent is to test all ductwork and all ducted systems. All ductwork shall be tested in accordance with SMACNA Procedures, including SMACNA Duct Performance Test Standard m DPTS-1995 and the latest editions of the SMACNA HVAC Duct Construction Standards and the SMACNA HVAC Air Duct Leakage Test Manual.
2. Additional requirements for all ductwork:
    a. The testing of all joints for air leakage after erection and the repair of any leaks are positive requirements. Leakage must be kept to a specified minimum. The test for air leakage is divided into two phases; namely, testing of individual vertical risers and testing of all branches. Provide all required instruments.
    b. All risers, branches and runouts shall be tested after installation before insulation is applied and before the air mixing units are installed. The total allowable leakage for the entire system shall be tested, measured and proven to be in accordance with Table 4-1, Applicable Leakage Classes, of the SMACNA HVAC Air Duct Leakage Test Manual; joints, seams and all wall penetrations shall meet Leakage Class 6 for rectangular ducts and Leakage Class 3 for round ducts.
    c. Equipment necessary for performing this test shall include a rotary hand blower calibrated orifice section and a “U” tube gauge board complete with cocks and rubber tubing. The test hookup, as well as details for the fabrication of the orifice section shall be in accordance with the recommendation of the “High Velocity Duct Manual” of Sheetmetal and Air Conditioning Contractors National Association, Inc.

O. The construction for low pressure rectangular sheet metal ducts shall be made in accordance with recommendations of ASHRAE Guide, Latest Edition, or as per SMACNA Manual but not less than the following weights and construction:

LOW PRESSURE - RECTANGULAR DUCTWORK				
Dimension Longest Side Inches	Sheet Metal Gauge All Four Sides			Transverse Reinforcing at Joints and Between Joints
	Steel Gauge	Aluminum Thickness In.	Copper Oz. Per Sq. Ft.	
Up thru 12	26	0.020	16	1" pocket lock 24 gauge, standing seam joint 24 gauge, 1" standing S slip 24 gauge. Joint max. on 8 ft. centers.
13 thru 18	24	0.025	24	Same as for up thru 12.
19 thru 30	24	0.025	24	1" pocket lock 22 gauge. Joints max, on 8 ft. centers with 1 x 1 x ⊂ in. angles 4 feet from joint.
31 thru 42	22	0.032	32	Same as for 19 thru 30.
43 thru 54	22	0.032	32	1" standing S slip 22 gauge with 1½" x 1½" x ⅛ in. angles, 1½" standing seam joint, 1½" pocket lock 22 gauge. Joints on 8 ft. centers with 1½" x 1½" x ⅛ in. angles max. 4 feet from joint.
55 thru 60	20	0.040	36	Same as for 43 thru 54.
61 thru 84	20	0.040	36	1" standing S slip gauge with 1½" x 1½" x ⅛ in. angles, 1½ standing seam joint, with 1½" x 1½" x ⅛ in. angels, 1½" in. pocket lock 22 gauge with 1½" x 1½" x ⅛ in. angels. Joints max. on 8 ft. centers with 1½" x 1½" x ⅛ in. angels max on 2 ft. centers.
85 thru 96	18	0.050	48	Same as for 61 thru 84 except all angles shall be 1½" x 1½" x 3/16 in.
over 96	18	0.050	48	Same as for 61 thru 84 except all angles shall be 2 x 2 x ¼ in.

1. Flat areas of duct over 18 in. wide shall be stiffened by cross breaking of beading.
2. All joints to have corner closures.
3. All joints (longitudinal and transverse) shall be sealed with Foster 32-19, Childers CP-146 or 3M EC-800 mastic or equal UL181A approved mastic, to provide sealing equivalent to SMACNA Seal Class A.

P. The construction for low pressure round sheet metal ducts and fittings shall be as follows:

Girth Reinforcing			
Duct Diameter Inches	Steel-Galv Sheet Gage	Minimum Reinforcing Angle Size & Maximum Longitudinal Spacing	Girth Joints (Continuously Welded or as Below)
Up thru 8	26	None required	Crimped and beaded joint
9 thru 13	26	None required	Crimped and beaded joint
14 thru 22	24	None required	Crimped and beaded joint
23 thru 36	22	None required	--
37 thru 50	20	1¼ x 1¼ x ⅛ @ 72 in.	--
51 thru 60	18	1¼ x 1¼ x ⅛ @ 72 in.	--

Girth Reinforcing			
Duct Diameter Inches	Steel-Galv Sheet Gage	Minimum Reinforcing Angle Size & Maximum Longitudinal Spacing	Girth Joints (Continuously Welded or as Below)
61 thru 84	16	1½x 1½ x ⅛ @ 72 in.	--

NOTE: Flanged joints may be considered as girth reinforcing.

1. Ductwork up to 36 in. diameter shall be spiral lockseam construction and it shall be assembled with prefabricated fittings made up of 20 gauge galvanized iron.
2. All joints (longitudinal and transverse) shall be sealed tight with EC-800 to provide sealing equivalent to SMACNA Seal Class A. Joints shall, in addition, be fastened with self-tapping screws.

2.09 BUILT-UP CASINGS

A. All air casings and plenums shall be constructed of No. 16 gauge galvanized iron braced and stiffened on outside by means of 2" x 2" x ¼" galvanized steel angles, or with 16 gauge standing seam panels not to exceed 26" in width. Standing seams are to have additional right angle bend and shall be capped with No. 18 gauge galvanized "U" cap over entire length of seam. All joints shall be caulked to make them airtight. The bottom of all air chambers at the floor shall be gasketed to prevent air leakage.

B. All air casings or transition sections on the discharge side of medium pressure or high pressure fans shall be air tight at coils by completely enclosing the coils in the casing.

C. Casings shall be supported on floor curbs. The bottom of all air casings at the floor and at any other connection to masonry shall be riveted to 1½" x 1½" x ⅛" galvanized steel angles which have been secured to masonry with expansion shields and caulked tight with cement.
1. Provide angles above and below access doors and frames for access doors.
2. See "Access Doors in Sheet Metal Work" for construction of doors.
3. Provide holes on angles spaced at 15" maximum centers to allow fastening of insulation.
4. This Contractor shall be responsible for any additional bracing required for stiffness including roof deck of casings. The roof deck shall be braced and supported from the ceiling slab, if required for stiffness.

D. Built-up casings and transition sections on the discharge side of medium pressure or high pressure fans shall be airtight at coils by completely enclosing the coils in the casing.

2.10 DAMPERS

A. At each main branch take-off and in such other locations where required to properly balance the system, provide volume dampers of the opposed blade, multi-louvered type, which shall be operated by indicating locable quadrants and set screws, for adjusting the system.

B. Volume dampers shall be constructed as follows: Damper blades shall not be wider than 12", shall be complete with heavy angle iron frames, connecting and operating links, brass trunnions, and bronze bearings. Dampers, unless otherwise noted, shall be fabricated with not less than No. 16 gauge sheet steel. Blades shall overlap and shall be provided with continuous stops on all four sides of dampers to prevent leakage. Blades shall be galvanized. Blades of dampers shall be set into a flat steel frame with frame securely bolted to the duct. All dampers shall be fitted with a hexagonal brass spindle which shall extend through the exterior of duct and be fitted with an indicating self-locking regulator. Regulator shall

be similar to Ventlok 641 or approved equal. All hardware shall be Ventlok or approved equal. For insulated ductwork provide No. 644 self-locking regulator as made by Ventlok or approved equal.

C. All automatic dampers shall be furnished as a part of the automatic temperature control system by the automatic temperature control manufacturer. Install dampers and provide safing in ductwork for automatic dampers smaller than duct size.

D. For stainless steel and aluminum ductwork, provide dampers of same material as ductwork.

E. All dampers shall be made accessible from building construction. Access doors in building structure shall be furnished or provided as herein before specified.

2.11 SMOKE DAMPERS

A. Smoke dampers shall be classified and labeled in accordance with UL 555S, "Standard for Leakage Rated Dampers for Use in Smoke Control System." Smoke dampers shall be of UL 555 S leakage class I, 4 CFM/Ft^2 at 1" w.g.; 8 CFM/Ft^2 at 4" w.g.

B. Smoke dampers installed at smoke barriers shall be installed no more than 2 ft. from the barrier and between any branch takeoff or duct inlet and outlets and the smoke barrier.

C. Smoke dampers shall be automatically return to closed position in the event of loss of electricity. All wiring required to interconnect the dampers with fire detection, fire alarm and fire alarm supervisory control systems shall be provided under the Division 26 of the Specification. Pneumatic control system for damper actuators shall be provided under Section 23 09 00, as specified hereinafter. All combination fire/smoke dampers and smoke dampers shall be provided with 120 VAC actuators. Power wiring for all combination fire/smoke dampers and all smoke dampers shall be through the fire alarm system control relay and through a BAS relay and control module. The Electrical Contractor shall provide all such wiring; the ATC Sub-Contractor shall provide a BAS relay which must be installed for each combination fire/smoke damper and each smoke damper. If the air handling system is shut down, all associated combination fire/smoke dampers and all smoke dampers shall close. The fire alarm relay shall, if necessary, override the BAS relay. Each damper shall be individually powered and controlled.

D. Smoke dampers shall be constructed as described above for dampers.

E. Damper actuators shall be as specified in Section 23 09 00.

F. For fire/smoke dampers, provide two (2) damper end switches that are blade actuated to signal the fire alarm system when dampers are in the open and closed position. For smoke and fire/smoke dampers which can isolate a fan from its distribution ductwork or as otherwise required by the Sequence of Operation, provide an additional end switch which shall be wired to the fan starter (VFD) control wiring to prevent the fan from operating unless the damper is open.

G. Apply a bead of sealant between damper and sleeve and between dampers for multiple damper assemblies, as defined below for combination smoke and fire dampers.

2.12 FIRE DAMPERS

A. Fire dampers and sleeve installation shall be in accordance with NFPA-90A recommendations and shall bear U.L. Label in compliance with U.L. 555.

B. Clearly indicate fire damper location on shop drawings. Provide access doors in the ducts and supply access doors or panels at building construction at each damper of sufficient size and type to permit

inspection and replacement of linkage. Assume responsibility to coordinate all locations of duct access doors with the other Contractors to conform with whatever architectural access openings may be necessary and supply access doors or panels in building construction. Provide shop drawings indicating location of access panels or doors for Architect's approval.

C. It is the intention of these plans and specifications to be complete. However, it is the responsibility of the Contractor, as being completely cognizant of local regulations, to determine where fire dampers are required and to advise the Architect prior to construction as to any discrepancies or questions in the plans or specifications.

D. Fire dampers shall be enclosed in sleeve of fourteen gage metal. Sleeve shall be secured at both sides of fire partitions with 1½ x 1½ x 14 ga. mounting angles secured to sleeves only: retaining angles must lap structural opening 1" minimum and cover corners of opening. Provide duct breakaway connections, see detail on drawings. Breakaway connections shall be located within 6 inches of the fire wall on both sides of the fire wall.

E. Dampers shall be steel plate, mounted to turn freely, in steel plate frame inserted in duct. Dampers shall be proportioned and weighted to close at once, if released from link with spring catches to hold closed, until manually reset. Dampers and frames to have suitable standard fusible-links, normally holding them open, but releasing upon contact with fire. Damper blades shall be mounted on corrosion resisting bearings. Damper shall close by gravity, moving with the air stream to full closed position against one-eighth (⅛) inch angle stop. Steel spring catch shall hold damper closed. Radius arm on shaft shall show position of damper. Submit details for approval.

F. Fire dampers shall be as made by Greenheck, Ruskin or approved equal, U.L. labeled.

G. Damper shall be fully out of the air stream (type B) U.O.I.

H. In stainless steel and aluminum ductwork, provide stainless steel construction fire dampers.

2.13 COMBINATION SMOKE AND FIRE DAMPERS

A. In lieu installing separate fire and smoke dampers in fire walls with a rating of two hours or less, a combination fire/smoke damper can be installed. Fire walls with a rating exceeding two hours must use separate fire and smoke dampers.

B. Combination fire/smoke dampers shall be model FSD36 as manufactured by Ruskin, Lau, Arlan Damper Corp. (631-589-7431) or approved equal.

C. Combination fire/smoke dampers shall be installed in sleeves in accordance with NFPA-90A, UL555 and manufacturer's installation instructions. Dampers shall be UL rated, UL555S, leakage class II, 4 CFM/Ft^2 at 1-inch w.g.; 8 CFM/Ft^2 at 4" w.g., and UL555 1½ hour fire rated. Each damper shall bear a UL label attesting to these qualifications, in accordance with established UL labeling procedure.

D. Damper manufacturer shall have tested and qualified with UL, a complete range of damper sizes covering all combination smoke and fire dampers required for this project.

E. Damper actuators shall be pneumatic or electric as specified in Section 23 09 00. Damper actuators shall be installed by the damper manufacturer at the time of damper fabrication; damper and actuator shall be supplied as a single entity which meets all applicable UL555S qualifications for both dampers and operators. Damper and actuator shall be qualified under UL555S and UL555 to an elevated temperature of 250 deg. F.

F. Each combination fire/smoke damper shall be equipped with a fusible link which shall melt at 165° F causing the damper to close and lock in the closed position.

G. Dampers shall automatically return to closed position in the event of loss of control air or electric power.

H. Each combination fire/smoke damper shall have a factory installed sleeve of length and gauge required for satisfactory installation and with the damper actuator factory installed on the exterior of the sleeve and properly linked to the damper operating shaft. Contractor shall coordinate space requirements where dampers are located, providing required service clearance for actuators.

I. All wiring required to interconnect the dampers with fire detection, fire alarm and fire alarm supervisory control systems shall be provided under the Division 26 of the Specification. Pneumatic control system for damper actuators shall be provided under Section 23 09 00, as specified hereinafter. All combination fire/smoke dampers and all smoke dampers shall be provided with 120 VAC actuators. Power wiring for all combination fire/smoke dampers and all smoke dampers shall be through the fire alarm system control relay and through a BAS relay and control module. The Electrical Contractor shall provide all such wiring; the ATC Sub-Contractor shall provide a BAS relay which must be installed for each combination fire/smoke damper and each smoke damper. If the air handling system is shut down, all associated combination fire/smoke dampers and all smoke dampers shall close. The fire alarm relay shall, if necessary, override the BAS relay. Each damper shall be individually powered and controlled.

J. For fire/smoke dampers, provide two (2) damper end switches that are blade actuated to signal the fire alarm system when dampers are in the open and closed position. For smoke and fire/smoke dampers which can isolate a fan from its distribution ductwork or as otherwise required by the Sequence of Operation, provide an additional end switch which shall be wired to the fan starter (VFD) control wiring to prevent the fan from operating unless the damper is open.

K. Clearly indicate fire damper location on shop drawings. Provide access doors in the duct and supply access doors for installation at building construction, at each damper, of sufficient type to permit inspection and replacement of damper actuators and linkage. Assume responsibility to coordinate all locations of access doors with other contractors. Provide shop drawings indicating locations of access doors, both duct and building construction, for Architect's approval.

L. It is the intention of these plans and specifications to be complete. However, it is the responsibility of the Contractor, as being completely cognizant of local regulations, to determine where combination fire/smoke dampers are required and to advise the Architect prior to construction as to any discrepancies or questions in the plans or specifications.

M. Combination fire/smoke dampers shall be enclosed in a sleeve of fourteen gauge metal set and grouted into the fire partition. The sleeve shall be secured on both sides of the fire partition with 1½ x 1½ x 14 gauge mounting angles secured to the sleeves only. Retaining angles must lap structural opening 1 inch minimum and cover corners of the opening.

N. Multiple damper assemblies shall be installed and fastened together per manufacturers instructions. Unless the manufacturer's instructions indicate otherwise multiple damper assemblies shall be fastened together with ¼"-20 bolts, No. 10 screws or ½" long welds staggered intermittently on both sides. Fasteners shall be spaced 6" on center and a maximum of 2" from the ends of the joining sections or from the corner. A continuous ⅛" bead of Dow-Corning 100% silicon rubber, Dow-Corning Selastic 732 or GE RTV 108 sealant shall be applied on the mullion joint. Press the surface of the sealant in place to dispel any air.

O. A bead of sealant, as described above, shall be applied between the damper and the sleeve.

P. Fire/smoke dampers shall be provided with end switches (Ruskin SP100 or equal) for status indication.

Q. In stainless steel and aluminum ductwork, provide stainless steel construction combination fire/smoke dampers.

2.14 ACCESS DOORS IN SHEET METAL WORK

A. Wherever necessary in ductwork, casings or sheet metal partitions, provide suitable access doors and frames to permit inspections, operation and maintenance of all valves, coils, humidifiers, controls, smoke dampers, smoke detectors, fire dampers, filters, bearings, traps, or other apparatus concealed behind the sheet metal work. All such doors shall be of double construction of not less than No. 20 gauge sheet metal and shall have sponge rubber gaskets around their entire perimeter. Doors in insulated ducts of insulated casings shall have rigid insulation between the metal panels.

B. All access doors in sheet metal ducts shall be hung on heavy flat hinges and shall be secured in the closed position by means of cast zinc clinching type latches. Where space conditions preclude hinges, use four heavy window type latches. Doors into ducts shall in general not be smaller than 24" x 24" except for access door to fire dampers which will depend on size of fire damper.

C. In no case shall access to any items of equipment requiring inspection, adjustment, or servicing require the removal of nuts, bolts, screws, wing nuts, wedges, or any other screwed or loose device.

D. Each sheet metal chamber or plenum shall have access doors for access to all parts of the system (outside air intake, exhaust and return air). Doors shall be fitted with cast zinc door latches, two per door. Latches shall be operable from both sides of casing. Hinges shall be extra heavy, zinc plated hinges, minimum of two per door. The doors shall be felted or provided with rubber gaskets so as to make them airtight. The doors shall be made with inner and outer shells 2 inches apart so that they may be properly insulated and properly operated. Doors shall be a minimum size of 20" x 48".

E. Hinges shall be Ventlok No. 150 or 260 with or without screw holes or approved equal. Latch for walk-in access doors shall be No. 260 as made by Ventlok Co. or approved equal. Latch for access door in ductwork shall be Ventlok No. 100 or approved equal.

F. Where reheat coils are installed in ductwork, provide two (2) access doors; one on the upstream side of the coil and one on the downstream side of the coil, both within 2'-0" of the coil.

G. Access doors at humidifier locations shall be provided on both sides of duct.

H. Provide access doors of adequate size to allow easy access to the equipment that will require maintenance. Provide insulated or acoustically lined doors to prevent condensation where applicable.

I. Manufacturer to provide an installed neoprene gasket around perimeter of access door for airtight seal.

J. Systems 3” w.g. or less shall utilize a hinged, cam, or hinged & cam square-framed access door.

K. Systems 4” w.g. and above shall utilize a sandwich-type access door. Construct doors in accordance with Figure 7-3 of the 2005 SMACNA Manual, HVAC Duct Construction Standards, Metal & Flexible Third Edition.
   1. Approved Manufacturer: Ductmate Industries Sandwich style door or approved equal.

2.15 FLEXIBLE CONNECTIONS

A. All fan and air supply unit connections, both at inlet and discharge shall be made with material as hereinafter specified, so as to prohibit the transfer of vibration from fans to ductwork connecting thereto.

B. The flexible connections shall be a minimum of 6" long including bands using extra wide fabric as specified and held in place with heavy metal bands, securely attached, to prevent any leakage at the connection points.

C. Flexible connections shall be fabricated from the following materials unless otherwise required by Local Authorities.
1. Low Pressure Systems - neoprene coated glass fabric - 30 ounce/sq. yd.

D. Flexible connections shall not be painted.

E. Flexible air connectors shall be listed and labeled to the requirements of UL 181 for class 0 or class 1 flexible air connectors and shall be so identified.

2.16 GRILLES, REGISTERS AND DIFFUSERS

A. Furnish and install where shown on the drawings all metal diffusers, grilles and registers of the sizes and capacities indicated.

B. Ceiling diffusers shall be selected to diffuse the air uniformly throughout the occupied space. The air shall be introduced at a temperature differential of 20 deg. F and shall be diffused at the five (5) foot level to a velocity of not greater than 50 FPM and a temperature differential of not greater than 2 deg. F when compared with mean room temperature. The sound power level of air distribution equipment devices shall not exceed ratings as shown in the schedule.

C. Equipment manufacturer shall submit engineering data in a manner to facilitate convenient review of the following factors:
1. Aspiration ability, including temperature and velocity traverses, throw and drop of each unit, noise criteria ratings for each unit, sizes, free area and quality of construction.

D. All air distribution equipment shall be as scheduled on plans.

E. All ceiling diffusers shall be furnished with an equalizing grid.

F. Location of ceiling diffusers and registers shown on the drawings are approximate. Coordinate with the acoustic tile ceiling Sub-Contractor for exact locations of ceiling diffusers and registers. They shall be in accordance with approved ceiling layout shop drawings.

G. Return grilles shall be as per drawings or approved equal.

H. All registers, grilles and diffusers shall be coated with baked aluminum enamel, baked flat white (W-1), or baked gloss white (W-4) as per drawings or approved equal. All supply registers and grilles shall have a ¼" sponge rubber gasket around the grille frame.

I. All grilles, registers and diffusers shall be provided without an integral shut-off damper.

J. Exceptions to foregoing types of grilles, registers and diffusers shall be as indicated on the plans.

K. Each air supply outlet shall have the required capacity and shall be guaranteed to give the required draft with draftless diffusion. Where manufacturer's recommendations require duct sizes differing from those on the drawings, the same shall be provided at no additional cost to the Owner.

L. All registers and grilles located at face of partitions or plaster line of ceilings or soffits, etc. shall have plaster frames.

M. Relocations of ceiling diffusers or registers in order to match the ceiling tile layout shall be made at no additional cost to Owner.

2.17 NON-ASPIRATING CEILING DIFFUSERS

A. The air distribution and panels shall be as manufactured by Multi-Vent Anemostat Products and be of the type in use for more than 10 years.

B. Access to the valving mechanism shall be through the removal of the ceiling tile located directly below the framing mechanism. The perforated distribution ceiling tile shall be provided and shall contain not less than 12% or more than 15% free area.

C. The subduct with 7" diameter collar will be spot welded to the frame. Each panel will be supplied completely assembled ready for application and to be applied per manufacturer's recommendation.

D. Panels are to be painted with a white baked epoxy paint.

E. Each panel shall deliver up to 25 CFM/sq. ft. with a pressure drop not exceeding .12" with an N.C. of 35.

F. Make final adjustments for air volume and provide air tight installation.

G. Duct sizes indicated on drawings are clear inside dimensions. Increase sheet metal sizes as required to install acoustic lining.

[3]Do not install lining within 5'-0" (downstream and upstream) of humidifier in ductwork. This portion of ductwork shall be externally insulated.

2.18 ACOUSTICAL PERFORMANCE SPECIFICATIONS - GENERAL

A. It is the intent of this Specification that noise levels due to air conditioning and/or ventilating equipment, ducts, grilles and registers, diffusers and air light fixtures, will permit attaining sound pressure levels in occupied spaces conforming to the following NC curves as explained in the ASHRAE Guide and Data Book.

Room Type	**NC Level**
Patient and Exam Rooms	NC 30-40
Doctors’ Offices	NC 30-40
Museum Gallery	NC 25-35
Operating Rooms	NC 35-45
Testing/Research Labs	NC 40-55
Group Teaching Lab	NC 35-45
Offices and Conference Rooms	NC 25-35
Teleconference Rooms	NC 25 (max)
Corridors and Public Spaces	NC 35-45

Auditoria/Large Lecture	NC 25-35

B. Grilles, Registers, Diffusers
1. The maximum permissible sound power levels of air terminal devices when installed and operating per plans and specifications shall be as follows:

Maximum PWL re 10-12 Watts			
Octave Band	NC-30	NC-35	NC-40
1	62	64	66
2	52	56	60
3	44	49	54
4	41	46	51
5	38	43	48
6	37	42	47
7	36	41	46
8	37	42	47

C. Sound Power Levels for air outlets and inlets shall be tested in accordance with ASHRAE Standard 70.

2.19 ACOUSTICAL PERFORMANCE WITHIN EQUIPMENT SPACES

A. Equipment room noise levels and noise transmission to adjacent buildings shall comply with all Federal, State, and City Noise Ordinances.

B. Motor Acoustical Performance:
1. Motor drives for pumps and refrigeration machine when installed per plans and specifications shall operate with noise levels not to exceed 80 dbA.
2. Noise levels shall be determined in accordance with IEEE Standard #85 test "procedure for Air-Borne Noise Measurements on Rotating Electric Equipment".

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where ductwork is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF DUCTWORK

A. Install ductwork in accordance with recognized industry practices, to ensure that ductwork complies with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation or ductwork with other components of systems.

C. Duct sizes shown on the drawings at connection to fans or other equipment may vary in actual installation. Contractor shall provide transition pieces as required.

D. Ducts, casings and hangers shall be installed straight and level and shall be free of vibration and noise when fans are operating.

E. Ducts at ceilings shall be suspended from inserts in concrete slabs except where otherwise indicated. Inserts shall be Grinnell Fig. 279, 282, or 152 as required. Ducts at floor shall be supported by steel angles suitably anchored to floor construction. Each duct shall be independently supported and shall not be hung from or supported by another duct, pipe, conduit or equipment of any trade.

F. Supports shall be placed at each joint and change in direction up to a maximum spacing of 8 feet on centers. Prevent buckling of ductwork.

G. All fastenings to building structure shall be adequate to insure permanent stability of sheet metal work and shall be capable of resisting all applied forces.

H. Vertical ducts in shafts or passing through floors shall be supported by steel angles or channels, welded, riveted, screwed or bolted to ducts and fastened to building structural members at each floor level. Provide safing to close all floor openings around ductwork - pack annular space with rockwool and 18 gauge sheet metal safing. Floor openings in plenums shall have ½ inch diameter steel bars.

I. Rigid connections between ductwork and non-rotating equipment shall be made with flanged joints, sealed with fireproof material (Fiber or Neoprene gaskets).

J. It is the intent to obtain low pressure ductwork construction with minimum leakage. The construction noted in Specifications can produce low or high leakage rates, depending upon the workmanship, particularly with regard to the connection at the top of the ducts. Guarantee that total diffuser volume, measured by means of velometer, shall be at least 95% of actual fan supply (measured by means of a duct traverse taken with a Pitot tube and water manometer). Seal the ductwork at all joints (longitudinal & transverse and duct wall penetrations) with suitable sealers Foster 32-19, Childers CP-146 or 3M EC-800 and tape equivalent to SMACNA Seal Class A. Use of "HARDCAST" or any other material is subject to Architect's approval.

K. For leakage test for medium and high pressure ductwork refer to Section "Testing and Balancing".

3.03 DUCT HANGERS

A. Low pressure ducts up to 24" on a side or up to 20" diameter shall be suspended with 16 gauge, galvanized strap hangers, 1" wide.

B. Low pressure ducts 25" to 40" on a side or 21" to 42" diameter shall be suspended with galvanized strap hangers 1" wide by ⅛" thick.

C. Strap hangers shall be bent 90°, extended down sides of ducts and turned under bottom of ducts a minimum of 2". Strap hangers shall be fastened at ceiling with nuts, bolts and lock washers and to sides and bottom of ducts with sheet metal screws.

D. All ductwork 43” and larger on a side or diameter and all roof-mounted ducts (regardless of size) shall be suspended with steel angle type hangers with rod and angle steel trapeze. The use of strut for support of any HVAC work (ducts, piping or equipment) is prohibited.

E. No screws shall penetrate medium and high pressure ductwork.

F. For any ducts which require seismic bracing, provide trapeze and rod type hangers regardless of duct size.

G. Trapeze type hangers shall have steel rods threaded at both ends and bottom bracing angles on ducts, with nuts and lock washers. Threaded rod diameter shall be as scheduled on the drawings based on the size of the duct supported.

H. Angle type hangers shall be extensions of side bracing angles on ducts, bent 90 at ceiling and fastened with nuts, bolts and lock washers.

I. The minimum spacing intervals for all duct supports shall be as scheduled on the drawings based on the size of the duct supported.

J. Hangers for vertical ducts shall be as per SMACNA Duct Manual.

K. Stainless steel ductwork shall be supported with rod or angle type hangers, so that there will be no penetration of the stainless steel ducts.

L. Any steel and hardware used for support of aluminum ductwork or any supports for ductwork located outdoors shall be constructed of hot-dipped galvanized or stainless steel. Carbon steel, painted steel or zinc-coated steel is unacceptable.

3.04 CLEANING AND PROTECTION

A. Clean ductwork internally, unit by unit as it is installed of dust and debris. Clean external surfaces of foreign substances, which might cause corrosion, deterioration of metal or interfere with painting.

B. At end of ducts which are not connected to equipment or air distribution devices at the time of ductwork installation, provide temporary closure of polyethylene film or other covering.

C. Cleaning of new and existing supply ductwork: After completion of ductwork installation clean ductwork as follows.
1. Cover all supply registers and diffusers with temporary filter mesh.
2. Use supply fan or install temporary fan to provide air to the system for four (4) hours.
3. Remove temporary filter mesh.

END OF SECTION

SECTION 23 34 00

FANS AND GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.2 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all fans and ventilators as shown on the drawings and hereinafter specified.

1.3 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12, "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 IN-LINE FANS

A. Furnish and install In-line Centrifugal Fans, belt drive, of size and capacities as indicated on Drawings.

B. The fans shall be the square shaped and of heavy gauge formed steel. One of the sides shall be hinged and shall support the entire drive assembly (motor only for direct drive fans) and wheel allowing the assembly to swing out for cleaning, inspection or service without dismantling the unit in any way.

C. For belt drive fans, the motor shall be mounted on the hinged side exterior isolated from air stream. The belt and pillow block ball bearings shall be protected from air stream by an enclosure. The shaft shall be keyed to both the wheel and pulley. Provide double groove sheaves and two (2) belts per fan.

D. The fan inlet shall be spun Venturi throat overlapped by a backward curved centrifugal wheel with spun cone for maximum performance.

E. Air and sound shall be A.M.C.A. certified.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify Architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts or motors and equipment within tolerances recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, test equipment to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 23 36 00
DUCT TERMINAL UNITS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all Duct Terminal Units as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12 "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 CONSTANT (C.A.V.) AND VARIABLE (V.A.V.) VOLUME AIR TERMINAL UNITS

A. Furnish and install pressure independent constant and variable air volume terminal units of size and capacities as shown on Drawings. Units shall be DESV as manufactured by Titus or approved equal.

B. Unit casings shall be 22 gauge galvanized steel and be fully lined with 1 inch, 1½ lb. density, fiber-free closed-cell polymeric foam insulation. The insulation shall comply with U.L.-181 for erosion, ASTM C-

534 and NFPA-90A, NFPA-90B, ASTM-84 and UL-723 for fire resistivity. There shall be no cut edges of the lining exposed to the moving air stream.

C. Unit inlets shall be round or rectangular. Rectangular inlets shall have S and Drive connections. Attenuation section where called for in the Schedule shall be integral to the basic unit casing to minimize casing leakage and eliminate all field assembly.

D. Damper to be heavy gauge metal with Delrin self-lubricating bearings. Tight close-off. Damper leakage is less than 2% of nominal cfm at 3 inches sp. Terminals shall be certified under the ARI Standard 880 Certification Program and must carry the ARI Seal.

For optimum control, the inlet duct must be of the same size as the assembly inlet.

E. If flexible duct is used, a section of straight duct 1½ diameters long shall be installed between the flexible duct and the assembly inlet.

F. Units shall be tested in accordance with ARI Standard 880. Unit sound power levels (second thru seventh octave band) and minimize pressure drop ratings shall not exceed those in the schedules.

G. Pressure independent air terminal units shall operate over an inlet velocity range of 0 to 3000 fpm. Terminals shall incorporate a multipoint center averaging sensor. Measuring ports in series are not acceptable. Sensors must provide control signal accuracy within ± 5%. CFM delivery shall be in accordance with (maximum-minimum) settings and/or as required by thermostat to satisfy space-served conditions. Adjustable minimum and maximum cfm limits gauge tee for flow measurement and balancing.

H. All actuators, controls, and circuitry shall be factory furnished and installed. Control and CFM settings must be easily accessible. Access shall also be provided to inspect, clean, and remove the velocity sensing device.

I. Provide integral hot water coils. Coils shall be as specified under "COILS" section of this Specification.

J. The integral hot water heating coils shall be of size rows and capacities as indicated in schedules.

K. Where integral hot water coils are provided, provide an access door upstream of the coil. Access door shall be factory installed. An access door shall also be provided immediately downstream of the reheat coil and may be installed in the supply air ductwork.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts or motors and equipment within tolerances recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, test equipment to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 23 40 00

AIR FILTERS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.2 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all air filters as shown on the drawings and hereinafter specified.

1.3 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12 "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

D. Equipment shall be shipped in its original package to prevent damage or entrance of foreign matter. All handling and shipping shall be performed in accordance with manufacturer's recommendations. Provide protective coverings during construction.

E. Standards:
1. ASHRAE Standard 52.1
2. Underwriters Laboratories: U.L. 900, U.L. 586
3. NFPA Standard 90A

F. Design Criteria
1. Air flow not to exceed rated capacity
2. Initial and final resistance not to exceed scheduled values

1.4 SUBMITTALS

A. Refer to section 01 31 46 Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.5 COORDINATION

A. Refer to section 01 31 46 Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to section 01 31 46 Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish and install the air filters shown on the Drawings. The filters shall be component sections of air handling units or shall be installed in ductwork as indicated on the drawings.

B. The filter arrangements shall be as indicated in the schedule on the Drawings.

C. Furnish and install filters as shown on drawings. Filters for factory fabricated AHU's shall meet all specification requirements.

D. Filters shall be as manufactured by American Air Filter, Flanders Precisionaire, National Air Filter, or approved equal as approved by Architect.

E. Filters shall be as indicated in the schedules on the drawings.

F. Fans and systems shall not be operated until protective filters meeting a minimum of MERV 8 have been installed. All systems are to have a minimum of MERV 8 filters installed during all operating phases of construction.

G. At the time of acceptance by the owner, the contractor shall install new filtering media for all air handling systems.

H. Before balancing and prior to acceptance by the owner, each MERV 8 filter shall be replaced with new media to consist of prefilters and final filters as scheduled and specified.

2.2 ACCEPTABLE MANUFACTURERS

A. Filters:
1. American Air Filter
2. Flanders Precisionaire
3. Camfil
4. As equal as approved by the Architect.

B. Accessories
1. Framing Modules - Holding Frames by filter manufacturer.
2. Side Access Housings by filter manufacturer.
3. Air Filter Gages - Dwyer Instruments, Inc.

2.3 FILTER CARTRIDGES

A. Pleated Media Filters (MERV 8 rating (2") . Filter media shall be high efficiency synthetic media.
1. Efficiency shall not be based on electrocharged technology.
2. Media support shall be continuously laminated to an expanded metal grid on the air leaving side.
3. Pleat design shall be a radial wedge.

4. Media frame shall be constructed from two pieces of die cut high wet strength carrier board. The frame shall be designed with diagonal and horizontal support members bonded to the media on the air entering and leaving sides.
5. Filters shall be U.L. 900 Class 2 listed.
6. Basis of design: American Air Filter PerfectPleat SC M8

B. Medium and High Efficiency Rigid Filters. Separator Type U.L. 900 Class 1. Efficiency levels of MERV 15 12" Filter Construction
   a. Filters shall be the totally rigid type with a wet laid microfine fiberglass filter. The media shall be folded into close spaced pleats supported by hemmed edge corrugated aluminum separators.
2. Enclosing Frame
   a. The enclosing frame shall be manufactured of 24 gauge galvanized steel and furnished with horizontal and diagonal support members to stabilize and protect the media pack.
3. Basis of design: American Air Filter VariCel RF

2.4 SIDE ACCESS HOUSINGS, FACTORY ASSEMBLED

A. Housings for 2 in. and 12", Filters (Minimum Inline Depth)
1. Housing shall be factory manufactured of 16 gauge galvanized steel and reinforced with "Z" channel bracing to eliminate twisting or racking.
2. 16 gauge access doors shall be gasketed along the periphery to maintain a proper seal.
3. Filter track shall be extruded aluminum and furnished with a polypropylene fin seal gasket.
4. Access doors shall be provided with continuous gasketing on the perimeter and positive locking latches with easy grip knobs. Both prefilter and final filter tracks shall be extruded aluminum with polypropylene fin seal gasket to create a positive seal of the filter to the track.
5. Factory installed gasketing shall be provided on the vertical sides of cartridges to prevent leakage between cartridges and between cartridges and doors. Filter cartridges shall be capable of removal and loading through either access door.
6. The leakage rate of the housing shall be less than 0.5% of air-flow at 6.0 in. w.g. internal static pressure.
7. Basis of design: American Air Filter Housing.

2.5 AIR FILTER GAGES

A. Dial type, diaphragm-actuated with external zero adjustment and nominal 4 in. diameter dial.

B. Provide with two (2) static pressure tips, 2-way valves, tubing and mounting plate (and adjustable signal flag if specified as an option).

C. Range shall be as recommended by filter manufacturer.

D. Basis of design: Dwyer 2000 Series Magnehelic.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install filters and hosings where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

C. Filter Bank Construction
1. Filter banks of individual holding frames shall be installed leak tight and structurally sound to eliminate air bypass.
2. Filter banks four filters high or higher shall be provided with proper steel stiffeners between each vertical row of filters. Caulk frames before installing. After installation caulk any gaps appearing at the leading edge of the holding frames.
3. Framing modules require sealant and blanking off between modules and around the periphery.

D. Filter gages shall be installed across each filter bank, mounted where directed. One gage may serve immediately adjacent pre-filter/final filter banks.

E. Temporary Prefilters for Construction
1. Protect all 40% or higher efficient filters upstream of air handling units during construction with temporary Panel filters meeting a minimum efficiency of MERV 8. Filters to be polyester media 2 in. disposable panel filters, U.L. 900 Class 2 listed. Flanders type 325.
2. Remove after air balancing and prior to acceptance.
3. Provide a spare set of these temporary pre-filters or media and install them during construction if required in accordance with Section 3.03B.

3.3 SPARE FILTERS

A. Furnish one new complete spare set of cartridges for each filter bank listed below on completion and acceptance of the work:
1. High efficiency rigid filters.

B. Install spare set in A. above only if and when directed. If not installed, deliver to owner in sealed cartons.

C. Replace all panel filters which are not temporary pre-filters with a new set at job completion and furnish owner with an additional set in sealed cartons.

D. Furnish owner with one set of spare trays loaded with carbon, if carbon housings or adsorbers are specified on this project.

3.4 FIELD QUALITY CONTROL

A. Filter cartridges shall be capable of being loaded and unloaded easily through access doors in the housings or access sections.

3.5 START-UP PROCEDURE

A. No fan shall be operated unless temporary particulate filters as specified are installed.

B. When the pressure drop of the temporary media reaches 1.0 in. w.g. during construction, replace it with the spare set. If not used, deliver the spare set to the owner at job completion.

3.6 SCHEDULE

A. See air filter schedule on drawings for filter model numbers, CFM and sizing data.

END OF SECTION

SECTION 23 82 13

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section is coordinated with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.2 SUMMARY OF WORK IN THIS SECTION

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all variable frequency drives as shown on the drawings and as specified elsewhere in this specification.

B. Provide a separate variable frequency drive, VFD, for each motor drive. For air handling units with two fans operating in parallel, a separate VFD shall be provided for each fan.

C. Each pump shall be provided with a VFD.

1.3 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Variable frequency drive (VFD) shall be produced by Yaskawa, ABB or approved equal. All VFD’s for the project shall be the product of a single manufacturer. All VFD shall be manufactured in USA.

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

D. Start-up services and customer training shall be provided by a factory trained and authorized representative. Provide a minimum of 4 hours of training for VFD's.

E. VFD shall be UL listed and shall have NYC approvals (BSA number) for NYC projects. Submit proof of approval.

F. Control of fan VFD's shall be provided under Section (23 09 00).

1.4 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Workand submit shop drawings.

B. Submit certificate from the factory demonstrating the product is manufactured in USA.

1.5 DELIVERY STORAGE AND HANDLING

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.6 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

B. In addition to the requirements of Section 01 31 46 regarding Guarantee, the manufacturer and/or supplier of variable frequency drives shall provide a 36-month warranty from the date of certified start-up and shall include all parts, labor, travel time and expenses. Any repairs of variable frequency drives shall be done on an emergency basis during the warranty period.

C. The manufacturer shall be listed by Underwriter's Laboratories.

1.7 REFERENCES

A. NEMA ICS 3.1 - Safety Standards for Construction and Guide for Selection,

B. Installation and Operation of Variable Frequency Drive Systems

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. IEEE Standard 519

E. UL 508C (Power Conversion) and UL 508A (Industrial Control Panel)

F. CSA 22.2 No. 14-95 (Industrial Control Equipment)

G. CE mark 2006/95/EC LVD and CE mark 2004/108/EC

PART 2 - PRODUCTS

2.1 VARIABLE FREQUENCY DRIVE

A. The variable frequency drive(s) (VFD) shall be pulse width modulation (PWM) type, microprocessor controlled design. Provide one VFD per fan motor for each fan in the array. Each VFD shall have an active front end AC to DC rectifier having a current distortion level at the individual drive terminals not exceeding 3% at full output.

B. The VFD, including all factory installed options, shall have UL approval.

C. Enclosure shall be NEMA 12 ventilated for installation as a wall-mounted or free-standing unit, depending on the amp rating. The drive shall be equipped with an input disconnect switch and fuses to protect against ground faults. A hand- off-automatic switch and speed potentiometer shall be mounted on the front of the enclosure.

D. VFD shall utilize a diode bridge rectifier to convert three phase AC to a fixed DC voltage or a phase controlled rectifier. Drives utilizing a phased controlled rectifier shall employ a three phase line reactor on the line side of the rectifier.

E. PWM type drives shall use Insulated gate bipolar transistors (IGBTs) shall be used in the inverter section to convert the fixed DC voltage to a three phase, adjustable frequency, AC output. A DC line reactor shall be provided to minimize harmonic and current distortion of the input power line.

F. The following customer modifiable adjustments shall be provided:
1. Acceleration time: 0.1 to 1800 seconds
2. Deceleration time: 0.1 to 1800 seconds
3. Minimum frequency: 0 Hz
4. Maximum frequency 66 Hz

G. Speed reference signal shall be customer selectable for 0-10 VDC or 4-20 mA.

H. The VFD shall be suitable for elevations to 3300 feet above sea level without derating. Maximum operating ambient temperature shall not be less than 104EF. VFD shall be suitable for operation in environments up to 95% non-condensing humidity. PWM type drives shall be capable of operating at carrier frequencies of 12000 Hz without derating.

I. The VFD shall be capable of displaying the following information via the display:
1. % speed
2. Voltage
3. % load
4. Fault identification

J. All VFDs shall be equipped with a bypass switch to allow the fan or pump to operate at constant speed while the drive is being serviced. The bypasses for motors 100 HP and greater shall be solid state reduced voltage.

K. The following communication features shall be provided to the BAS:
1. Remote start/stop
2. Failure of any system component
3. VFD speed

L. VFD's shall meet the requirements as outlined in the latest edition of IEEE-519 for total harmonic voltage and current distortion. Individual or simultaneous operation of the VFD's shall not add more than 5% total harmonic voltage distortion to the normal bus, nor more than 10% while operating from standby generator.

The step-up transformers shall be the point of common coupling, as indicated on the project electrical drawings. The short circuit current at point of common coupling under utility operation shall be provided by the Engineer. Standby generator rating shall be as indicated on the electrical drawings. The minimum subtransient reactance shall be provided by the Engineer. The maximum number of VFD's which will operate simultaneously from the generator are indicated on the equipment schedule as having emergency power (E.P.) Maximum allowable total and individual harmonic current distortion limits for each VFD shall not exceed limits as set forth by IEEE 519 latest edition. If harmonic filters are required to meet these requirements, it is the responsibility of the VFD manufacturer to provide filter. It is the responsibility of the VFD manufacturer to design and manufacture any required filters. A preliminary detailed harmonic analysis must be submitted by the VFD manufacturer at bid time, which includes all harmonics to the 99th. Compliance shall be verified by the VFD manufacturer with field measurements of the harmonic distortion difference at the point of common coupling with and without VFD's operating.

The variable frequency control shall include transient voltage suppression to allow reliable operation on a typical industrial or commercial power distribution system.

M. When the VFD is in fault mode and the fan in smoke purge mode, the VFD shall automatically switch to bypass mode. A signal shall be provided under Section 23 09 00 from the VFD indicating that the fan is in smoke purge mode.

2.2 ACCEPTABLE MANUFACTURERS:

A. See approved manufacturer Section.

B. NEMA 3R enclosure with heated enclosure for outdoor installation.

C. NEMA 12 for all others.

2.3 DESCRIPTION

A. Provide enclosed variable frequency drives suitable for operation at the current, voltage, and horsepower indicated on the schedule. Conform to requirements of NEMA ICS 3.1.

B. Motors should be inverter duty rated, per NEMA MG1 parts 30 and 31, for motor-drive compatibility.

2.4 RATINGS

A. VFD must operate, without fault or failure, when voltage varies plus 10% or minus 15% from rating, and frequency varies plus or minus 5% from rating.

B. VFD shall be _208_volts, _60_Hz, 3 Phase, as shown on schedules.

C. Displacement Power Factor: 0.98 over entire range of operating speed and load.

D. Service factor: 1.0

E. Operating Ambient Temperature: -10°C to 50°C (14°F to 122°F)

F. Humidity: 0% to 95% non-condensing.

G. Minimum Efficiency: 96% at half speed; 98% at full speed.

H. Starting Torque: 100% starting torque shall be available from 0.5 Hz. to 60 Hz.

I. Overload capability: 110% of rated FLA (Full Load Amps) for 60 seconds; 150% of rated FLA peak.

J. Controlled speed range of 40:1

K. VFDs must be suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes.

2.5 DESIGN

A. VFD shall employ a PWM (Pulse Width Modulated) power electronic system, consisting of:
   1. Intermediate Section:
      a. DC bus shall be interfaced with the VFD diagnostic logic circuit, for continuous monitoring and protection of the power components.
   2. Output Section
      a. Insulated Gate Bipolar Transistors (IGBTs) shall convert DC bus voltage to variable frequency and voltage.

B. The VFD must be rated for operation at a carrier frequency of 5 kHz to satisfy the conditions for current, voltage, and horsepower as indicated on the equipment schedule.

C. VFD shall have an adjustable carrier frequency, from 1 kHz to 12.5 kHz

D. (Above 250 HP from 1 kHz to 5 kHz)

E. VFD Must include an adjustable dynamic noise control for quiet motor operation

F. VFD shall have embedded Building Automation System (BAS) protocols for network communications BACNET/MSTP. These protocols shall be accessible via a RS-422/485 communication port.

G. VFD shall include at least two independent analog input. Selectable for either 0-10 VDC or 4-20 MA.

H. VFD shall include two selectable 0-10 VDC or 4-20 MA analog outputs for monitoring, or "speed tracking" the VFD. The analog output signal will be proportional to output frequency, output current, output power, PI (Proportional & Integral control) feedback or DC bus voltage.

I. VFD shall provide terminals for remote input contact closure, to allow starting in the automatic mode.

J. VFD shall include at least one external fault input, which shall be programmable for a normally open or normally closed contact. These terminals can be used for connection of firestats, freeze stats, high pressure limits or similar safety devices.

K. VFD shall include a power loss ride through capable of 2 seconds.

L. VFD shall have DC injection braking capability, to prevent fan “wind milling” at start or stop, adjustable, current limited.

M. VFD shall have a motor preheat function to prevent moisture accumulation in an idle motor.

N. VFD shall include diagnostic fault indication, time and date stamped faults storage and heatsink cooling fan operating hours.

O. VFD shall have a digital operator with program copy and storage functions to simplify set up of multiple drives. The digital operator shall be interchangeable for all drive ratings.

P. VFD shall include a front mounted, sealed keypad operator, with an English language illuminated LCD display. The operator will provide complete programming, program copying, operating, monitoring, real time clock and diagnostic capability. Keys provided shall include industry standard commands for Hand, Off, and Auto functions.

Q. VFD plain language display shall provide readouts of; output frequency in hertz, PI feedback in percent, output voltage in volts, output current in amps, output power in kilowatts, D.C. bus voltage in volts, interface terminal status, heatsink temperature and fault conditions. All displays shall be viewed in an easy-to-read illuminated LCD.

R. VFD unit shall include the following meters to estimate use of energy:
1. Elapsed Time Meter
2. Kilowatt Meter
3. Kilowatt Hour Meter

S. VFD shall include a user selectable PI control loop, to provide closed loop set point control capability, from a feedback signal, eliminating the need for closed loop output signals from a building automation system. The PI controller shall have a differential feedback capability for closed loop control of fans and pumps for pressure, flow or temperature regulation in response to dual feedback signals.

T. The VFD shall include HVAC specific application macros. The macros can be used to help facilitate start-up. The macros will provide initialization to program all parameters and customer interfaces for a particular application (Fans, Pumps and Cooling Towers) to reduce programming time

U. The VFD shall have VLP Sensorless technology. VFD's that require a separate pressure transducer shall not be accepted.

V. VFD shall include loss of input signal protection, with a selectable response strategy including speed default to a percent of the most recent speed.

W. VFD shall include electronic thermal overload protection for both the drive and motor. The electronic thermal motor overload shall be approved by UL.

X. VFD shall include the following program functions:
1. Critical frequency rejection capability: 3 selectable, adjustable dead bands.
2. Auto restart capability: 0 to 10 attempts with adjustable delay between attempts.
3. Ability to close fault contact after the completion of all fault restart attempts.
4. Stall prevention capability.
5. Bi-directional "Speed search" capability, in order to start a rotating load.
6. 14 preset and 1 custom volts per hertz pattern.
7. Heatsink over temperature speed fold back capability
8. Terminal status indication.
9. Programmable security code
10. Current limit adjustment capability, from 30% to 200% of rated full load current of the VFD.
11. Motor pre-heat capability
12. Input signal or serial communication loss detection and response strategy.
13. Anti "wind-milling" function capability.
14. Automatic energy saving function.
15. Undertorque / Overtorque Detection.
16. Fan failure detection and selectable drive action
17. Bumpless transfer between Hand and Auto modes
18. Seven preset speeds
19. VFD shall include user parameter initialization capability to re-establish project specific parameters.

2.6 PRODUCT OPTIONS

A. Three Contactor Manual Bypass shall be provided when indicated by the schedule. VFD and bypass package shall be NEMA 12 rated, fully pre-wired and ready for installation as a single UL listed device. Selectable energy savings and harmonic reduction mode. Drive automatically switches to Bypass (Across-the-line) when motor is running 60 Hz for a set time and automatically switches back when frequency reference changes.

B. Bypass shall include the following:
1. Drive, output, and bypass contactors to isolate the VFD from the motor, when the motor is running in the bypass mode. These contactors shall be electrically and software interlocked to ensure safe operation. Two Contactors with Service Switch will not be accepted.

2. 120 VAC control transformer, with fused primary.
3. Bypass shall include an Electronic motor overload relay, to display motor amps and protect the motor while operating in the bypass mode.
4. Control and safety circuit terminal strip.
5. Door mounted control panel with; Drive/Bypass selector keys, Hand/Off/Auto selector keys, Normal/Test selector keys.
6. Door mounted control keypad with LCD display for “Control Power”, “Drive Ready”, “Drive Run”, “Drive Selected”, “Drive Fault”, “Drivel Test”, “Bypass Selected”, “Bypass Run”, “Motor OL”, ”Safety Open” “BAS Interlock”, “Auto Run”, Auto Transfer”, “Emergency Override”, “Hand Mode”, “Off Mode”, and “Auto Mode”.
7. Drive/Bypass selector keys, to allow switching between the Drive and Bypass mode.
8. Hand/Off/Auto selector keys shall provide the following operation and be programmed to operate in any of these modes upon power-up:
9. Normal/Test selector keys, to allow VFD trouble shooting while operating in bypass mode. This option is only available with the 3 contactor style bypass.
10. Hand Position - The drive is given a start command, operation is via the local speed input (digital operator/keypad). If in bypass mode, the motor is running.
11. Off Position - The start command is removed, all speed inputs are ignored, power is still applied to the drive. If in bypass mode, the motor is stopped.
12. Auto Position - The drive is enabled to receive a start command and speed input from a building automation system. If in bypass mode, the motor start/stop is controlled by the building automation system
13. Eight Programmable digital inputs (24Vdc, 8mA) shall be provided for Auto Transfer to bypass, Safety Interlock, BAS Interlock, and numerous other bypass specific functions.
14. Four Programmable form C relays (24Vdc/120 VAC, 2 Amp) for: “Motor Run”, “Damper Actuator”, “Auto Transfer”, “Drive Run”, “Hand Mode”, “Auto Mode”, “System Fault”, “Bypass Run” or ”Serial Com Run”.
15. Damper control circuit with end of travel feedback capability. This circuit shall also include two adjustable wait time functions. One is a run delay time where the drive will operate at a preset speed before the damper opens to pressurize the system. The other time function is an interlock wait time, so if the damper has not fully opened within the specified time, a fault will be declared.
16. Line voltage sensors on all phases to monitor for brownout, blackout and single phase conditions. Fault levels for each condition must be adjustable to ensure the proper settings pursuant to each application.

C. Main input circuit breaker with a pad-lockable through-the-door handle mechanism, making the whole bypass package 100KAIC.

2.7 FABRICATION

A. All standard and optional features shall be included in a NEMA12 rated enclosure with a UL certification label as shown on the schedule.

PART 3 - EXECUTION

3.1 INSPECTION

A. The contractor shall examine location where this equipment is to be installed and determine space conditions and notify construction manager in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts of motors and equipment within tolerances recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, energized with normal power source, test equipment to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactory corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 23 82 17

COILS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all coils as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12 “Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 WATER/GLYCOL COILS

A. All water/glycol coils shall be of the continuous flat plate fin type for minimum resistance to air flow. Fins shall be fabricated with drawn collars and shall be bonded to the tubes by a hydraulic expansion process. Openings in unit casing for coil connections to be sealed against leakage. Coil casings shall be not less than 16-gauge galvanized steel.

B. Water/glycol coils shall be of the continuous tube type and circuited so as to be completely drainable by gravity through the supply header. Headers and tubes are to be fabricated of a seamless .024 inch thick wall copper tubing. Fins are to be .009 inch thick aluminum for heating coils and .005 inch thick copper for cooling coils. Supply and return headers shall be complete enclosed within the unit casing or external where called for on the drawing, and shall be equipped with steel nipples of extra length equipped with drain and vent plugs outside unit casing. Coils shall have capacities as called for and shall have the minimum number of rows as shown on the schedule.

C. The tube thickness shall be: 0.031 for ½" tube, 0.035 for 5/8" tube and 0.049" for 1" tube.

D. Cooling coils shall have ARI Certification.

2.02 DIRECT EXPANSION COOLING COILS

A. Tubes - Round, seamless copper grooves, arranged in parallel pattern with respect to airflow.

B. Fins - Plat-Tube, Sigma-Flo II configured, copper fins producing identical capacities. Fins continuous across entire coil width and die-formed in multiple stages for accurate tube fit, fin bonding and spacing. Fins mechanically bonded to tubes for lasting reliability.

C. Casing - Continuous coated galvanized steel, 16 gauge formed end supports and top and bottom channels. d" holes on 3" centers in channels for mounting or fastening coils together. One 16 gauge continuous coated, galvanized steel center tube support on ordering lengths over 42". Two or more supports on lengths over 96".

D. Test and Working Pressure - Proof tested at 450 psig and leak tested at 300 psig air pressure under water, cleaned, dehydrated and sealed with dry nitrogen charge.

E. U-Bends - Round, seamless copper tubes, e" O.D., machine die-formed on each end to provide accurate fit for silver brazed joints.

F. Distributor - Venture type refrigerant distributors or low pressure drop design, arranged for down feed. Male sweet connections. Maximum of twelve circuits per single distributor. Split evaporator.

G. Air Bypass and Water Carryover Arrestor - Foam sealing strip located between casing channels and fins along top and bottom.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install coils where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that coils comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of coils with other components of systems.

C. Check alignment and, where necessary (and possible), realign shafts of motors and coils within tolerances recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of coils, test coils to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 23 82 36
FIN TUBE RADIATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all fin tube radiation as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 FIN TUBE RADIATION AND ENCLOSURES

A. Provide finned tube radiation complete with enclosures of one piece back panel, one piece front panel, heating element, hangers and accessories.

B. Fin tube radiation shall be I.B.R. rated.

C. Enclosure front panel, one-piece #16 USSG Steel cabinet, with Stamped top outlet or, extruded grille top outlet, or front outlet or sloping top (as shown on architectural drawings). Each enclosure front panel, rigidly braced by integral vertical channel braces in at least two locations. Each front panel shall extend to wall and be fastened to back panel at both top and bottom. Enclosures shall be finished with baked-on gray enamel primer and final baked enamel finish, color as selected by the Architect.

D. Back panel shall be of one-piece construction #20 USSG steel, and shall provide continuous support at both top and bottom for rigid fastening of front panel. Back panel shall be pre-punched for fastening to wall and for attaching of heating element hangers.

E. Support brackets shall be a minimum 4'-0" on centers for heating element shall attach to back panel; vertically adjustable for pitch, and providing free longitudinal movement for expansion and contraction. Where pipe runs under enclosures they too shall be supported from back panel. No sheet metal screws or other fastening devices shall be visible when enclosure is installed below eye-level. Where two or more enclosure sections are joined end to end, rolled enclosure edges shall form neat butt joint without butt straps or other concealing devices. No unfinished metal edges shall be visible in the installed ensemble.

F. Heating elements shall be constructed of corrugated aluminum fins mechanically bonded to seamless copper tubing. They shall be provided with swagged ends to permit end to end jointing without coupling.

G. Where fin-tube radiation with expanded metal cover is used, it shall be same element as specified for enclosed fin-tube radiation.

H. Fin tube elements shall have a capacity as shown on the Drawings when supplied with hot water at 190 degrees F average water temperature. Copper elements shall be copper tubing of 0.049" wall thickness. All elements shall be one row high as noted on the Drawings.

I. Provide end caps where radiation terminates at doors, walls, pilasters or columns and inside or outside corners where required.

J. Provide knob-operated dampers above all radiation where radiation is not controlled by individual room automatic control valves. Provide access doors in enclosures at control valves, balancing valves, shut-off valves and air vents.

K. All radiation enclosures and access door locations shall be field measured prior to fabrication.

L. Fin tube radiation shall be of type as scheduled on the drawings.

2.02 CONVECTORS

A. Units shall be of size, type and capacity called for on the Drawings when supplied with 190 deg F average water temperature.

B. Units shall be complete with 16-gauge steel cabinet with baked enamel finish, color as selected by Architect, heating coil of copper tubes, aluminum fins and cast-iron headers and dial-operated damper.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, test equipment to demonstrate compliance with requirements. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 23 82 40
CABINET HEATERS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all cabinet heaters as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Manufacturing firms regularly engaged in manufacture of this material with characteristics 6nd capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 CABINET HEATERS

A. Furnish and install cabinet heaters of size, type and capacities as shown on the Drawing.

B. Basic unit shall include chassis, coil, fanboard, fanwheel(s), housing(s), motor and insulation. Chassis is galvanized steel wrap-around structural frame with all edges flanged. Insulation is faced, heavy density glass fiber.

C. Vertical Cabinet Models:
1. 16 gauge steel front panels and 18 gauge steel end and top panels have channel-formed edges around entire panel perimeters. Front panel insulated over entire coil section. Integral, stamped outlet grilles have 15 degree deflection from vertical. Stamped lattice discharge grilles on inverted airflow models. Access door on coil connection side of unit. Front panel removable without tools.

D. Vertical Recessed Models:
1. 16 gauge steel, four-side overlap front panels, with "M"-shaped stiffener running entire panel length as standard. Integral, stamped inlet and outlet grilles have 15 degree downward deflection. Front panel insulated over entire coil section. Front camlocked access doors on right hand side of unit. Front panel removed with two screws.

E. Horizontal Cabinet Models:
1. 18 gauge steel panels. Bottom and end panels have channel-formed edges around entire panel perimeter. Integral, stamped outlet grilles have 15 degree downward deflection. Stamped lattice inlet grilles. Bottom panel hinged at front and camlocked at back.

F. Horizontal Recessed Models:
1. 18 gauge steel, removable, four-side overlap bottom panel adjustable with full length, piano-type hinge at back and camlocks at front.

G. Cabinet Finish:
1. All cabinet parts cleaned, bonderized, phosphatized, and flow-coated with baked-on primer. Final finish of spray applied baked-on enamel in colors selected by Architect.

H. Water Coils:
1. Seamless copper tubes mechanically bonded to configured aluminum fins with continuous fins collars and sleeved coil and supports. Maximum working pressure 300 PSIG, factory burst test 450 PSIG (air), and leak test 300 PSIG (air under water). Maximum entering water temperature 275 F. Supply and return connections on same side of units on all models and sizes.

I. Fans:
1. Fan wheels centrifugal, forward-curved, double of non-corrosive, molded, fiberglass-reinforced thermo-plastic material on all units except electric heat and inverted airflow models which use aluminum. Fan housings of formed sheet metal on 200-600 CFM units. 800-1800 CFM units have end caps made of non-corrosive, molded, fiberglass-reinforced thermo-plastic material, and fan scrolls of galvanized steel.

J. Motors:
1. All motors have integral thermal overload protection and start to 78% of rated voltage. Motors operate satisfactorily at 90% of rated voltage on all speed settings and at 10% over voltage without undue magnetic noise. All motors factory run tested assembled in unit prior to shipping.

K. Filters:
1. Removable from vertical cabinet models without removing from panel; from vertical recessed units by removing front panel; from horizontal units by pivoting hinged bottom panel. 1" woven glass filters.

L. Electrical Performance:
1. All cataloged models wired in accordance with National Electric Code. Underwriters Laboratories, Inc. listed. Provide on-off switch with thermal overload.

M. Control
1. Provide unit mounted factory wired four position three speed switch, with manual starter and return air thermostat. Thermostat shall cycle fan on and off.
2. Ceiling mounted units shall be supplied with thermostat for remote wall mounting. Thermostat for ceiling mounted units shall be mounted and wired by the electrical Contractor. Thermostat shall be rated for the fan motor voltage and amperage.

2.02 ELECTRIC CABINET HEATERS

A. Basic Unit - shall include chassis, electric coil, fanboard, fan-wheel(s), housing(s), motor and insulation. Chassis shall be galvanized steel wrap-around structural frame with all edges flanged. Insulation shall be faced, heavy density glass fiber.

B. Cabinet Finish - all cabinet parts shall be cleaned, bonderized, phosphatized, and flow-coated with baked-on primer. A final finish of spray applied baked-on enamel in one of seven decorator colors shall be provided.

C. Electric Heating Coils - Hydronic type fin-tube construction with resistance elements shall be inserted in the tubes on 200-600 cfm units; sheath type on 800-1800 cfm units. Units shall be factory wired with unit mounted heat switch, magnetic contactors, high temperature cutout control, and fan override switches.

D. Fans - Fan wheels shall be centrifugal, forward-curved, double width of molded, fiber glass reinforced thermo-plastic material. Fan housings shall be of molded polyester resin, fiber reinforced material, gradually expanded radially and axially. Wheels and housings non-corrosive.

E. Motors - All motors shall have integral thermal overload protection and start at 78% of rated voltage. Motors shall operate satisfactorily at 90% of rate voltage on all speed settings and at 10% over voltage without undue magnetic noise. Temperature rise by winding resistance method shall not exceed 60 C (shaded pole motors) and 50C (PSC motors) on high speed. All motors shall be factory run tested assembled in unit prior to shipping. Motor cords shall be quickly detachable at junction box by locking prong connector on vertical cabinet and wall hung units.

F. Electrical Performance - All units shall be wired in accordance with National Electrical Code, and Underwriters' Laboratories, Inc., listed.

G. Motor Starters - shall isolate unit from electric power source for maintenance. Thermal overload device shall protect motor. Overload mechanism shall reset by moving toggle switch to "off" and then "on" position.

H. Transformers - Totally enclosed transformers with Class A insulation shall step down power voltage to 115 volts for motor control circuit. Transformers shall be factory mounted on all units. Units shall be equipped with a mounted switch having off-heat-vent selection.

I. When placed in the heat position, the contactor shall energize the electric coil subject to room thermostat's setting and fan shall run continuously.

J. Provide 1" replaceable media of woven glass fiber with 1" permanent frame.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, energized with normal power source, test equipment to demonstrate compliance with requirements. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Test and Balancing.

END OF SECTION

SECTION 23 84 13

HUMIDIFIERS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Mechanical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

1.02 DESCRIPTION OF WORK

A. The work includes the providing of all labor, materials, equipment, accessories, services and tests necessary to complete and made ready for operation by the Owner, all humidifiers as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Firms regularly engaged in manufacture of this material with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 10 years.

B. Provide product produced by the manufacturers, which are listed in Section 23 05 12 "Approved Manufacturer's List".

C. Provide equipment whose performance, under specified conditions, is certified by the manufacturer.

1.04 SUBMITTALS

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work and submit shop drawings.

1.05 COORDINATION

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

1.06 GUARANTEE

A. Refer to Section 01 31 46 - Special Requirements for Mechanical and Electrical Work.

PART 2 - PRODUCTS

2.01 SELF CONTAINED HUMIDIFIER (ELECTRIC RESISTIVE TYPE)

A. Provide self-contained, microprocessor controlled, wall mounted, electric resistive steam humidifiers as indicated, of size and capacity as scheduled. Electrode technology is not acceptable.

B. Humidifier shall meet the requirements of UL 998 and CSA C22.2 No.104 standards to comply with ETL certification.

A. Humidifier cabinet:
   1. The humidifier casing shall be constructed of cold roll steel and stainless steel base with baked enamel finish to prevent rust.
   2. For safety and security reasons, all components, electrical wiring and plumbing connections will not be exposed and must be contained within the cabinet of the unit.
   3. The compartmentalized enclosure shall separate the plumbing, controls, and high-voltage sections, preventing heat, humidity or water transfer to the electrical sections and ensuring that the evaporation chamber remains isolated.
   4. The plumbing compartment shall be equipped with a drip tray.
   5. The front of the unit and the high voltage compartment shall have a lockable door to restrict access by unauthorized personnel.

B. Evaporation chamber:
   1. Steam shall be generated in a stainless steel cleanable evaporation chamber.
   2. The evaporation chamber shall be easily serviceable and removable from the unit. No tools are required during servicing.
   3. The electronic level sensing assembly remains permanently fixed and separate from the evaporation chamber.
   4. The heating elements and manual reset high temperature safety cut-out switch remain fixed in place, even as the evaporation chamber is removed for service cleaning.
   5. The evaporation chamber shall have a water port designed to minimize the risk of blockage caused by sediment build-up. The water port will be easily detachable for servicing by means of a single quick connect assembly.

C. Immersion heating element(s):
   1. Steam shall be generated by self-cleaning 800/825 Incoloy electric heating immersion elements.
   2. The heating elements shall have a high expansion factor, minimizing mineral deposits and enabling most of them to break off and fall to the bottom of the chamber.

D. Water level control:
   1. The water level detection system shall be self-cleaning, self-calibrating and equipped with a redundancy system, consisting of a high-resolution capacitive sensor and two fail-safe resistive sensors.
   2. The humidifier must have the ability to sense foam and take a corrective action by going into drain cycle.
   3. For safe temperature operation, the humidifier must have both an electronic temperature sensor inside the evaporation chamber and an external bimetallic temperature cut-off.

E. Water requirements:
   1. The humidifier shall operate under all types of water including tap, deionized and reverse osmosis water, with no additional parts required.

F. Feed water:
   1. The supply water to the unit shall be controlled by a quiet three port solenoid valve equipped with flow regulators, to supply water into the evaporation chamber, temper the hot water during a drain and clean the water level sensors.
   2. To conserve energy, any hot water skimming during normal FILLING cycle is not acceptable.
   3. The humidifier shall have a check valve in the fill water line to prevent backflow of hot contaminated water into the water supply system.
   4. The humidifier shall have a pulsed fill mode to ensure that boiling does not stop while the humidifier is refilling, in order to maintain a constant steam output.

G. Drain:
   1. The humidifier shall have a drain pump which provides a quick drain cycle, minimizing the down time.
   2. The humidifier shall have four draining strategies: periodic full drain cycle, water dilute system, AFEC and configurable drain schedule, ensuring maximum energy efficiency, optimal steam output stability and minimal steam output interruptions.

3. To enhance safety and minimize energy consumption, the humidifier shall vary the drain time periods according to variations in water conditions.
4. After 72 hours of no demand, the humidifier will go into "Tank Rinse" or end of season mode, completely draining the unit to eliminate stagnant water.

H. Manual drain valve:
1. The humidifier shall be supplied with a manual drain valve which ensures that the unit can be drained even during a power failure.

I. Disconnect switch:
1. For safety reasons and to conform to local regulations, the humidifier shall have a built-in factory wired disconnect switch, to easily turn off the power without opening any access doors, ensuring that the power is off when accessing the electrical panels. An external disconnect switch is not required.

J. Controller:
1. The humidifier shall have an alphanumeric display and control module with 8 function buttons for fast configuration and operation.
2. The Idle Screen shall display common information including humidity demand, actual steam output and state of operation. It will also indicate special diagnostic parameters such as abnormal operation, time delays, etc.
3. The humidifier shall be programmable using the menu buttons to view and configure settings including control method, %R.H. set point, control signal type, and indication on number of actual service hours.
4. After the maximum number of hours of operation before servicing is due has been exceeded, the unit will display a need for servicing and the Status Display LED on the control panel will turn red.

K. SD card:
1. The unit shall be equipped with an SD card slot, to allow for simplified troubleshooting, by storing a history log of all humidifier trends and alarms.
2. The SD card shall allow for on-site firmware upgrades.

L. USB connection:
1. The unit shall be equipped with a USB port, to allow on-site firmware upgrades.

M. Scheduling system:
1. The humidifier shall be equipped with a configurable and independent scheduling system for unit operation and drain cycle, ensuring that the unit does not operate or drain when not necessary.

N. User rights management:
1. The electronic controller shall be equipped with a user rights management system, which simplifies operation and protects the humidifier from unwanted access by displaying only the features associated to the type of user logged in.

O. Building automation systems:
1. The humidifier shall be equipped with communication protocols, including BACnet MS/TP, for integration with a building management system (BMS).
2. This protocol shall be available via a plug-in module for simple upgrade of units already in the field.

P. Modulating control:
1. The control modulating signal shall be 0-10 VDC or 2-10 VDC, 4-20 mA or 0-20 mA to modulate 0-100% of the capacity.
2. The maximum output (SPAN) can be minimized by using the electronic "MAX OUTPUT" setting.
3. Modulation of all elements shall be achieved using silent SSR's with zero voltage crossing detection and firing. The SSR's will be backed up by an electro-mechanical contactor.
4. To avoid harmonics and peak electrical loads, Time Proportioning modulation using only electro-mechanical relays will not be acceptable.

Q. Steam distribution manifold (S.A.M.E2):
1. Type 304 stainless steel manifold with brass nozzle inserts which provide uniform steam distribution over entire length, used in applications with restricted duct dimensions.

R. Accessories: Include the following:

1. HRO20 humidity controller: Wall mounted, modulating device with electronic display and adjustment buttons that measures from 0-100% RH and provides selectable output signals, with a control range of 10% to 90% RH.
2. HRL24 humidity transmitter: Wall mounted, programmable device with electronic display and adjustment buttons that measures from 0-100% RH, with a control range of 10% to 90% RH.
3. SHC80 duct humidity sensor: Duct mounted device that measures from 0-100% RH range and provides a 0-10VDC output.
4. SHS80 duct humidity sensor: Duct mounted device with high limit that measures from 0-100% RH range and provides a 0-10VDC output, with a high limit control range of 20% to 90% RH.
5. SHS20 high limit humidistat: Wall mounted, ON/OFF device with a control range of 20% to 90% RH, having a built-in humidity sensor.
6. APS-ADJ: Air pressure switch shall be diaphragm operated with pitot tube for field installation. Switch shall have an adjustable set point range of 0.05"WC (1.3mmWC) to 2.0”WC (50mmWC).
7. IDC: Provide an Internal Drain Cooler (IDC) to automatically limit drain discharge temperature. The drain water must not exceed 140°F (60°C) during normal operation.
8. Drain Cooler: Provide an External Condensate Cooler (with thermostatic valve) to automatically limit drain discharge temperature. The drain water must not exceed 140˚F (60˚C) during normal operation.
9. A5X115 condensate pump: High temperature device used to collect and automatically remove drain water produced by the humidifier.
10. BACnet MS/TP: BACnet Master Slave/Token Passing (MS/TP) network interface shall be provided to connect BACnet client devices with Neptronic humidifier devices.
11. BACnet IP: BACnet IP interface shall be provided to allow for data transfer to and from devices over Ethernet using the BACnet IP Protocol.

S. Duct distribution manifold complete with supply hose.

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall examine location where this equipment is to be installed and determine space conditions and notify architect in writing of conditions detrimental to proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment where shown, in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that equipment comply with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation of equipment with other components of systems.

3.03 FIELD QUALITY CONTROL

A. Upon completion of installation of equipment, energized with normal power source, test equipment to demonstrate compliance with requirement. When possible, field correct malfunctioning units, then

retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected. Refer to Section 23 05 93 - Testing and Balancing.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

    a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
    b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Metraflex Co.
    d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM, NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestopping system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

SECTION 26 05 19

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. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by the following] [provide products by one of the following or approved equal:

B. Basis-of-Design Product: Subject to compliance with requirements, provide products by the following or comparable product approved equal:

1. Alcan Products Corporation; Alcan Cable Division.

2. Alpha Wire.
3. Belden Inc.
4. Encore Wire Corporation.
5. General Cable Technologies Corporation.
6. Southwire Incorporated.

C. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

D. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2, Type THHN-2-THWN-2 and Type XHHW-2.

E. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

F. VFC Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.

2.2 CONNECTORS AND SPLICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by the following or comparable product approved equal:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. Ideal Industries, Inc.
4. NSi Industries LLC.
5. O-Z/Gedney; a brand of the EGS Electrical Group.
6. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with local electrical codes.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway, Metal-clad cable, Type MC.

B. Exposed Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Metal-clad cable, Type MC.

D. VFC Output Circuits: Type XHHW-2 in metal conduit.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and 486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each lug, splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Contractor shall field test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test all service entrance and all feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:

    a. All conductors serving emergency and standby power system fuel-oil pumps and gas-booster pumps.
    b. All conductors serving motors 3 hp and larger.
    c. All conductors serving data center and computer room HVAC system equipment.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. **Perform insulation resistance (megger) testing on all feeder and service conductors.** Provide testing as per ANSI/NETA ATS-2013 (InterNational Electrical Testing Association Standard for Acceptance Testing Specifications) part 7.3.2. Test results shall be validated as per ANSI/NETA ATS-2013 Table 100.1. Applied potential shall be 1000VDC for a duration of one minute. Record on NETA standard forms or other forms approved by engineer. Identify specific feeder tested on each form including equipment name/reference at each end of feeder. Test equipment must measure values accurately up to a minimum of 100 meg-ohms (not a ‘pass-fail’ tester). Record actual meg-ohm readings below 100 meg-ohms. Submit completed test forms to engineer for review & approval.

4. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice and all terminations in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
   a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, and New York City Electrical Code by a qualified testing agency and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 and New York City Electrical Code and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Compression fittings that are installed with hydraulically operated tools, approved for the class type.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions. Only welded connectors for connections and splices concealed in concrete structure or buried in earth.

E. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 ELECTRODES

A. Ground Rods:

1. Material: Copper-clad steel.
2. Diameter: 3/4 inch (19 mm).
3. Rods shall be not less than 120 inches (3050 mm) long.

B. Ground Plates:

1. Material: Copper.
2. Thickness: 1/4 inch (min).
3. Plates shall be not less than 24 inches by 24 inches.

2.5 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

C. Grounding Bus: Install in electrical and telecommunication equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.

2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.
5. Connections within Concrete Structure: Welded connectors.
6. Lightning Protection System Connections: Welded connectors.

2.6 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

B. Provide copper grounding bar in all electric service rooms and at all telecom points-of-entry (PoE). Provide copper bar for intersystem bonding bus (if required). Provide copper grounding bar as otherwise indicated on plans.

2.7 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the frame of the generator; and, only where generator is identified as a separately derived system, to the equipment grounding conductor.

2.8 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70 and New York City Electrical Code:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Computer and rack-mounted electronic equipment circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

2.9 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, unless otherwise noted, and install in conduit.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Exothermic welding: Exothermically weld all grounding and bonding connections and splices that will be installed to be inaccessible, including underground and within concrete slabs, columns, walls, floor slabs, etc.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to **all** metal water service entrances to building. Connect grounding conductors to all metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve and utility meter(s).

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for New Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Grounding for concrete reinforcing bars in new buildings: Connect grounding electrode system to reinforcing bars via exothermic weld.

I. CORROSION PROTECTION

1. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
2. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

2.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81. Submit test report to Engineer for approval prior to closing up any related underground work.

4. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:

1. Power and lighting equipment or system with capacity of 500 kVA and less: 10 ohms.
2. Power and lighting equipment or system with capacity of 500 to 1000 kVA: 5 ohms.
3. Power and lighting equipment or system with capacity more than 1000 kVA: 3 ohms.
4. Power distribution units (PDUs) or panelboards serving electronic equipment: 1 ohm(s).

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor as recommended by structural engineer.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

C. Comply with all local electrical, building and fire codes.

D. Note that components of this specification may not be permitted in all jurisdictions. This includes certain expansion anchors in New York City. Contractor shall be aware of local jurisdiction product prohibitions. Where required by the AHJ, contractor shall ensure all inspections, including special and progress inspections, are performed and approved.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product approved equal:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. Thomas & Betts Corporation.
    d. Unistrut; Tyco International, Ltd.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: [Steel] [Steel and malleable-iron] hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product approved equal:

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product approved equal:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Hilti Inc.
3) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
4) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted [or other]support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb. (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements as described in architectural sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Surface raceways.
5. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel, threaded conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC, fire protection and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable products approved equal:

1. Allied Tube & Conduit.
2. O-Z/Gedney.
3. Thomas & Betts Corporation.
4. Western Tube and Conduit Corporation.
5. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70 and local electrical code, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit and IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: Steel.
b. Type: Setscrew.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70 and local electrical code, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable products approved equal:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Condux International, Inc.
4. Lamson & Sessions; Carlon Electrical Products.
5. RACO; Hubbell.
6. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70 and Local electrical code, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. LFNC: Comply with UL 1660.

E. RTRC: Comply with UL 1684A and NEMA TC 14.

F. Fittings for ENT: Comply with NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable products approved equal:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Mono-Systems, Inc.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 and Type 3R, unless otherwise indicated, and sized according to NFPA 70 and Local electrical code.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70 and Local electrical code, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Flanged-and-gasketed type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable products approved equal:

1. Cooper Technologies Company; Cooper Crouse-Hinds.
2. Hoffman.
3. Milbank Manufacturing Co.
4. O-Z/Gedney.
5. Thomas & Betts Corporation.
6. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular or as required by field conditions, subject to engineer’s approval.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70 and Local electrical code, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70 and Local electrical code, by a qualified testing agency, and marked for intended location and application.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: As required by field conditions, subject to engineer's approval.

K. Gangable boxes are allowed.

L. Cabinets:

1. NEMA 250, Type 1 and Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC; except where IMC or GRC, PVC coated is specified in the Contract Drawings.
2. Concealed Conduit, Aboveground: IMC.
3. Underground Conduit: Refer to Section 260543 – Underground Ducts and Raceways for Electrical Systems. Refer to utility specifications for all raceways under utility jurisdiction.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R].

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew cast-metal fittings except below design flood elevation (DFE). Comply with NEMA FB 2.10.
4. EMT below design flood elevation (DFE): Rainproof compression connectors. Comply with NEMA FB 2.10.
5. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 and Local electrical code limitations for types of raceways allowed in specific occupancies and number of floors.

B. Comply with all relevant federal, state and local codes including local building, fire and electrical codes.

C. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

D. Complete raceway installation before starting conductor installation.

E. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches (300 mm) of enclosures to which attached.

J. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC or IMC before rising above floor.

K. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or flexr raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and Local electrical code and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70 and Local electrical code.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways with American Polywater catalog # ‘FST’ at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where underground raceways enter a building or structure.
3. Where otherwise required by NFPA 70 and Local electrical code.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Locate boxes so that cover or plate will not span different building finishes.

AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeve-seal systems.
2. Sleeve-seal fittings.
3. Grout.
4. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels. Refer to the drawings for equipment identifications for electrical equipment.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with New York City Electrical Code.

D. Comply with New York City Building Code.

E. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

F. Comply with ANSI Z535.4 for safety signs and labels.

G. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

B. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.5 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.6 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
3. Electrical room: “WARNING, ELECTRICAL EQUIPEMNT, NO STORGAE PERMITTED”.

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with white letters on black face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.8 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, paint. Minimum letter height shall be 1 inch (25 mm.

2.9 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

G. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 30-foot (10-m) maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Switchgear.
    d. Switchboards.
    e. Emergency system boxes and enclosures.
    f. Enclosed switches.
    g. Enclosed circuit breakers.
    h. Enclosed controllers.
    i. Variable-speed controllers.
    j. Power transfer equipment.
    k. Contactors.
    l. Remote-controlled switches, dimmer modules, and control devices.
    m. Power-generating units.
    n. Monitoring and control equipment.

END OF SECTION

SECTION 26 05 72

OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Short-circuit study input data, including completed computer program input data sheets.
2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient

study data to ensure that the selection of devices and associated characteristics is satisfactory.

b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

c. This study may be combined with studies required by specification sections 260573 and 260574 if required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

A. Software Developers:
1. Eaton CYME International
2. ESA Inc.
3. Operation Technology, Inc.
4. Power Analytics, Corporation
5. SKM Systems Analysis, Inc

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

6. Contractor is responsible to coordinate levels of over-current protection as per electrical code requirements and to size interrupting rating of boards, panels and over-current devices as per the study results at no additional cost to owner.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article.

G. Short-Circuit Study Output:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated fault-current magnitude and angle.
c. Fault-point X/R ratio.

d. Equivalent impedance.

2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated symmetrical fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. Calculated asymmetrical fault currents:

      1) Based on fault-point X/R ratio.
      2) Based on calculated symmetrical value multiplied by 1.6.
      3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

   a. Voltage.
   b. Calculated symmetrical fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. No AC Decrement (NACD) ratio.
   e. Equivalent impedance.
   f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
   g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.

1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Engineer.
2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.

3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is the complete electrical distribution system unless otherwise indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 75 kVA and having impedance of 4.5% or greater.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

1. Electric utility's supply termination point.
2. Incoming switchgear and service switches.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.

6. Control panels.
7. Standby generators and automatic transfer switches.
8. Distribution panelboards.
9. Branch circuit panelboards.
10. Switchboards
11. Disconnect switches.
12. All overcurrent protection of systems rated 1000 volts or greater.

3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

END OF SECTION

SECTION 26 05 73

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

A. Coordination (Selective): Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the choice of overcurrent protective devices and their ratings or settings. Two overcurrent protective devices shall be deemed selectively coordinated if their respective time-current characteristic curves do not intersect at a time of 0.1 seconds (6 cycles on 60 Hz systems) or longer.

B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

C. OCPD: Overcurrent protective device.

D. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

E. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

F. SCCR: Short-circuit current rating.

G. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Coordination-study input data, including completed computer program input data sheets.
2. Study and equipment evaluation reports.
3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
b. This study may be combined with studies required by specification sections 260572.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. The following parts from the Protective Device Coordination Study Report:

1) One-line diagram.
2) Protective device coordination study.
3) Time-current coordination curves.

b. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:
1. Eaton CYME International
2. ESA Inc.
3. Operation Technology, Inc.
4. Power Analytics, Corporation
5. SKM Systems Analysis, Inc

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

1. Optional Features:

a. Arcing faults.
b. Simultaneous faults.
c. Explicit negative sequence.
d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

    a. Phase and Ground Relays:

        1) Device tag.
        2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
        3) Recommendations on improved relaying systems, if applicable.

    b. Circuit Breakers:

        1) Adjustable pickups and time delays (long time, short time, ground).
        2) Adjustable time-current characteristic.
        3) Adjustable instantaneous pickup.
        4) Recommendations on improved trip systems, if applicable.

    c. Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:

    a. Power utility's overcurrent protective device.
    b. Medium-voltage equipment overcurrent relays.
    c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.

e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
f. Cables and conductors damage curves.
g. Ground-fault protective devices.
h. Motor-starting characteristics and motor damage points.
i. Generator short-circuit decrement curve and generator damage point.
j. The largest feeder circuit breaker in each motor-control center and panelboard.

5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.
6. Provide adequate time margins between device characteristics such that selective operation is achieved.
7. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.

1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied includes the entire electrical distribution system, unless otherwise indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Selective coordination between overcurrent protective devices shall be required to be achieved as follows:
1. Normal (utility) power system(s)

a. Where the service OCPD rating or setting is over 601 amps, include this OCPD and all OCPDs in the next level downstream.
b. Where a second level OCPD has the same rating or setting as the service OCPD, include the third level OCPDs and the two upstream OCPDs in the study.
c. Note that selective coordination shall not be required between two OCPDs in series with one another when no loads are connected in parallel with the downstream device.
d. Note that selective coordination shall not be required between transformer primary and secondary OCPDs, where only one OCPD exists on the transformer secondary.

2. Emergency and legally-required standby power system(s): all supply-side OCPDs and all OCPDs on the load side of transfer switches and other transfer equipment.
3. Ground-fault protection devices for health-care facilities as per Article 517 of the applicable electrical code.
4. Where otherwise indicated on the Drawings

H. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

I. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

J. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

K. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

L. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

M. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

1. Electric utility's supply termination point.

2. Incoming switchgear and service switches.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.
6. Control panels.
7. Standby generators and automatic transfer switches.
8. Distribution panelboards.
9. Branch circuit panelboards.
10. Switchboards
11. Disconnect switches.
12. All overcurrent protection of systems rated 1000 volts or greater.

N. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.

4. Contractor is responsible to coordinate levels of over-current protection as per electrical code requirements and to size interrupting rating of boards, panels and over-current devices as per the study results at no additional cost to owner.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.

1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Engineer.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.

7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Maximum demands from service meters.
13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
14. Motor horsepower and NEMA MG 1 code letter designation.
15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
16. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
17. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

    a. Special load considerations, including starting inrush currents and frequent starting and stopping.
    b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
    c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
    d. Generator thermal-damage curve.
    e. Ratings, types, and settings of utility company's overcurrent protective devices.
    f. Special overcurrent protective device settings or types stipulated by utility company.
    g. Time-current-characteristic curves of devices indicated to be coordinated.
    h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
    i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
    j. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.
    k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.4 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lighting Contactors
2. Occupancy and Vacancy Sensors
3. Photosensors and Daylighting Controls
4. Panel/Modules Systems
5. Timer switches.
6. Wallbox Dimmers
7. Emergency Lighting Control Relays

B. Related Sections:

1. Section 260500 “Common Work”
2. Section 262726 "Wiring Devices"

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting control product.

1. Physical description of each lighting control device including dimensions.

B. Shop Drawings: Show project specific installation details of system including wiring between devices.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

C. Samples:
   1. Provide faceplate finishes as requested by the architect.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device..

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined by NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 WARRANTY

A. All occupancy/vacancy sensors, photosensors, timer switches and wallbox dimmers to carry a minimum of five-year warranty.

B. All other lighting control components to carry a minimum two-year warranty.

PART 2 - PRODUCTS

Unless otherwise and specifically noted elsewhere in the contract documents, wireless lighting control devices and equipment, other than handheld remote controllers, are not permitted. Provide wired lighting control solution including both power and control wiring to all sensors, switches and equipment.

2.1 LIGHTING CONTACTORS

A. Approved Manufacturers:
   1. ASCO Power Technologies.
   2. Eaton.
   3. Siemens Industry, Inc.

B. Description: Electrically operated and mechanically held, combination-type lighting contactors with non-fused disconnect, complying with NEMA ICS 2 and UL 508.

   1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
   2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
   3. Enclosure: Comply with NEMA 250.
   4. Provide with control and pilot devices as matching the NEMA type specified for the enclosure.

2.2 OCCUPANCY AND VACANCY SENSORS

A. Approved Manufacturers:
1. Acuity Brands
2. Cooper Lighting Solutions
3. Crestron Electronic, Inc.
4. Hubbell Control Solutions
5. Leviton Mfg. Company Inc.
6. Lutron Electronics Co., Inc.
7. Wattstopper

B. Description: Solid-state sensors provided based on applications indicated on drawings.

1. All sensors to be wired unless otherwise noted.

2. All sensors shall be dual technology with PIR and Ultrasonic technology unless otherwise noted.

3. Listed and labeled as defined in NFPA 70, and marked for intended location and application.

4. Refer to the lighting control narrative on the drawings programming and timeout requirements.

C. Configuration:

1. Wall-Mounted: Sensors shall be mounted in a single-gang wall box and be gangable with other designer style electrical devices and faceplates. Sensors shall be provided with a designer style screwless faceplate with the color as selected by the Architect. A red LED will indicate when unit is being triggered and it will glow when off to facilitate location in an unlit room. Sensors to have sensitivity and timing adjustment.

2. Ceiling-Mounted: Sensors with a separate relay/power pack unit. Sensors shall have an LED indicator to provide feedback to the power pack when detecting a change in heat or movement and shall have a sensitivity and timing adjustment. Unit shall not detect motion through glass and shall be mounted a minimum of six (6) fee away from air turbulent devices.

D. Remote Relay/Power Pack/Control Module: Where indicated or required, provide a remote power pack that interfaces with the sensor. Remote pack shall accept multiple input voltages and shall contain a transformer to prove low-voltage outputs to compatible sensors, and a dry-contact relay (normally open) for switching lighting loads. Control module shall be sized to fit inside a standard 4 in. X 4 in. junction box, and shall be fitted with a ½ in. EMT threaded male fitting the line voltage end such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low-voltage wiring external. Module shall be rated for switching 20 A of ballast load at 120 V and 277 V.

E. Low-Voltage Momentary Switch: Where indicated, provide a single-pole momentary switch. Switch to be provided with a screwless faceplate.

F. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms that are to be provided with sensors. Contractor is responsible for arranging a preinstallation meeting with the manufacturer's factory-authorized representative, at the Owner's facility, to verify placement of sensors and installation criteria. Contractor is responsible for coordinating the appropriate voltage and maximum/minimum load conditions as well as coordinated with other work such as painting, raceways, electrical boxes, etc.

G. Locate and aim all sensors in correct position required for complete and proper volumetric coverage within the range indicated in the manufacturer's recommendations. Rooms shall have a 90% to 100% coverage of the specified area to accommodate all occupancy habits.

H. Field of view templates shall be installed, as required, to mask the viewing lens to prevent fals triggering for auto-on operation.

I. Provide, that the Owner's facility, the training necessary to familiarize the Owner's personnel with the operation, use, adjustment and problem-solving diagnosis of the sensors.

2.3 Photosensors and Daylighting Controls

A. Approved Manufacturers:
1. Acuity Brands
2. Cooper Lighting Solutions
3. Crestron Electronic, Inc.
4. Hubbell Control Solutions
5. Leviton Mfg. Company Inc.
6. Lutron Electronics Co., Inc.
7. Wattstopper

B. Description: Solid state photoelectric device that measures amount of available daylight. Sensors to interface directly with a controller and provide amount of daylight or an analog signal proportional to the light measured. Sensors to be class 2 low-voltage.

1. All sensors to be wired unless otherwise noted.

2. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Sensors to interface directly with a controller and provide amount of daylight or an analog signal proportional to the light measured.

4. Sensors to have a minimum time delay of 3 minutes to prevent false operation.

5. Sensors to have an accuracy of +/- 1%

C. Configuration

1. Indoor
   a. Light-Level Monitoring Range: 0 to 100 fc (0 to 10,000 lux)
2. Outdoor
   a. Light-Level Monitoring Range: 0 to 750 fc (0 to 7,500 lux)
   b. Sensors to be rated for wet location.
   c. Sensor to have a hood to shield from direct sunlight.
3. Atrium or Skylight
   a. Atrium Light-Level Monitoring Range: 0 to 2,500 FC (0 to 25,000 lux)
   b. Skylight Light-Level Monitoring Range: 10 to 7,500 FC (100 to 75,000 lux)
   c. Sensor to have a translucent dome with 180 degree field of view.

2.4 PANELS/MODULES SYSTEMS

A. Approved Manufacturers:
1. Cooper Lighting Solutions
2. Crestron Electronic, Inc.
3. ETC
4. Hubbell Control Solutions
5. Leviton Mfg. Company Inc.
6. Lutron Electronics Co., Inc.
7. Wattstopper

B. Description: Lighting control systems consisting of switching and dimming. Refer to drawings/narrative for connection between controls and networking requirements, if required.
1. Provide timeclock, head end, interfaces, and other lighting control devices as indicated on the drawings/narratives.
2. System to consists of panels and/or modules utilizing 1, 2, 4, 12, 24, 48 or 96 zones.
3. The number of relays in each panel or module shall be determined by the number of circuits to be controlled or relay zones, as indicated on the plans.
4. Provide barriers where 120 and 277 volt circuits and normal and emergency circuits are used in the same panel.
5. Provide, in addition to zones/relays indicated, an additional four (4) spare relays.
6. Receptacles to be controlled via relays suitable for receptacles.
7. Switching and dimming protocol to be compatible with luminaire.
8. Providing wiring between devices, as required, to provide a working system.

C. Configuration
1. Panels: 12 or more relays within an enclosure
   a. Panels to be located in electrical closet, unless otherwise noted.
   b. Panels to be preassembled and shall consist of a back box, hinged lockable cover, 120 V or 277 V power supply, and an interior back plane with required number of relays factory-installed. Panels shall be suitable for surface or flush installation. Panel interior shall have a suitable divider separating Class 1 and Class 2 compartments. Panel enclosure shall be UL-approved.
   c. Relays shall be 2-wire single-pole full loaded relays suitable for controlling all types of lighting loads and receptacles up to 20 A. Load contacts shall be able to sustain 1,500 amp fault currents for up to 20 milliseconds.
2. Modules: Modules/room controllers consisting of 1, 2 or 4 zones.
   a. Modules to be located within enclosure capable of mounting above an accessible ceiling. Modules to be located within room controlled, unless otherwise noted.
3. Control Stations
   a. Provide preset stations as indicated on drawings.
   b. Control stations shall be mountable in a standard 2, 3 or 4 gang backbox.
   c. Stations shall have nameplate capability for either graphic insert style or factory applied “silkscreen” lettering. Switch covers shall have no exposed screws. Color to be almond, gray, ivory or white as specified by the Architect.
   d. Power failure memory of ten (10) years in duration shall return the control unit to the last selected scene once power is restored and shall ensure retention of all programmed information.
4. Interfaces: Provide interfaces, where required, for communication with other systems.
   a. AV

1) The AV interface shall allow an AV system to access the preset scenes in each area shown via isolated momentary dry contact closures, RS-232 communication link, or other industry standard interface to override lighting control scenes to select any preset plus "off."

b. BMS
1) The BMS interface shall allow a BMS system to access the preset scenes in each area via BACnet communication link to override lighting control scenes to select any preset plus "off."
2) Where indicated, provide occupied and unoccupied status of occupancy and vacancy sensors.

c. Fire Alarm
1) Where indicated, provide contact closure. Emergency lights to be change to full "on" upon activation of a fire alarm system.

d. Low Voltage
1) Contact closure input device shall accept both monetary and maintained contact closures for control of lights scenes, shade group presets, or other system.

5. Timeclock
a. Timeclock to have 10 year astronomical timeclock, providing control 365 days per year, with daily and weekly time schedules. Overrides of time clock events shall be maintained for a maximum of two (2) hours, followed by a sweep-through of all zones. Timeclock shall have the ability to be override via remote low-voltage local switches.

6. Wiring
a. Where (1) or more module or panel is connected, they shall be interconnected with a plenum-type data line, run in ¾" EMT.

7. Occupancy and Vacancy Sensors
a. Refer to Occupancy and Vacancy Sensors Section.

8. Photosensors and Daylighting Controls
a. Refer to Photosensors and Daylighting Controls Section

9. Emergency Capability
a. For panels and modules fed with a normal/emergency feeder, the system shall bring all zones to full-on condition upon the loss of normal power and the subsequent presence of emergency power. The emergency control circuity shall control both intensity signal and on/off signal of each zone connected to an emergency circuit between the local control stations and a full-on constant drive supply.
b. When normal power fails, emergency zones shall operated at full intensity (or be bypassed entirely) until normal power is restored.
c. Manufacturer to provide listed emergency lighting transfer switches/shunt relays.

D. Operation
1. Systems shall have the following capabilities:
a. System to have the ability to separate each control zone and independently operate the associated zone.
b. Each lighting zone shall be independently controlled via local control or head end lighting control.

2.5 TIMER SWITCHES

A. Approved Manufacturers

1. Cooper Lighting SolutionsIndustries, Inc
2. Hubbell Control Systems
3. Leviton Mfg. Company Inc.

4. Lutron
5. Wattstopper

B. DescriptionSolid state, electronicprogrammable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70 bya qualified testing agency, and marked for intended location and application.

2. Contact Configuration: SPST.
3. Contact Rating: 30-A inductive or resistive, 240-V ac.

4. Astronomic Time: All channels.

5. Automatic daylight savings time changeover.
6. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.6 Wallbox Dimmers

A. Approved Manufacturers:
1. Acuity Brands
2. Cooper Lighting Solutions
3. Crestron Electronic, Inc.
4. Hubbell Control Solutions
5. Leviton Mfg. Company Inc.
6. Lutron Electronics Co., Inc.

B. WattstopperDescription: Provide dimmer suitable for specific lighting loads in all areas as indicated on drawings.
1. Dimmers shall be compatible with dimming protocol of luminaires.
2. Faceplants to have screwless covers with finish, as per Architect.
3. Location of all dimmers to be coordinated and dimensions with Architectural drawings.
4. Dimmers shall provide full-range, smooth and continuously variable control of light intensity.
5. An actuator, accessible from the front of the unit, with the wall plate attached, shall activate a mechanical air-gap switch disconnecting power from the load during “safety off” condition; no-leakage current shall be present at the fixture(s.)
6. Dimmers shall be capable of on/off, raise/lower and mechanical air-gap “safety off” from up to nine (9) additional locations using aesthetically coordinated remotes.
7. Dimmers shall be capable of operating at the rated capacity; this includes modified capacities for ganging configurations that require the removal of fins. Operation at rated capacity shall be possible across the full ambient temperature range without shortening design lifetime.
8. Dimmers shall be designed to reduce interference with radio, audio and video equipment.
9. Dimmers shall incorporate power-failure memory. Should power be interrupted and subsequently returned, the lights shall come back on to the same light level set prior to the power interruption.
10. Dimmers shall operate in an ambient temperature range of 32° F to 104° F.
11. 3-way controls shall be wired using conventional 3-way and 4-way wire runs.
12. Multi-location dimmers without neutral shall be capable of operating either 3-way switch location.
13. Wall controls shall fit a decorator wall plate opening with a flush tap switch. Dimmers and remotes shall have a small, raised rocker to the right of the tap switch. Tap switches shall remain flush in both the “on” and “off” state. Wall controls shall have a gloss finish.

14. A single tap of the tap switch shall raise lights from “off” to the preset light level or fade light to “off.” The raise/fade rate shall travel the dimming range in 3 seconds.
15. The LEDs on the tap switch shall indicated the light level when the dimmer is on.

2.7 EMERGENCY LIGHTING CONTROL

A. Approved Manufacturers:
1. Acuity Brands
2. Bodine
3. Hubbell
4. Wattstopper

B. Description: 20 amp emergency transfer relay for the quantity of circuits or zones, as indicated in the Electrical Drawings.

1. The relay devices shall comprise of normal voltage-sensing circuity and transfer relay to automatically bypass lighting controls or/and transfer load circuits from the normal to the emergency power feeds when normal power is lost.
2. On restoration of normal power supply, load circuits shall be transferred to be fed from the lighting controls automatically or/and from the emergency feeds to the normal supply automatically.
3. An integral test switch shall be provided to simulate normal power source loass for periodic verification of system operation.

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive and store all necessary materials and equipment for installation of the lighting controls. It is the intent of these specifications and plans to include everything required for proper and complete installation and operation of the system, even though every item may not be specifically mentioned. Deliver on a timely basis to other trades any equipment that must be installed during construction.

B. The system shall be installed utilizing complete manufacturer's shop drawings and in accordance with these specifications. Dimmers shall not be used to furnish any temporary light or power for construction activities.

C. Provide accurate as-built drawings to the Owner for correct programming and proper maintenance of the lighting control system.

D. Install control stations only after "wet" work such as plastering has been completed and the area has been cleaned.

E. Mount equipment at locations and heights indicated on approved shop drawings or as directed by the Owner/Architect. Locations indicated on the Electrical Drawings are general and approximate. Verify locations with Architect's plans and elevations prior to installation. Check for adequacy of headroom and clearance with other equipment such as ducts, pipes, and opening. Bring any conflicts to attention prior to proceeding with work.

F. Upon completion of the installation and prior to the removal of the bypass jumpers, completely test all line-voltage power and low-voltage control wiring for continuity and accuracy of connections. The jumpers shall remain in place until all loads have been full tested and found to be free of miswires, short circuits or other wiring defects.

G. On completion of the installation, the lighting control equipment shall operate per specifications and be free from defects in condition and finish. Movable parts must operate freely and with uniform friction throughout their range. Prior to inspection, replace any damaged parts.

H. Provide all required relays, transformers, power supplies, wiring, conduit or other necessary or auxiliary devices not specifically listed on the Contract Documents, but that are needed to affect the functional requirements of the control systems.

I. Field terminations in these systems shall be made to numbered screw terminals on circuit breakers or switches or on numbered barrier terminal blocks. Wire nuts and crimped connectors are not acceptable.

J. Provide separate grounded conductors (neutrals) for all branch load circuits that include dimmers or dimming systems.

K. Grounded conductors (neutrals) shall be run to all switch locations.

L. All breakers that serve wiring with shared neutrals shall be provided with common trip action.

M. Occupancy and Vacancy Sensors
   1. Sensor layout shown on plans is diagrammatic. Contractor shall provide complete sensor coverage of spaces as required to provide a 100% fully-functional system at no added costs for additional sensors. Contractor shall adjust quantity of all sensors, including occupancy sensor, vacancy sensor, daylight sensor, photosensor and any additional sensors as required and submit sensor layout shop drawings review and approval.
   2. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
   3. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
   4. Provide plans showing sensor locations, devices and control sequences.

5. Review the installation, perform functional tests and document the results and operating and maintenance information prior to receiving final project approval.
6. On completion of installation and after circuitry has been energized, demonstrate capability and compliance with system requirements. Where possible, correct any malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units or relocate devices, if required, and proceed with retesting. Testing and retesting shall be done at no expense to the Owner.

N. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

O. Photocells
1. Prior to commissioning, Contractor shall verify that all photosensors have been properly located, factory-calibrated (proof require) or field-calibrated and set for appropriate set points and threshold light levels. Contractor shall provide documentation of set points, setting and programming for each device.
2. Contractor shall demonstrate that only the luminaires in the daylit zone are affected by the daylight control. The contractor shall simulate both bright and dark conditions in the dimming system in order to determine the following:
   a. Automatic daylight control system reduces and increases the amount light delivered to the space uniformly based on available daylight.
   b. In continuous dimming systems, demonstrated that the dimming control system provides reduce flicker operation over the entire operating range. Additionally, in stepped light level control systems, demonstrate that the minimum time delay between steps is three (3) minutes to prevent short cycling and that the automatic daylight control system reduces the amount of light delivered to the space per manufacturer’s specifications for power level versus light level.
   c. Contractor shall document illuminance measurements in the space, location of measurements and specific device settings, program settings and any other measurements, as required.

P. Wiring
1. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
2. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
3. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
4. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.2

3.3 SYSTEM START-UP
1. On completion of the installation, the system shall be commissioned by a factory-trained technician. The commissioning will be performed upon notification that the system installation is complete and that all loads have been tested live for continuity and free from defects and that all control wiring has been connected and checked for continuity.

2. Advise the Owner's Representative prior to scheduling start-up so that all persons designated by the Owner are present for training.
3. Contractor shall make any necessary adjustments and calibrations necessary prior to Final Inspection by the Owner.

3.4 SYSTEM FUNCTIONAL TESTING

1. Occupancy sensors, vacancy sensors, photocells, and timelock controls shall be tested by an approved testing agency to ensure that control hardware and software are calibrated, adjusted, programmed, tested and in proper working order per the construction documents and manufacturer's instructions. Functional testing to occur after system start-up.
2. Documentation shall be provided to the Owner within 90 days of the date of receipt of the certificate of occupancy and include construction documents, operating and maintenance manual and report of the test results.

3.5 SYSTEM ONSITE PROGRAMMING

1. Manufacturer shall provide technical support for one (1) full day of onsite set-up to program scenes and settings. Manufacturer and contractor shall confirm that system is properly installed, fully operational and commissioned prior to scheduling on-site programming. Set-up shall be prior to instruction and training periods.
2. Prior to programming, the Owner/Architect/Lighting Consultant shall provide a lighting control narrative indicating description of zones, operational hours, timed events, light levels and sequencing requirements with other building systems.

3.6 TRAINING

1. A Factory Engineer or Manufacturer representative shall demonstrate the operation and maintenance of all system components to the Owner's Representatives. Factory technician shall schedule, in coordination with the Owner, a training period for the Owner's staff or designated appointees. This training period shall be a minimum of three (3) hours. Training shall encompass the entire scope for the system, including operation, adjustment, maintenance and troubleshooting, until completely understood. Factory technician shall submit names and period of attendance of those instructed.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

C. SPD: Surge protection device.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means" the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.

3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.

5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.

8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

1.6 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares of each size for each panelboard.

3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.9 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Comply with local electrical codes.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.11 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than 7 business days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's and Owner's written permission.
3. Comply with NFPA 70E.

1.12 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.13 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R, unless otherwise indicated.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.

4. Finishes:

   a. Panels and Trim: Galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Galvanized steel.

5. Directory Card: Inside panelboard door, mounted in metal holder frame with transparent card protector.

C. Incoming Mains Location: Top and bottom, coordinate with field conditions.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box, where specifically indicated.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads, where specifically indicated.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical or compression type.

3. Ground Lugs and Bus-Configured Terminators: Mechanical or compression type.

4. Feed-Through Lugs: Mechanical or compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

5. Subfeed (Double) Lugs: Mechanical or compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Mechanical or compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus. Provide where extra-capacity neutral bus is required.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible products approved equal:

1. ABB Ltd.
2. All City Switchboard Co., Inc.
3. Atlas Switch Co., Inc.
4. Electrotech Service Equipment Corp.
5. Eaton Electrical Inc.; Cutler-Hammer Business Unit
6. Lincoln Electric Products Co., Inc.
7. Mac Products, Inc.
8. Raycap, Inc.
9. Schneider Electric
10. Siemens Energy & Automation, Inc.

B. power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: As specified on drawings.

E. Branch Overcurrent Protective Devices: Fused switches, unless otherwise noted.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible products approved equal:

1. ABB Ltd.
2. All City Switchboard Co., Inc.
3. Atlas Switch Co., Inc.
4. Electrotech Service Equipment Corp.
5. Eaton Electrical Inc.; Cutler-Hammer Business Unit
6. Lincoln Electric Products Co., Inc.
7. Mac Products, Inc.
8. Raycap, Inc.
9. Schneider Electric
10. Siemens Energy & Automation, Inc.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: As indicated on the drawings.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4 LOAD CENTERS

Load centers with plug-in circuit breakers are acceptable only for residential dwelling units and where specifically described within contract drawings.

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible products approved equal:

1. ABB Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Load Centers: Comply with UL 67.

C. Mains: As indicated on the drawings.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible products approved equal:

1. ABB Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time time adjustments.
    c. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.

    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

    e. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    g. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1, whichever is more stringent.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1, whichever is more stringent.

B. Retain first paragraph below for floor-mounted distribution panelboards. Even if floor mounted, all panelboard cabinets must still be securely attached to a vertical wall or surface.

C. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

G. Install filler plates in unused spaces.

H. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Contractor shall inspect components, assemblies, and equipment installations, including connections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 10 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Tamper-resistant receptacles.
3. Weather-resistant receptacles.
4. Snap switches and wall-box dimmers.
5. Solid-state fan speed controls.
6. Wall-switch and exterior occupancy sensors.
7. Communications outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Approvals: All submittals shall be approved by the Engineer and Architect. Architect shall approve wiring devices and wall plates for style and finish.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles, subject to approval by architect:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

C. Provide wiring devices as specified in this section unless otherwise noted by the Architect and /or Interior designer. Listed manufacturers are subject to approval by the Architect and /or Interior designer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with the current New York City Electrical Code.

D. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

B. Tamper-Resistant Convenience Receptacles, 125 V, 15 A and 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; TR8300.
b. Hubbell; HBL8300SGA.
c. Leviton; 8300-SGG.
d. Pass & Seymour; TR63H; 885TR.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 15 A and 20 A:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Hubbell; GFTR20.
b. Pass & Seymour; 2095TR.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

1) Single Pole:

2) Cooper; AH1221.
3) Hubbell; HBL1221.
4) Leviton; 1221-2.
5) Pass & Seymour; CSB20AC1.

6) Two Pole:

7) Cooper; AH1222.
8) Hubbell; HBL1222.
9) Leviton; 1222-2.
10) Pass & Seymour; CSB20AC2.

11) Three Way:

12) Cooper; AH1223.
13) Hubbell; HBL1223.
14) Leviton; 1223-2.
15) Pass & Seymour; CSB20AC3.

16) Four Way:

17) Cooper; AH1224.
18) Hubbell; HBL1224.
19) Leviton; 1224-2.
20) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; AH1221PL for 120 and 277 V.
b. Hubbell; HBL1201PL for 120 and 277 V.
c. Leviton; 1221-LH1.
d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; 1995.
    b. Hubbell; HBL1557.
    c. Leviton; 1257.
    d. Pass & Seymour; 1251.

2.6 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; 6252.
    b. Hubbell; DR15.
    c. Leviton; 16252.
    d. Pass & Seymour; 26252.

B. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; TR6252.
    b. Hubbell; DR15TR.
    c. Pass & Seymour; TR26252.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

C. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; TWRBR15.
    b. Hubbell; DR15TR.
    c. LevitonTRW15.
    d. Pass & Seymour; TRW26252.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

D. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; VGF15.
    b. Hubbell; GF15LA.
    c. Leviton; 8599.
    d. Pass & Seymour; 1594.

E. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; TWRVGF15.
    b. Hubbell; GFTR15.
    c. Pass & Seymour; 1594TRWR.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

F. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; 7621 (single pole), 7623 (three way).
    b. Hubbell; DS115 (single pole), DS315 (three way).
    c. Leviton; 5621-2 (single pole), 5623-2 (three way).
    d. Pass & Seymour; 2621 (single pole), 2623 (three way).

G. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

    a. Cooper; 7631 (single pole), 7633 (three way).
    b. Hubbell; DS120IL (single pole), DS320 (three way).
    c. Leviton; 5631-2 (single pole), 5633-2 (three way).
    d. Pass & Seymour; 2625 (single pole), 2626 (three way).

2. Description: With neon-lighted handle, illuminated when switch is "off."

2.7 RESIDENTIAL DEVICES

A. Residential-Grade, Tamper-Resistant Convenience Receptacles, 125 V, 15 A and 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; TR270.
b. Hubbell; RR155TR.
c. Leviton; T5320.
d. Pass & Seymour; TR62.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

B. Weather-Resistant and Tamper-Resistant Convenience Receptacles, 125 V, 15 A and 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; TWR270.
b. Hubbell; RR155WRTR.
c. Leviton; TWR15.
d. Pass & Seymour; 3232TRWR.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

C. Telephone Outlet:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; 3560-6.
b. Leviton; 40649.

2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

D. Combination TV and Telephone Outlet:

1. Products: Subject to compliance with requirements, provide one of the following or comparable product approved equal:

a. Cooper; 3562.
b. Leviton; 40159.

2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

2.8 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.

3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.9 MULTIOUTLET ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following or comparable product approved equal:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold/Legrand.

C. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

D. Raceway Material: Metal, with manufacturer's standard finish.

2.10 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected... Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections. No. 10 AWG may be directly wired to devices listed for 10 AWG using side-wire clamping terminals.
8. Tighten all unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down and on horizontally mounted receptacles to the right, unless otherwise indicated.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.

3. Install unshared neutral conductors online and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports, upon request.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Motor-control centers.
c. Panelboards.
d. Switchboards.
e. Enclosed controllers.
f. Enclosed switches.

2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in PDF format.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures," Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in PDF format.
4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than 3 of each size and type.

1.6 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than **40 deg F (5 deg C)** or more than **104 deg F (40 deg C)**, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.8 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by only one of the following:

1. Cooper Bussmann, (Eaton Electrical, Inc.)
2. Edison Fuse, (Eaton Electrical, Inc.)
3. Mersen, USA (Ferraz Shawmut, Inc.)
4. Littelfuse, Inc.

B. Source Limitations: Obtain fuses from single source from single manufacturer.

C. Where Engineer has indicated specific fuse manufacturer, model, class, characteristics and/or part number on project drawings, substitutions are not acceptable.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting or time delay, as required.
4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, fast acting or time delay, as required.
5. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC (min), time delay.
7. Type T: 600-V, zero- to 800-A; 250-V, 801- to 1200-A rating, 200 kAIC, very fast acting or time delay as required.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

2.3 PLUG FUSES

A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.4 PLUG-FUSE ADAPTERS

A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

2.5 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay, Class RK1, time delay, Class J, time delay.
2. Feeders: Class L, time delay, Class RK1, time delay, Class RK5, time delay, Class J, time delay.
3. Motor Branch Circuits: Class RK1, Class RK5, Class CC, motor duty, time delay.
4. Large Motor Branch (601-4000 A): Class L, time delay.
5. Other Branch Circuits: Class RK1, time delay Class RK5, time delay Class J, fast acting Class J, time delay.
6. Power Electronics Circuits: Class J, high speed, Class T, fast acting.
7. Other Branch Circuits: Class RK1, time delay, Class RK5, time delay, Class J, time delay, Class CC, fast acting.
8. Control Transformer Circuits: Class CC, time delay, control transformer duty.
9. Or as indicated on drawings.

10. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable from the front of the equipment, or with partially opened cabinet door, without removing fuse.

B. Furnish & install spare-fuse cabinet(s). Provide at least one spare fuse cabinet in main electric service room, and at least one additional cabinet in each elevator machine room; and additional cabinets as indicated on drawings.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Molded-case circuit breakers (MCCBs).
5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 or as specified by the structural engineer.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).

4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. Comply with local electrical codes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than 7 business days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Construction Manager's and Owner's written permission.
4. Comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible product approved equal:

1. ABB, Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.
7. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac/208-V ac.

2.2 NONFUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ABB, Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

3. Lugs: Mechanical type, suitable for number, size, and conductor material.

4. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac/208-V ac.

2.3 SHUNT TRIP SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible product approved equal:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power source of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

E. Accessories:

1. Oiltight key switch for key-to-test function.
2. Oiltight green ON pilot light.
3. Isolated neutral lug; 200 percent rating.

4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Form C alarm contacts that change state when switch is tripped.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible product approved equal:

1. ABB, Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time time adjustments.
3. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

H. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.

2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads.

4. Ground-Fault Protection: Comply with UL 1053; integrally mounted type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

6. Zone-Selective Interlocking: Integral with ground-fault trip unit; for interlocking ground-fault protection function.
7. Electrical Operator: Provide remote control for on, off, and reset operations.

2.5 MOLDED-CASE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or compatible product approved equal:

1. ABB, Ltd.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.

B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Features and Accessories:

1. Standard frame sizes and number of poles.

2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

2.6 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R, unless otherwise indicated.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Contractor shall field inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
b. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study.

END OF SECTION

SECTION 28 31 13

FIRE PROTECTIVE ALARM SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the work, wherever applicable to Mechanical and Electrical Work.

B. Section 01 31 46 - Special Requirements for Mechanical and Electrical Work shall apply.

C. Section 26 05 00 - General Provisions for Electrical Work shall apply.

D. Drawings are diagrammatic and are a graphic representation of contract requirements to beed available standards at the scale required.

1.2 DESCRIPTION OF WORK

A. The system shall consist of addressable, intelligent devices, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. Generic terms such as “sub system”, “the system”, “a system”, “the fire alarm system”, etc. shall be deemed to apply to the complete intelligent analog addressable fire alarm system, unless specifically noted elsewhere.

B. The features and capacities described in this specification are a requirement for this project and shall be furnished by the successful Contractor. The system as described shall be installed, programmed, tested, and delivered to the Owner in fully operational condition. The system shall include all required hardware, software, raceways and interconnecting wiring to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein. The system shall consist of, but not be limited to, the following:
1. Fire Command Station with Integral Flashing “FIRE” Visible Signal. (FCS)
2. Remote System Panel. (RSP)
3. Remote Annunciator Panel(s) with LCD alphanumeric display. (If required)
4. Fire System Alarm Printer(s).
5. System CRT Terminal with Keyboard.
6. Addressable Analog Duct Smoke Sensors.
7. Addressable Interface Modules.
8. Audible and Visual Notification Devices.

C. Devices to be controlled by the FCS and/or RSP’s panel programmable relays, duct smoke detector programmable relays, remote system programmable addressable relays and/or intelligent addressable interface module relays:
1. Connections to the appropriate Receiving Agency for smoke alarm, supervisory, and system trouble conditions.
2. Air handling fan systems alarm shutdown operations.
3. Fire/smoke dampers operations. (If required)

1.3 RELATED DOCUMENTS / WORK AND EXISTING CONDITIONS

A. RELATED DOCUMENTS

1. Prior to the commencement of work, the Contractor shall obtain all permits necessary for installation of the work. All permit costs and inspections fees shall be included as part of the required work.
2. Local requirements shall be adhered to with regard to submitting specifications, wiring diagrams, shop drawings and plans. Responsibility for furnishing the quantities of copies on cloth and/or paper, as directed by such requirements, shall be included as part of the work of this Section.
3. Prior to commencement and after completion of work, the Contractor shall notify all authorities having jurisdiction.
4. The Contractor shall submit a letter of approval of the installation, from the local code authority, before requesting final acceptance of the system.

B. RELATED WORK

1. The Contractor shall coordinate work in this Section with all related trades. Work and/or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:
2. Duct smoke sensors to be installed by the Mechanical Contractor. See Division 23. They shall be furnished, wired and connected to the fire alarm system by the Contractor.
3. Air handling system, smoke exhaust fan and smoke damper control circuits and fan status contacts to be provided by the fan systems control equipment. See Division 23. They shall be wired and connected to the fire alarm system by the Contractor.
4. Coordinate with all other trade Contractors for the mounting of and/or interfacing with any and all other fire alarm system related devices.
5. The Contractor shall visit the site to determine and verify all existing conditions. Existing conditions that would, in the Contractor's opinion, prohibit or greatly delay construction progress shall be brought to the Architect's and Engineer's attention in writing.
6. No additional compensation shall be permitted for variations due to field conditions that would affect the installation of the fire alarm system.

C. RETROFIT COORDINATION REQUIREMENTS

1. VERIFICATION TESTING: The fire protection Contractor shall test and document the operation of existing fire protection system(s) prior to new installation. The purpose of testing is to establish a benchmark of functional reliability prior to altering or removing existing protection. The Contractor shall maintain the condition and integrity of existing life safety equipment as found after verification testing. Interfacing requirements shall be provided for all new installed work during the phasing of this project. Interfacing shall mean that both existing and new work shall operate and/or function as one system during the life cycle of installation.
2. CRITICAL PATH - INSTALLATION SCHEDULE: The fire protection Contractor shall prepare, and gain approval by the Owner or owners Engineer, an installation schedule based on owners priorities prior to the start of work. Any deviation from the agreed work schedule, unless requested in writing and approved, shall not be acceptable. Minimizing impact on normal business activities shall be the contractor’s responsibility, should “off-hour” work be required outside of the approved installation schedule, the Contractor shall request a change order prior to starting work.
3. FIRE WATCH RESPONSIBILITIES: Prior to the start of work the Owner and Contractor shall determine fire watch activities. This shall include, but not be limited to, the who, what, where, when and how fire watch activities shall be performed. As a minimum, the Owner shall provide the necessary manpower to conduct fire watch activities during scheduled installations. Non-scheduled work shall be the fire protection contractor’s responsibility to provide all necessary manpower and equipment to conduct fire watch duties.

4. RETROFIT FINAL ACCEPTANCE TESTING: Partial system modifications and add on changes shall be accepted tested as per NFPA 7-1.6.2. Complete fire system replacement shall use NFPA 72 - 1-7.2.
5. Other (e.g. Project Meetings, Installation Progress Reports to Engineer)

D. MODIFICATIONS TO EXISTING SYSTEM
1. The system shall consist of, but not be limited to, the following: indicated plans and associated REFERENCES - APPLICABLE LISTINGS, CODES, STANDARDS, DOCUMENTS

E. STANDARDS AND CODES
1. All equipment shall be installed and complied with the current adopted provisions of the following codes and standards.
2. All equipment shall be U.L. listed for its intended use, as a minimum, the following standards shall apply:
   a. U.L. 268 and 268A - Smoke Detectors for Fire Protective Signaling Systems. - Detectors Duct Application.
   b. U.L. 864 - Control Units for Fire Protective Signaling Systems.
3. National Fire Protection Association Standards.
   a. NFPA No. 70 - 2008 Edition with 2011 NYC Amendments- National Electrical Code.
   b. NFPA No. 72 - 2016 Edition - National Fire Alarm Code.
   c. NFPA No. 90A - 1996 Edition - Installation of Air Conditioning & Ventilating Systems.
   d. NFPA No. 101 - 2015 Edition - Life Safety Code
4. All raceways and wiring shall be installed in compliance with NFPA Standard 70 (National Electrical Code - Article 760). Codes shall be implicitly followed, in particular with regard to material type and quality, circuitry extensions from and connections to outlet and junction boxes, panel boards and similar appurtenances.
5. The fire alarm system and its installation shall comply with all applicable requirements of The Americans with Disabilities Act of 2010.
6. The fire alarm system and its installation shall comply with all applicable requirements of the New York State Uniform Fire Protection and Building Code.
7. The fire alarm system and its installation shall comply with all other local codes and authorities having jurisdiction, including but not limited to, owners engineering design guidelines.

1.4 DEFINITIONS

A. Initiating Device: A system component that originates transmission of a change of state condition, such as a smoke detector, manual fire alarm box, supervisory switch, etc.

B. Initiating Device Circuit: A circuit to which automatic or manual initiating devices are connected where the signal received does not identify the individual device operated. Typically known as a “Zone” for conventionally wired systems or circuits.

C. Notification Appliance: A fire alarm system component such as a bell, horn, speaker, strobe, printer, etc., that provides an audible or visual output or both.

D. Notification Appliance Circuit: A circuit or path directly connected to a notification appliance.

E. Signaling Line Circuit: A circuit or path between any combination of circuit interfaces, control units, or transmitters over which multiple system input or output signals or both are carried. (When used with addressable analog initiating devices, these SLC circuits are also known as “Addressable Loops”)

F. Note: Both Signaling Line Circuits and Initiating Line Circuits operate initiating devices, however, they provide different communication capabilities. Code requirements differ greatly for performance and capacities. Refer to NFPA 72, Tables 3-5.1 & 3-6.1.

1.5 SYSTEM DESCRIPTION

A. The system shall operate as an integrated multiplexed protected premises fire alarm/emergency communication monitoring and control system.
   1. Changes in the status of monitored points shall be detected by the microprocessor based fire command station utilizing distributed processing, peer-to-peer networking with remote system panel's located throughout the facility if required.
   2. Sensor "dirty" and "excessively dirty" trouble conditions shall report automatically.
   3. Devices shall be listed by U.L. for sensitivity testing by means of the portable programmer/tester or by readout from the control panel. Each addressable device address shall be set electronically, devices requiring dip switch settings, rotary switch settings, staples or jumper settings are not acceptable.
   4. As a minimum, RSP's shall consist of an enclosure, power supply, digital communications circuitry, mother boards, batteries and hardware, modules, audio hardware, and circuitry described for inclusion in the fire alarm control panel as required to function as specified. System control panels shall function in standalone fail safe mode upon loss of the FCS processing, communications, or communications wiring.
   5. Smoke detectors shall alarm at their programmed sensitivity settings and shall not revert to a common default setting when their operating system segment is in the default mode.
   6. System individually identifies each addressable initiating device and other addressable monitor functions using multiplexing interfacing techniques.
   7. System is capable of individually operating each alarm indicating appliance, and other control functions, using multiplexing techniques.
   8. The FCS shall be listed and capable for the release FM200, Deluge and Pre-action systems.

B. Life safety alarm function programs shall perform automatically upon system alarm actuation. In addition, control points may be operated manually at any time by the attendant through appropriate keyboard commands. The system FCS shall also provide integral programmable function control switches to allow personnel to manually operate specific preprogrammed control output functions, as required.

1.6 QUALITY ASSURANCE

A. It is the intent of these Specifications to provide a complete fire alarm system that complies in all respects with the requirements of all applicable codes and standards. Equipment, materials, software, installation practices, etc. that do not meet these requirements or do not meet the performance standards herein specified shall not be acceptable.

B. Fire alarm system equipment furnished under this Specification shall be UL listed, under the appropriate category, as a product of a single manufacture. All central control equipment shall be listed under UL category UOJZ as a single control unit. The manufacture shall have been engaged in the production of this type of equipment for at least ten (10) years.

C. The equipment furnished under this Specification shall be that of the specified manufacture or approved equal. All information herein is intended to establish minimum standards of performance, quality and construction, and is based upon Compatible equipment MXL addressable analog equipment designed and manufactured by Cerberus Compatible equipment, a Division of Cerberus Technologies, Inc., Cedar Knolls, NJ, USA, whose catalog and numbers are used, shall indicate the materials as well as the operating features required. It is not the intent of these specifications to eliminate competitive equipment.

D. Before commencing work the Contractor shall submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified. The Contractor shall also include the names and locations of at least three installations where such systems have performed satisfactorily for the preceding 18 months.
   1. The Contractor shall submit three copies of all required Licenses and Bonds as required in the State or Province having jurisdiction.
   2. The installing Contractor shall employ on staff a minimum of one NICET level 2 technician or a professional Engineer, registered in the State of the installation.
   3. The installing Contractor shall be qualified by Underwriter's Laboratories certifying the complete system meets UL upon completion of the installation. Ongoing maintenance and testing shall be provided to the Owner under a maintenance contract to maintain the certification.
   4. Installation contractors unable to comply with the provisions of 1.06 shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

E. Provide the services of a representative or technician from the manufacturer of the system. The representative or technician is to be certified and experienced in the installation and operation of the type of system provided. The representative shall be licensed in the State, if required by law. The fire alarm Contractor shall supervise installation, software programming, software documentation, adjustments, preliminary testing, final testing and certification of the system. The fire alarm Contractor shall also be required to provide operational instruction to the Owner's personnel. Instruction shall include system operation, maintenance, programming, and arm/disarm procedures.

F. All fire alarm system equipment furnished under this Specification shall be UL listed, under the appropriate category, as the product of a single manufacturer. All control equipment shall be listed under UL as a single control unit. The manufacturer shall have been engaged in the production of this type of equipment for at least ten (10) years and have a fully equipped service organization capable of responding within 4 hours from the initial contact for warranty or regular service work. Emergency and/or off hours calls shall be responded to within 4 hours of initial contact seven days a week.

G. With bid submittal, the Contractor shall state what, if any, specific points of the proposed system's operation or the equipment's quality differ in any way from this Specification by submission of a complete technical proposal to include supporting literature and drawings. Only those departures from these Specifications, submitted in writing at the time of bid, shall be considered by the Engineer during the submittal review phase. Failure to submit all departures from these Specifications at the time of bid shall be cause for summary rejection of any submittal documents where additional departures are discovered.

H. Acceptance of substitutions, based on submittal documents furnished by the Contractor, shall only be construed as permission to proceed with the installation pending final test and approval of the system. The Contractor shall continue to bear the liability for replacement of substituted equipment, if in the opinion of the Owner or Engineer, the substitute equipment fails to perform as specified, or fails to meet approval of all authorities having jurisdiction within three (3) months after scheduled Project completion.

I. Should conflicts arise between project drawings and/or these Specifications, regarding design, quantities of devices or circuits, the higher quantity or cost shall be considered as correct, unless directed by the Engineer to provide other appropriate measures.

J. It is the Contractor's responsibility to submit acceptable equipment for review by the Engineer. The Contractor shall bear all liability for damages arising from his failure to submit equipment that meets these Specifications, including, but not limited to, any penalties for failure to meet construction deadline.

K. Final determination of compliance with these Specifications shall rest with the Engineers, who, at their discretion, may require proof of performance at the cost of the Contractor. Required proof may include,

but shall not be limited to, expense paid visits by representatives of the Owner and Engineer to sites where identical equipment is installed and providing beneficial use.

1.7 SUBMITTALS

A. Prior to the start of work, the Contractor shall provide a complete and comprehensive submittal for review by the Engineer. These are to describe the proposed system and its equipment. Failure to provide a complete submittal shall be grounds for summary rejection of any incomplete submittal documentation. Contractor's who provide Resubmittal's, due to prior rejection, shall be subject to a review fee, should the Engineer elect to do so. The complete submittal shall include, but not be limited to, all of the following material:

1. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, finish and mounting requirements.
2. Complete drawings covering the following shall be submitted by the Contractor for the proposed system. Floor plans in a CAD compatible format showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
3. A complete proposed system database including a description of all logic strings, control by event programming and point identification labels on a 3.5" high density floppy disk and in a formatted printed form, as required for off site editing, shall be submitted for evaluation by the Owner.
    a. The program shall include all required interactive control functions between the local network systems and the methods for implementing these actions.
4. Provide the address, telephone number, and contact person(s) of the manufacturer's local service facility for normal and off hour warranty issues.
5. If the fire alarm system and its equipment is supplied by a manufacturer's distributor, as part of the submittal documentation, the manufacturer shall provide, on its corporate letterhead, a "letter of support". Said "letter of support" shall state that, when in the opinion of the Engineer, the distributor's efforts require backup and/or assistance, the manufacturer shall provide, at no cost to the Owner, all required technical support and manpower, in a timely manner, during the installation period and for a one (1) year guarantee period starting on the date of final acceptance by the Owner and the Authority Having Jurisdiction. If said "letter of support" is not submitted, the manufacturer's equipment will be deemed unacceptable and shall be grounds for summary rejection.
6. Provide a fire alarm system function matrix. Matrix shall illustrate alarm output events in association with initiating devices input events. Matrix shall represent a summary of the installed system alarm, supervisory and trouble functions. Include any and all departures, exceptions, variances or substitutions from these Specifications and/or drawings at the time of bid. Failure to provide this requirement shall be cause for summary rejection of submittal documents where additional departures are discovered. (See NFPA Appendix A-7-5.2.2(i) 2016).
7. Provide manufacturer's printed product data, catalog pages and descriptions of any special installation requirements and/or procedures. Drawings depicting any special physical installation requirements shall show physical plans, elevations, all dimensions, conduit entry, minimum access clearances and any other details required.
8. Provide a signed letter and notarized statement on the manufacture's letterhead, stating that each analog addressable data communications circuit shall support one hundred (100%) of the circuits and addressable devices in alarm or operated at the same time, during both primary (AC) and secondary (battery) power conditions.
9. Provide shop drawings as follows:
    a. Single line riser diagram showing all equipment, all connections and number and size of all conductors and conduits.
    b. Provide samples of various items when requested by the Architect/Engineer.

10. The fire alarm Contractor shall provide copies of certification for service technicians formal training by the system manufacturer. As a minimum, certification documents shall indicate training dates, systems qualified, name of individual certified and current status.

1.8 SYSTEM OPERATION

A. Description

INITIATION	OPERATION
1. Triggering of duct smoke detector; or of area smoke or heat detector	Initiate an automatic alarm zone verification sequence. Upon verification, sound evacuation and alert tone signals and recorded announcements through loudspeaker stations, and flash visual fire warning signals. Sound audible signal and display "duct smoke" detector and zone identification at fire command station and outlying annunciators. Operate relay at fire command station to accommodate transmission of an "automatic" signal through telephone company wires to a central station location. Operate outlying addressable modules to accommodate transmission of signals to dampers, fans, elevators, and other equipment, as scheduled and/or as specified hereinafter. Display status of affected equipment at Fire Command Station and outlying annunciators.

B. Reset of all alarm initiating device circuits, alarm notification circuits, and equipment control relays shall be accomplished from the fire command station. In no case shall the above alarm reset procedure cause the resetting of equipment control relays (for fans, dampers, etc.). Such devices shall require separate reset from the fire command station.

C. It shall be possible to disconnect any floor, or any device or combination of devices on any floor, from the system to allow for maintenance, repairs, or the addition of system devices and wiring without disabling any other floor. Such disconnection shall cause a visual "disabled" annunciation at the fire command station identifying the floor and/or devices.

D. System operation shall be providing automatic and/or manual shutdown of fans larger than 2,000 CFM, and of dampers and other equipment in response to alarm initiation, as well as central status reporting. Any fans over 2,000 CFM shall be provided with manual control (and status reporting) from FCS. Controls shall be provided in accordance with a schedule on the drawings and/or as described hereinafter. Include provisions at the FCS in outlying system equipment control cabinets, and in outlying addressable module boxes (or cabinets) - each located within 3'-0" of the associated motor starter, smoke purge damper control device or other equipment control device, control circuitry extensions (i.e., final connections) from the addressable module boxes to the controlled equipment and connections, all as required to achieve this control.

E. System Configuration

1. Each duct smoke detector shall constitute a separate zone for reporting to the fire command station. For display at the fire command station (FCS) and at outlying annunciator(s), each reporting zone (i.e., device) shall be individually identified, except that multiple smoke detectors (or multiple heat detectors) located within a single space may be identified by a common display. It shall be possible to separately identify and display the address of the individual detector(s) in alarm within any such space by means of an appropriate command at the FCS keyboard or keypad.

2. Control (automatic and/or manual) and status reporting (monitoring) of equipment via the fire protective alarm system as specified hereinafter shall be accomplished by means of addressable control modules (ACM's) and addressable monitoring modules of the status reporting type (AMM/S's) located within 3'-0" of the controlled equipment in outlying addressable monitor boxes similar to those specified above for the AMM/ID's. Addressable modules (ACM's and AMM/S's) shall be provided in accordance with the following:
    a. ACM's and AMM/S's shall be of a type intended for connection to NFPA 72, Style 6 "branch signalling circuits (SLC's) as described hereinbefore, and shall be connected to the appropriate SLC serving the floor on which they are located.
    b. Each ACM shall provide (2) SPDT contacts suitable for use at voltages up to 250 VAC and capable of interrupting 10 amperes inductive, and shall derive its operating and supervisory current at 24VDC from the SLC. If necessary, these contact ratings shall be accommodated by means of auxiliary control relays mounted within or adjacent to the same addressable monitor boxes as the ACM's, and deriving their operating power from the associated ACM's, or directly from the associated ECC via separate supervised power supply conductors.
    c. Each AMM/S shall function so as to provide a readily identifiable status indication at the FCS in response to a 120 or 208 VAC signal from the associated controlled equipment. Incorporate an auxiliary status (monitoring) relay for each AMM/S to convert a 120 or 208 VAC AC signal to a "dry" contact if the AMM/S requires a "dry" contact for proper status signal initiation. Auxiliary status relays, if required, shall be mounted in the same outlying addressable module boxes as their associated AMM/S's.
    d. At locations (such as motor control centers) where multiple equipment controllers are installed, the addressable modules (and any associated auxiliary relays) may be grouped in common addressable module boxes.
3. Outlying addressable module boxes, each complete as indicated, shall be provided for equipment requiring automatic or manual control by the FPA system on the basis of the following:
    a. One box including two ACM's ("stop", start") and one AMM/S ("running") for each fan over 2,000 CFM (including fans in self-contained air conditioning units).
    b. One addressable module box for each supply or return damper at the duct or shaft entries to each floor supplied by a multi-floor fan system which will be permitted to run during a fire. Include one ACM ("close") and one AMM/S ("closed") intended to accomplish automatic floor-by-floor isolation for smoke control purposes.
    c. One addressable module box for each damper requiring individual manual control from the central damper control panel (specified hereinafter for normal after-hours control), but for which direct manual or automatic control by the fire alarm system is not specified. Include one ACM ("closed") and one AMM/S ("closed").
    d. One addressable module box, including two ACM's ("recall", "recall to alternate floor") and one AMM/S ("elevators recalled") for each bank of elevators. Provide two additional ACM's ("de-energize/re-energize elevator power panel) for each bank of elevators if the elevator machine room and/or associated shaft is sprinklered. Also, include one AMM/S per bank ("panel de-energized").
    e. One addressable box, including one ACM for the fire stair door unlocking system.
    f. One addressable module box, including one ACM, for the fire/smoke door release system.
    g. One addressable module box, including one ACM for each fire stair or elevator machine room smoke vent.
    h. One addressable module box, including one ACM for each escalator controller.
    i. Additional addressable module boxes as necessary to comply with the scheduled control of equipment in response to system alarm actuating devices.
4. Priority of Signals:
    a. Accomplish automatic response functions by the first zone initiated. Alarm functions resulting from initiation by the first zone are not altered by subsequent alarms. The highest

priority is an alarm signal. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even though the lower-priority condition occurred first. Annunciate all alarm signals regardless of priority or order received.

b. Noninterfering: Zone, power, wire, and supervise the system so a signal on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. Systems that require batteries or battery backup for the programming function are unacceptable.

c. Fire Alarm Control Panel (FACP) Response: The manual or automatic operation of an alarm-initiating or supervisory-operating device causes the FACP to transmit an appropriate signal including the following:
   1) General alarm.
   2) Fire-suppression system operation alarm.
   3) Smoke or heat detector alarm.
   4) Valve tamper supervisory.
   5) Door release.
   6) Elevator recall.
   7) Elevator shutdown.
   8) Dumbwaiter shutdown.
   9) System trouble.
   10) Fan shutdown.
   11) Smoke-control initiation.

d. Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service.

e. Silencing at the FACP: Switches provide capability for acknowledgment of alarm, supervisory, trouble, and other specified signals at the FACP; and capability to silence the local audible signal and light a light-emitting diode (LED). Subsequent zone alarms cause the audible signal to sound again until silenced by switch operation. Restoring alarm, supervisory, and trouble conditions to normal extinguishes the associated LED and causes the audible signal to sound again until restoration is acknowledged by switch operation.

5. Smoke detectors indicated in mechanical equipment rooms shall be of the combination photocell plus fixed temperature/rate-of-rise type.
6. Smoke detection devices shall have integrally mounted pilot lamps giving a "triggered" indication.
7. Smoke detection devices which are mounted in ducts shall be supplied with remote "triggered" indication pilot wired in parallel, in an approved manner, with the similar pilots included integrally with detection units. The pilots for duct detectors shall each be flush or surface mounted within 15 feet circuiting distance of its associated detector. Mounting and location to be as directed by the Architect.
8. Smoke detectors indicated as being located in floor or ceiling cavities of the air handling type shall be equipped with "air shields" where air velocities are such as to require these appurtenances for the proper detection of smoke.
9. Recording of Events:
   a. Print a record all alarm, supervisory, and trouble events on the system printer. Printouts are by zone, device, and function. When the FACP receives a signal, the alarm, supervisory, and trouble conditions are printed. The printout includes the type of signal (alarm, supervisory, or trouble) the zone identification, date, and the time of the occurrence. The printout differentiates alarm signals from all other printed indications. When the system is reset, this event is also printed, including the same information for device, location, date, and time. A command initiates the printout of a list of existing alarm, supervisory, and trouble conditions in the system.

1) Circuit Supervision: Indicate circuit faults by both a zone and a trouble signal at the FACP. Provide a distinctive indicating audible tone and LED-indicating light. The maximum permissible elapsed time between the occurrence of the trouble condition and its indication at the FACP is 200 seconds.

F. System Trouble Functions
1. Receipt of a system trouble alarm, shall cause the following actions and indications:
   a. Activate "Trouble Alarm" notification to the FCS computer terminal display indicating device address, device type, device location, time and date.
   b. Activate "Trouble Alarm" notification to the appropriate receiving agency and/or on site location as shown on the drawings.
   c. Audible signals shall be silenced from the control panel by an acknowledge switch.
   d. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.
   e. Record all events at the system alarm printer.
2. The fire alarm system wiring (except control wiring to fans, dampers, 120Vac door holders, etc.) shall be electrically supervised to automatically detect and report trouble conditions to the FCS.
3. Any opens or grounds on Interface Addressable Module alarm initiating or supervisory circuit wiring and any opens, grounds or shorts across the addressable data communications, remote annunciator data communications, alarm speaker, Warden telephone or alarm strobe light circuit wiring shall initiate a system trouble condition.
4. System addressable devices shall be supervised for placement and normal operation. Removal of an addressable device or the failure of its internal electronic circuitry shall initiate a system trouble condition.
5. The following FCS and/or remote transponder control panels shall initiate a system trouble condition when the following occurs:
   a. Primary 120/220 VAC power loss.
   b. Battery disconnects.
   c. Battery low voltage.
   d. FCS remote transponder or graphic LCD annunciator panel power loss.
   e. FCS primary alarm log printer power loss.
6. Operating a central station agency alarm disconnect switch (if equipped), or any manual control commands that alter the system from its normal programmed standby configuration shall initiate a trouble condition.
7. Trouble conditions shall automatically activate an audible signal and flash the general system trouble LED indicator at the FCS. Pressing the trouble acknowledge key on the FCS shall silence the audible signal and continuously light the LED indicator, until the trouble condition is repaired. Subsequent trouble conditions shall resound the audible signal and again flash the LED. Each trouble condition must be individually acknowledged.
8. Removal of or failure of internal electronic circuitry of any addressable device shall initiate a system trouble condition.

PART 2 - SYSTEM OPERATION

2.1 BASIC SYSTEM EQUIPMENT, CIRCUITING, ADDRESSING AND OPERATING CAPABILITIES

1. Duct smoke sensors shall be photoelectric. Each smoke sensor and air duct housing shall be self-compensating for the effects of air velocity (from 300 to 4,000 CFM), temperature, humidity and atmospheric pressure. It shall not be necessary to field adjust the sensitivity to compensate for the above effects. Each smoke sensor shall utilize solid state components and be equipped with an alarm indicating LED which shall flash when the smoke sensor is activated and shall be provided with a form "C" remote relay with contacts rated at 3 amps 120 VAC or 24 VDC. The smoke sensors

address shall be set by electronic means only, no mechanical means such as dipswitches, rotary dials or by inserting programmable pins shall be used. The smoke sensor mounting base shall be of the twist/lock type. Each duct smoke detector shall be provided with remote status panel with LED mounted flush on single gang plate with Legend "Alarm" and system identification name plate.

2. The intelligent interface module shall be listed by Underwriters' Laboratories, Inc. The unit shall incorporate a custom microprocessor based integrated circuit which shall provide communication with main fire control panel. The interface module shall supervise and monitor normally open or normally closed dry contacts. The interface module shall report the contact's status to the control panel. The intelligent interface module shall be dynamically supervised and uniquely identifiable by the control panel. The intelligent interface module's address shall be set by electronic means only, no mechanical means such as dipswitches, rotary dials or by inserting programmable pins shall be used. The intelligent interface module shall be used to uniquely identify field devices such as water flow switches, tamper switches, OS&Y valves or as directed by these specifications and project drawings.
3. The intelligent interface module shall be used when remote relay functions are required for system functional requirements, such as but not limited to, fan shut downs. Relay dry contacts shall be rated at 2 amp. 120 VAC resistive or 30 VDC resistive and shall be Form "C".
4. The FCS addressable data communications circuits shall support one hundred percent (100%) of the addressable devices in alarm or operated at the same time, during both primary (AC) and secondary (battery) power conditions. Systems which cannot support one hundred percent (100%) of the system address capacity in alarm or operated simultaneously cannot assure appropriate system alarm responses and shall not be acceptable.
5. The system shall provide status indicators and control switches for all of the following functions:
    a. HVAC supply and exhaust fans.
    b. Fire and/or smoke dampers.
6. Manual control and annunciation of system audio status shall be provided by a set of modular switch units. Each module shall include eight discreet, momentary push button switched devices. Membrane type switches for this purpose shall not be acceptable.
    a. Each switch shall include space for labeling switch function. The label shall be protected behind a clear protective membrane cover. In addition, each switch shall have two LED's associated with it. One of the LED's shall be amber in color and shall indicate a fault condition on a zone or zone's associated with that switch. The second LED shall be dual color red/green, and be capable through software configuration, to clearly indicate zone status including which audio source is active (i.e. Evacuation, Alert, Page, etc.)
7. Status only annunciation shall be provided by a set of modular visual Led indicators. Each module shall be capable, through system software mapping to include, but not limited to alarms and troubles. Each module shall include eight individual status indicators each containing one dual color LED for red and green status, and one amber color LED for zone integrity monitoring.
8. HVAC supply-exhaust units and fire and smoke dampers shall be provided with a hand off-on-auto switch module with LED indicators. LED indication shall be red for "off", green for "on" and amber for monitoring circuit integrity. In addition, visual indication shall be provided for positive feedback confirmation of field devices. LED status annunciation shall be real time and actual, derived from a monitored auxiliary contact on the fan contactor, sail switch or atmospheric pressure switch installed downstream from the fan.
9. Devices shall be listed by U.L. for sensitivity testing by means of the portable programmer/tester or by readout from the control panel. Device address and sensitivity assignments shall be predetermined electronically, devices requiring dip switch settings, rotary switch settings, staples or jumper settings are not acceptable.
10. Smoke detectors shall alarm at their programmed sensitivity settings and shall not revert to a common default setting when their operating system segment is in the default mode.
11. Software and Firmware Control:

a. All software and firmware provided with a fire alarm system shall be listed for use with the fire alarm control unit.
b. A record of installed software and firmware version numbers shall be maintained at the location of the fire alarm control unit.
c. All software and firmware shall be protected from unauthorized changes through the use of "access levels."

12. Conductors
a. Each conductor shall be identified as shown on the drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.
b. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer wiring guides.
c. Wiring for analog loop circuits, conventional detection circuits, speaker circuits and telephone circuits shall based on the fire alarm manufactures wiring guidelines, but shall not be smaller then #16 AWG.
d. Plenum rated cable, if used, shall be rated for 150§ degrees Celsius with an insulation of Teflon or its equivalent.
e. Splices shall be made with UL listed mechanical connectors or shall be soldered and taped to assure reliable service.
f. Crimp-on type spade lugs shall be used for termination's of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.
g. Wire nuts or other solderless splicing devices shall not be used.
h. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.
i. A consistent color code for fire alarm system conductors throughout the installation shall be provided. The installation Contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.
j. All nominal voltage branch circuit power feeds (120/220 Vac) shall be identified "labeled" at both ends of the circuit to indicate it's source and purpose.
k. Wiring within system control panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance and to isolate nominal voltage wiring from system low voltage wiring.
l. Splices in electrical conductors in vertical risers are prohibited except when the length of conductors exceeds 150 feet in vertical risers, an approved terminal cabinet shall be used.

2.2 WIRE

A. Wire: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install system according to NFPA standards referenced in Parts 1 and 2 of this Section.

3.2 EQUIPMENT INSTALLATION

A. Smoke detection devices which are mounted in ducts shall be supplied with remote "triggered" indication pilot wired in parallel, in an approved manner, with the similar pilots included integrally with detection units. The pilots for duct detectors shall each be flush or surface mounted within 15 feet circuiting distance of its associated detector. Mounting and location to be as directed by the Architect. Duct smoke detectors shall be low-flow type, and to be suitable to be installed in ducts with air velocity ranging between 100 feet per minute and 4,000 feet per minute.

B. Smoke detectors indicated as being located in floor or ceiling cavities of the air handling type shall be equipped with "air shields" where air velocities are such as to require these appurtenances for the proper detection of smoke.

C. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems". Conceal raceway except in unfinished spaces and as indicated.

B. Wiring within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and a different color code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visual alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

E. The minimum temperature rating of the cables shall be 150 Deg. Celsius.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification for Electrical Systems.

3.5 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements of Division 26 Section "Grounding and Bonding for Electrical Systems".

D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

3.7 FIELD TESTING

A. Each addressable analog smoke detector shall be individually field tested prior to installing the device at its designated location to ensure reliability after shipment and storage conditions. A dated log indicating correct address, type of device, sensitivity and initials of the technician performing test - using test equipment specifically designed for that purpose - shall be prepared and kept for final acceptance documentation. After testing, the detection devices and base shall be labeled with the system address, date and initials of the installing technician. Labeling shall not be visible after installation is complete.

B. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.
1. A systematic record shall be maintained of all readings using schedules or charts of tests and measurements. Areas shall be provided on the logging form for readings, dates and witnesses.
2. The acceptance inspector shall be notified before the start of any required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector, shall be corrected.
3. Test reports shall be delivered to the acceptance inspector as completed.

C. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing Contractor. The following equipment shall be a minimum for conducting the tests:
1. Ladders and scaffolds as required to access all installed equipment.
2. Multimeter for reading voltage. current and resistance.
3. Intelligent device programmer-tester.
4. Laptop computer with programming software for any required program revisions.
5. Two way radios, flashlights, smoke generation devices and supplies.
6. Spare printer paper.
7. An approved device for measuring air flow through air duct smoke detector sampling assemblies.
8. Decibel meter.
9. Testing documentation.

D. In addition to the testing specified to be performed by the installing Contractor, the installation shall be subject to test by the acceptance inspector.

3.8 FINAL ACCEPTANCE TESTING

A. A written “Acceptance Test Procedure” (ATP) for testing the fire alarm system components and installation will be prepared by the Engineer in accordance with NFPA 72 and this Specification. The Contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits and programming.

B. A final Asbuilt Function Matrix shall be prepared by the installing Contractor referencing each alarm input to every output function affected as a result of an alarm, trouble or supervisory condition on that input. In the case of outputs programmed using more complex logic functions involving "any", "or", "not", "count", "time", and "timer" statements; the complete output equation shall be referenced in the matrix.

C. A complete listing of all device labels for alpha-numeric annunciator displays and logging printers shall be prepared by the installing Contractor prior to the ATP.

D. The acceptance inspector shall use the system record drawings in combination with the documents specified. During the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request a demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:
   1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
      a. Open, shorted and grounded intelligent analog signaling circuit.
      b. Open, shorted and grounded network signaling circuit.
      c. Open, shorted and grounded conventional zone circuits.
      d. Open, shorted and grounded speaker, telephone circuits.
      e. Intelligent device removal.
      f. Primary power or battery disconnected.
      g. Incorrect device at address.
      h. Printer trouble, off line or out of paper.
      i. Loss of data communications between system control panels.
      j. Loss of data communications between system annunciators.
   2. System evacuation alarm indicating appliances shall be demonstrated as follows:
      a. All alarm notification appliances actuate as programmed.
      b. Audibility and visibility at required levels.
   3. System indications shall be demonstrated as follows:
      a. Correct message display for each alarm input at the control panel, each remote alpha-numeric LCD display.
      b. Correct annunciator light for each alarm input, at each annunciator and color graphic terminal.
      c. Correct printer logging for all system activity.
   4. System on-site and/or off-site reporting functions shall be demonstrated as follows:
      a. Correct alarm custom message display, address, device type, date and time transmitted for each alarm input.
      b. Correct trouble custom message display, address, device type, date and time transmitted for each alarm input.
      c. Trouble signals received for disconnect.
   5. Secondary power capabilities shall be demonstrated as follows:
      a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
      b. System primary power shall be restored for forty eight hours and system charging current shall be normal trickle charge for a fully charged battery bank.
      c. System battery voltages and charging currents shall be checked at the fire alarm control panel using the test codes and displayed on the LCD display.

E. In the event of system failure to perform as specified and programmed during the ATP procedure, at the discretion of the acceptance inspector, the test shall be terminated.
   1. The installing Contractor shall retest the system, correcting all deficiencies and providing test documentation to the acceptance inspector.

2. In the event that software changes are required during the ATP, a utility program shall be furnished by the system manufacturer to compare the edited program with the original. This utility shall yield a printed list of the changes and all system functions, inputs and outputs affected by the changes. The items listed by this program shall be the minimum acceptable to be retested before calling for resumption of the ATP. The printed list and the printer log of the retesting shall be submitted before scheduling of the ATP.
3. The acceptance inspector may elect to require the complete ATP to be performed again if, in his opinion, modifications to the system hardware or software warrant complete retesting.

3.9 DOCUMENTATION

A. System documentation shall be furnished to the Owner and shall include but not be limited to the following:
   1. System record drawings and wiring details including one set of reproducible masters and drawings on 3 ½ inch floppy disks in a DXF format suitable for use in a CAD drafting program.
   2. System operation, installation and maintenance manuals.
   3. Written documentation for all logic modules as programmed for system operation with a matrix showing interaction of all input signals with output commands.
   4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
   5. System program “hard copy” showing system functions, controls and labeling of equipment and devices.
   6. All specified documentation as required.

3.10 TEST EQUIPMENT

A. The Contractor shall furnish to the Owner all test equipment as required to program the field analog devices, specifically an intelligent device programmer-tester or a calibrated smoke generator with power source.

3.11 WARRANTY/SERVICES

A. The Contractor shall warrant the entire system against system hardware and electrical defects including programming software defects for a period described in the contract general conditions, but not less than one year. This period shall begin upon satisfactory completion and certification of final acceptance testing of the system and sign acceptance of consulting Engineer. Contractor shall provide to Owner a letter stating the start-date and end-date of warranty period. In addition, the Contractor shall also provide an updated list of name(s) and phone number(s) for normal and off hours contacts necessary to respond to warranty issues. Response to warranty notification shall require a reply within 24 hours of initial contact.

3.12 TRAINING

A. The fire alarm Contractor shall furnish training as follows for a minimum of four employees of the system user:
   1. Training in the receipt, handling and acknowledgment of alarms.
   2. Training on system operation including manual control of output functions from the FCS.
   3. Training in the testing of the system including logging of detector sensitivity, field test of devices and response to common troubles.
   4. The total training requirement shall be a minimum of 8 hours but shall be sufficient to cover all items specified.
   5. The manufacture shall provide a written schedule of training dates for factory training of owners representatives. Include all fee’s, dates, times, phone numbers and contact individual.

END OF SECTION

EXHIBIT D: DRAWINGS

ABBREVIATIONS

NOTE: CONTACT ARCHITECT FOR EXPLANATIONS OF ANY ABBREVIATIONS NOT SHOWN BELOW.

A.F.F.	ABOVE FINISHED FLOOR
ACOUST.	ACOUSTIC / ACOUSTICAL
ADJ.	ADJUSTABLE / ADJACENT
A.C.	AIR CONDITIONING
AL.	ALIGN
ALUM.	ALUMINUM
ANOD.	ANODIZED
APPROX.	APPROXIMATE
ARCH.	ARCHITECT (URAL)
AD	AREA DRAIN
@	AT
BSMT.	BASEMENT
BM.	BEAM
BLKG.	BLOCKING
BD.	BOARD
BOT.	BOTTOM
B.O.	BOTTOM OF
BRK.	BRICK
BLDG.	BUILDING
B.U.R.	BUILT UP ROOF
CAB.	CABINET
C.I.	CAST IRON
C.H.	CABINET HEATER
CER.	CERAMIC
C.J.	CONTROL JOINT
CLG.	CEILING
CEM.	CEMENT (ITUOUS)
C.L.	CENTERLINE
C.D.	CEILING DIFFUSER
C.R.	CEILING REGISTER
C.B.	CATCH BASIN
C.O.	CLEAN OUT
CLOS., CL.	CLOSET
CLR.	CLEAR
C.W.	COLD WATER
CONC.	CONCRETE
COL.	COLUMN
CONST.	CONSTRUCTION
C.M.U.	CONCRETE MASONRY UNIT
CONT.	CONTINUOUS
CONTR.	CONTRACTOR
CORR.	CORRIDOR
C.	CONDUIT
CRS.	COURSE
D	DOWN
DET.	DETAIL
D.P.	DAMPPROOFING
DIAG.	DIAGONAL
DIA.	DIAMETER
DIM.	DIMENSION
DISP.	DISPENSER
DN.	DOWN
DWG.	DRAWING
D.F.	DRINKING FOUNTAIN
E	EAST
EC.	EMPTY CONDUIT
ELEC.	ELECTRIC (AL)
EWC.	ELECTRIC WATER COOLER
EL.	ELEVATION
ELEV.	ELEVATOR
EQ.	EQUAL
EQUIP.	EQUIPMENT
EXH.	EXHAUST
E.J., EXP. JT	EXPANSION JOINT
EXISTG., EXIST.	EXISTING
EXT.	EXTERIOR
F.O.B.	FACE OF BLOCK/BRICK
FIN.	FINISH (ED)
F.T.	FIN TUBE
F.A.P.	FIRE ANNUNCIATOR PANEL
F.E.C.	FIRE EXTINGUISHER CABINET
F.H.C.	FIRE HOSE CABINET
F.P.	FIRE PROOF (ING)
F.R.	FIRE RATED
FIX.	FIXTURE
FLSHG.	FLASHING
FL.	FLOOR
FD	FLOOR DRAIN
FLUOR.	FLUORESCENT
FDN.	FOUNDATION
FTG.	FOOTING
F.H.	FULL HEIGHT
GALV.	GALVANIZED
GA.	GAUGE
GL.	GLASS
GR.	GRADE
GRAN.	GRANITE
G.L.	GRID LINE
G.W.B., GYP. BD	GYPSUM WALL BOARD
H.C.	HANDICAPPED
H.D. GALV.	HOT DIPPED GALVANIZED
H.R.	HAND RAIL
HDWR.	HARDWARE
HDWD.	HARDWOOD
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
HT	HEIGHT
H.M.	HOLLOW METAL
HOR.	HORIZONTAL
H.W.	HOT WATER
INCL.	INCLUDING
I.D.	INSIDE DIAMETER
INS., INSUL.	INSULATION
INT.	INTERIOR
JAN. CL.	JANITOR CLOSET
JT.	JOINT
LAM.	LAMINATE / LAMINATED
LAV.	LAVATORY
LDR.	LEADER
LT. FIX.	LIGHT FIXTURE
LW.	LIGHTWEIGHT
LMS.	LIMESTONE
LTL.	LINTEL
LBS.	POUNDS
M.O.	MASONRY OPENING
MAT'L.	MATERIAL
MAX.	MAXIMUM
MECH.	MECHANICAL
MEMB.	MEMBRANE
MTL.	METAL
MIN.	MINIMUM
M.M., MISC. MTL.	MISCELLANEOUS METAL
NOM.	NOMINAL
N.I.C.	NOT IN CONTRACT
N.T.S.	NOT TO SCALE
N.	NORTH
No., #	NUMBER
O.C.	ON CENTER
OPNG.	OPENING
OPP. HND.	OPPOSITE HAND
OPP. SIM.	OPPOSITE SIDE SIMILAR
O.D.	OUTSIDE DIAMETER
O/	OVER
O.P.	OVERFLOW PIPE
O.H.	OVERHEAD
PTD.	PAINTED
PNL.	PANEL
PLAS.	PLASTIC
PL. LAM.	PLASTIC LAMINATE
PLYWD.	PLYWOOD
P.P.	POLISHED PLATE
P.S.I.	POUNDS PER SQUARE INCH
P.S.F.	POUNDS PER SQUARE FOOT
P.M.F.	PRE MOLDED FILLER
P.L.	PROPERTY LINE
PS	PROJECTION SCREEN
RAD.	RADIUS, RADIATOR
REC.	RECESSED
REG.	REGISTER
REINF.	REINFORCED, REINFORCING
RES.	RESILIENT
RET.	RETURN
REF.	REFER (ENCE)
REFL.	REFLECTED
REV.	REVISED, REVISION
R.	RISER
R.D.	ROOF DRAIN
R.S.	ROOF SCUPPER
RM.	ROOM
R.O.	ROOF OPENING
SAN. SEW.	SANITARY SEWER
SCH., SCHED.	SCHEDULE
S.D.	SCUPPER DRAIN
SEC.	SECTION
SEP.	SEPARATE
SIM.	SIMILAR TO
S.	SOUTH
SPEC.	SPECIFICATIONS
SPR, SPKLR.	SPRINKLER
SQ.	SQUARE
SMD	SEE MECHANICAL DRAWINGS
SSD	SEE STRUCTURAL DRAWINGS
S.S., ST/STL.	STAINLESS STEEL
STL.	STEEL
STOR.	STORAGE
ST. SEW.	STORM SEWER
STR., STRUC.	STRUCTURE
SP	SUMP PUMP
SW	SWITCH
THERM, T'STAT.	THERMOSTAT
TB.	TACKBOARD
TEL.	TELEPHONE
T.G.	TEMPERED GLASS
T.C.	TERRA COTTA
	THERMOSTAT
T.O.	TOP OF
TRANS.	TRANSFORMER
T.	TREAD
T.D.	TRENCH DRAIN
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
U.	UP
V.C.	VALVE CABINET
V.B.	VAPOR BARRIER
V/D	VOICE/DATA
VEN.	VENEER
V.F.D.	VARIABLE FREQUENCY DRIVE
V.I.F.	VERIFY IN FIELD
VERT.	VERTICAL
VEST.	VESTIBULE
V.C.T.	VINYL COMPOSITION TILE
VT.	VINYL TILE
W.	WEST, WATER, WASTE
W.C.	WATER CLOSET
W.P.	WATER PROOFING
W.R.	WATER RESISTANT
W.W.M.	WELDED WIRE MESH
WDW.	WINDOW
WKSP.	WORKSPACE
W/	WITH
W/O	WITHOUT
WD.	WOOD

GENERAL NOTES

1. SCOPE OF WORK: INTERIOR RENOVATION OF SELECT PORTIONS OF THE HISTORY GALLERY AND THE GALLERY FIT ON THE FIRST FLOOR, INCLUDING RELATED MECHANICAL, ELECTRICAL, FIRE SUPPRESSION AND FIRE ALARM WORK. SELECT PORTIONS OF WORK ON OTHER FLOORS (SUB-BASEMENT AND BASEMENT) HAVING TO DO WITH M.E.P.FP. INFRASTRUCTURE IN SUPPORT OF INTERIOR RENOVATIONS. REPLACEMENT OF TWO EXISTING WINDOWS AT EXISTING OPENINGS.
   NO CHANGE IN USE, *EGRESS* OR OCCUPANCY PROPOSED UNDER THIS APPLICATION.
2. WORK SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT CODE OF THE NYC BUILDING DEPARTMENT AND ALL SUBSEQUENT AMENDMENTS, REGULATIONS OF NEW YORK CITY AND NEW YORK STATE, AND THE REGULATIONS OF THE AMERICANS WITH DISABILITIES ACT (ADA).
3. BEFORE COMMENCING WORK, THE CONTRACTOR SHALL FILE ALL REQUIRED CERTIFICATES OF INSURANCE WITH THE DOB, OBTAIN ALL REQUIRED PERMITS, AND PAY ALL FEES REQUIRED BY GOVERNING NYC AGENCIES.
4. REFER TO PROJECT SPECIFICATIONS FOR GENERAL MATERIAL, WORKMANSHIP, SHOP DRAWING REQUIREMENTS, WORK RULES AND DELIVERY & REMOVAL REQUIREMENTS.
5. ALL DIMENSIONS SHALL BE FIELD VERIFIED AND COORDINATED BY THE CONTRACTOR WITH ALL TRADES. INCONSISTENCIES SHALL BE REPORTED TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.
6. CONTRACTOR SHALL VERIFY ALL PROPOSED AND EXISTING DIMENSIONS AND ELEVATIONS IN THE FIELD. NOTIFY THE ARCHITECT IMMEDIATELY- AND BEFORE PROCEEDING WITH RELEVANT ASPECTS OF THE WORK- OF ANY LAYOUT CONDITION THAT IS NOT CONSISTENT WITH PLANS OR THAT WILL IMPAIR LAYOUT, ATTACHMENTS, OR FINISHES.
7. DO NOT SCALE FROM DRAWINGS. USE INDICATED DIMENSIONS AND ELEVATIONS. NOTIFY ARCHITECT-IMMEDIATELY AND BEFORE PROCEEDING- OF ANY LAYOUT CONDITION THAT IS NOT CONSISTENT WITH THE DRAWING OR THAT WILL IMPAIR LAYOUT OF ANY TRADE.
8. DIMENSIONING FORMAT FOR THE ARCHITECTURAL DRAWINGS IS THAT DIMENSIONS ARE TO FINISH FACE UNLESS NOTED OTHERWISE.
9. MINOR DETAILS NOT USUALLY SHOWN OR SPECIFIED, BUT NECESSARY FOR PROPER CONSTRUCTION OF ANY PART OF THE WORK SHALL BE INCLUDED AS IF THEY WERE INDICATED IN THE DRAWINGS.
10. THE CONTRACTOR SHALL COORDINATE ALL WORK PROCEDURES WITH REQUIREMENTS OF LOCAL AUTHORITIES AND BUILDING OWNER.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL CONDITIONS AND MATERIALS WITHIN THE PROPOSED CONSTRUCTION AREA. THE CONTRACTOR SHALL DESIGN AND INSTALL ADEQUATE SHORING AND BRACING FOR ALL STRUCTURAL OR REMOVAL TASKS. THE CONTRACTOR SHALL HAVE SOLE RESPONSIBILITY FOR ANY DAMAGE OR INJURIES CAUSED BY OR DURING THE EXECUTION OF THE WORK.
12. PLUMBING, SPRINKLER AND ELECTRICAL WORK SHALL BE PREFORMED BY PERSONS LICENSED IN THEIR TRADES WHO SHALL ARRANGE FOR AND OBTAIN INSPECTIONS AND REQUIRED SIGN-OFFS.
13. THE CONTRACTOR SHALL DO ALL CUTTING, PATCHING AND REPAIRING AS REQUIRED TO PERFORM ALL OF THE WORK INDICATED ON THE DRAWINGS, AND ALL OTHER WORK THAT MAY BE REQUIRED TO COMPLETE THE JOB.
14. ALL PIPING AND WIRING SHALL BE REMOVED TO A POINT OF CONCEALMENT AND SHALL BE PROPERLY CAPPED OR PLUGGED.
15. THE CONTRACTOR, UPON COMPLETION OF THE WORK, SHALL ARRANGE FOR DEPARTMENT OF BUILDINGS INSPECTIONS AND SIGN-OFFS AS REQUIRED.
16. THE CONTRACTOR SHALL CONFIRM AND MAINTAIN ALL PAPERWORK RELEVANT TO THE PROJECT.

LOCAL LAW 58/87 NOTES

1. PROPOSED WORK TO COMPLY WITH APPLICABLE REQUIREMENTS OF LOCAL LAW #58/87 FOR HANDICAPPED ACCESS.
2. CONTROLS AND OPERATING MECHANISMS SHALL BE OPERABLE WITH ONE HAND AND SHALL NOT REQUIRE TIGHT GRASPING, PINCHING OR TWISTING OFTHE WRIST, AS PER 4-6, 4.25.4.
3. ACCESSIBLE ROUTES TO BE PROVIDED BETWEEN NEW FACILITIES, PROVIDING A MINIMUM OF 36 INCHES OF WIDTH ALONG THE ACCESSIBLE ROUTE AS PER RS 4-6, 4.3.1, AND A MINIMUM OF 32 INCHES OF WIDTH AT DOORWAYS, AS PER RS 4-6, 4.13.5ALL NEW AND RELOCATED DOORS TO BE MIN 2'-10" WIDE WITH HANDICAPPED USABLE HARDWARE AND PROPER CLEARANCES AND/ OR AUTOMATIC DOOR OPENERS.

PLUMBING & DRAINAGE NOTES

1. ALL PLUMBING AND GAS PIPING WORK SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF 2008 NEW YORK CITY PLUMBING CODE.
2. PLUMBING FIXTURES SHALL BE OF TYPE AND MANUFACTURE APPROVED FOR USE IN NEW YORK CITY AND SHALL BEAR BS&A APPROVAL.
3. PLUMBING CONTRACTOR TO EXAMINE PROPOSED LAYOUT WITH REGARD TO EXISTING FIELD CONDITIONS AND SHALL NOTIFY ARCHITECT OF ANY DISCREPANCIES BETWEEN ASSUMED FIELD CONDITIONS AND THOSE ENCOUNTERED DURING CONSTRUCTION. PLUMBING CONTRACTOR SHALL INFORM ARCHITECT OF ANY REVISIONS TO PLAN WHICH SHALL BE NECESSARY BASED ON CONDITIONS UNCOVERED IN THE FIELD, IN ORDER TO INSTALL ALL FIXTURES, EQUIPMENT AND PIPING IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE NYC BUILDING CODE.
4. PLUMBING CONTRACTOR SHALL ARRANGE AND OBTAIN INSPECTIONS AND REQUIRED SIGN-OFFS.

SPECIAL INSPECTIONS

FIRE-RESISTANT PENETRATIONS AND JOINTS - BC 1705.17
MECHANICAL SYSTEMS - BC 1705.21
SPRINKLER SYSTEMS - BC 1705.29
HEATING SYSTEMS - BC 1705.31
POST-INSTALLED ANCHORS - BC 1705.37
FIRE RESISTANT RATED CONSTRUCTION - BC 110.3.4
ENERGY CODE COMPLIANCE INSPECTIONS - BC 110.3.5
INTERIOR LIGHTING POWER
LIGHTING CONTROLS
FINAL INSPECTIONS - UNDER DIRECTIVE 14

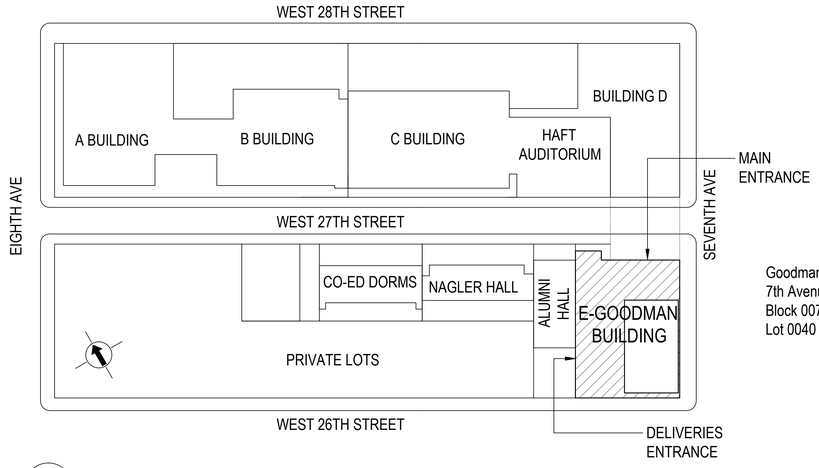
PROGRESS INSPECTIONS

1. FIRE RESISTANT RATED CONSTRUCTION - BC 110.3.4
2. ENERGY CODE COMPLIANCE INSPECTIONS - BC 110.3.5
3. FINAL INSPECTION, PER DIRECTIVE 1475

HISTORY GALLERY RENOVATION
FASHION INSTITUTE OF TECHNOLOGY

282 SEVENTH AVE, NEW YORK, NY 10001

BID SET



Goodman Building at 282 7th Avenue
Block 00776
Lot 0040

1 SITE PLAN
NTS

DRAWING INDEX

ARCHITECTURAL

G-000 COVER SHEET
D-001 FIRST FLOOR DEMOLITION PLAN & REFLECTED CEILING PLAN
A-001 FIRST FLOOR PROPOSED PLAN
A-011 FIRST FLOOR PROPOSED REFLECTED CEILING PLAN
A-020 EXTERIOR ELEVATIONS
A-021 INTERIOR SECTIONS & ELEVATIONS
A-051 DETAILS
A-052 DETAILS
A-061 PARTITION TYPES & FINISH SCHEDULE
A-070 DOOR, WINDOW & GLAZING SCHEDULES
A-071 CURTAIN WALL WINDOW DETAILS
A-072 CURTAIN WALL WINDOW DETAILS
A-081 DEVICE PLAN
A-091 EGRESS PLAN

MECHANICAL

M-001.00 SYMBOL LIST, ABBREVIATIONS AND NOTES
M-011.00 1ST FLOOR MECHANICAL DEMOLITION PLAN
M-100.00 SUB CELLAR & CELLAR MECHANICAL PLAN
M-101.00 1ST FLOOR MECHANICAL PLAN
M-501.00 MECHANICAL DETAILS 1
M-502.00 MECHANICAL DETAILS 2
M-503.00 MECHANICAL DETAILS 3
M-601.00 GLYCOL WATER PIPING DIAGRAM
M-701.00 MECHANICAL SCHEDULES 1
M-702.00 MECHANICAL SCHEDULES 2
M-801.00 MECHANICAL CONTROL DIAGRAMS
M-802.00 GLYCOL WATER PIPING CONTROL DIAGRAM
M-803.00 BAS ARCHITECTURE

ELECTRICAL

E-001.00 ELECTRICAL SYMBOLS LIST, ABBREVIATIONS AND DRAWING LIST
E-002.00 ELECTRICAL NOTES
E-003.00 ELECTRICAL SCHEDULES
E-011.00 1ST FLOOR ELECTRICAL DEMO PLANS
E-101.00 1ST FLOOR ELECTRICAL LIGHTING PLAN
E-200.00 SUB CELLAR ELECTRICAL EQUIPMENT PLAN
E-201.00 1ST FLOOR ELECTRICAL POWER PLAN
E-501.00 ELECTRICAL DETAILS
E-701.00 ELECTRICAL PANEL SCHEDULES

PLUMBING

P-001.00 PLUMBING NOTES, SYMBOLS & DRAWING LIST
P-100.00 SUB CELLAR & CELLAR PLUMBING PART PLANS
P-101.00 1ST FLOOR PLUMBING PLAN
P-801.00 PLUMBING DETAILS

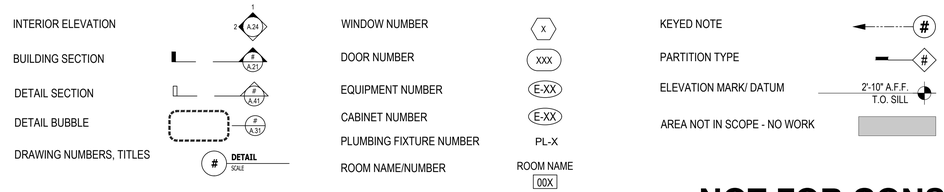
FIRE ALARM

FA-011.00 1ST FLOOR FIRE ALARM DEMOLITION PLAN
FA-101.00 1ST FLOOR FIRE ALARM PLAN
FA-601.00 FIRE ALARM NOTES, SYMBOLS LIST, AND RISER DIAGRAM

FIRE PROTECTION

SP-001.00 SPRINKLER NOTES, SYMBOLS, & DRAWING LIST
SP-101.00 1ST FLOOR SPRINKLER PLAN
SP-601.00 SPRINKLER EXISTING RISER DIAGRAM & DETAILS

DRAWING SYMBOLS



NOT FOR CONSTRUCTION

FIT History Gallery Renovation
Project No. 2448

282 7th AVENUE
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ARCHITECT
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LIGHTING DESIGNER
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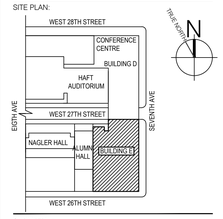
SITE PLAN:



SUBMITTAL:
Bid Set

ISSUE / REVISION:

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01	100% SCHEMATIC DESIGN	2025.02.06
02	100% DESIGN DEVELOPMENT	2025.11.24
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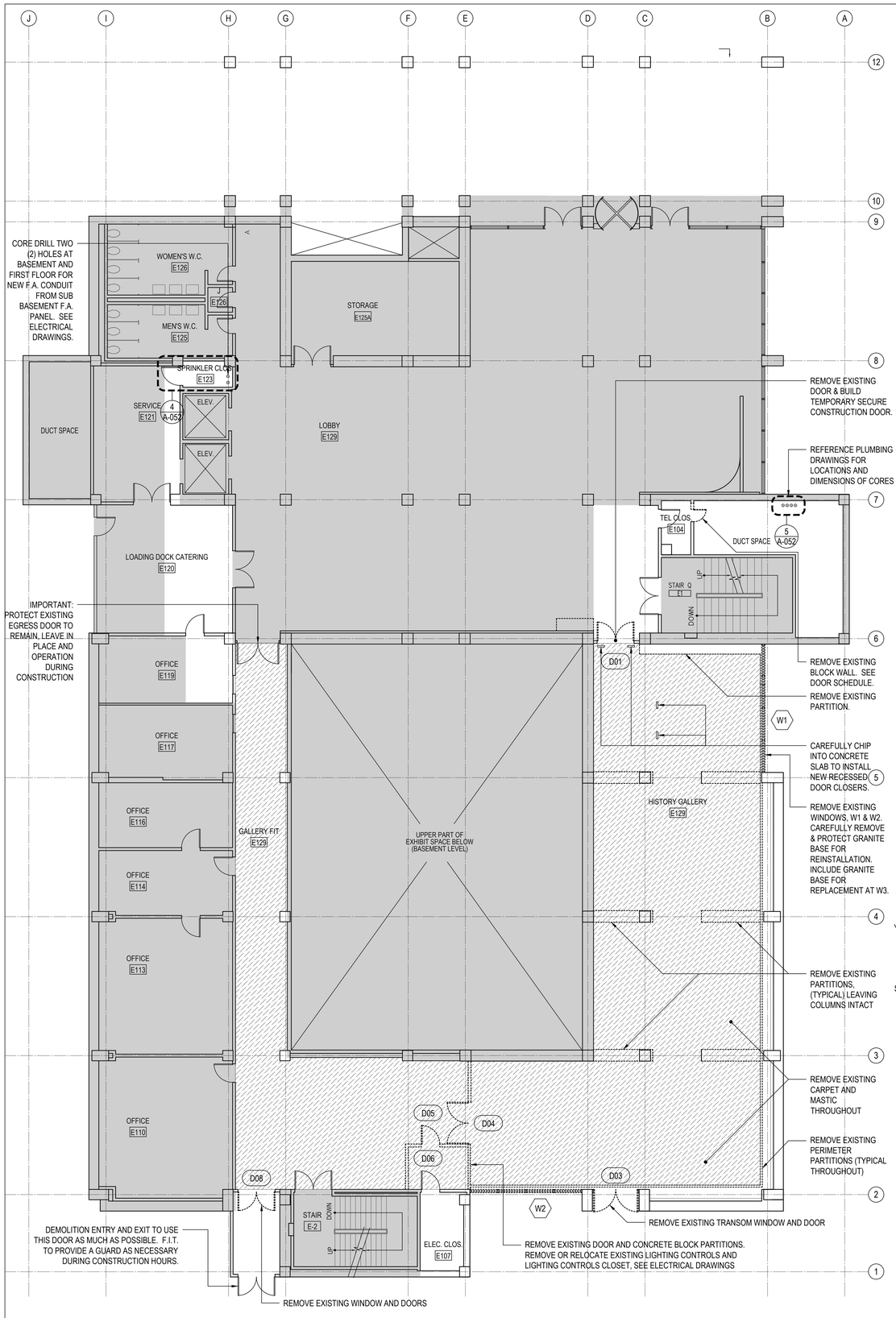
04	REVISED BID SET	2026.04.24
05	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

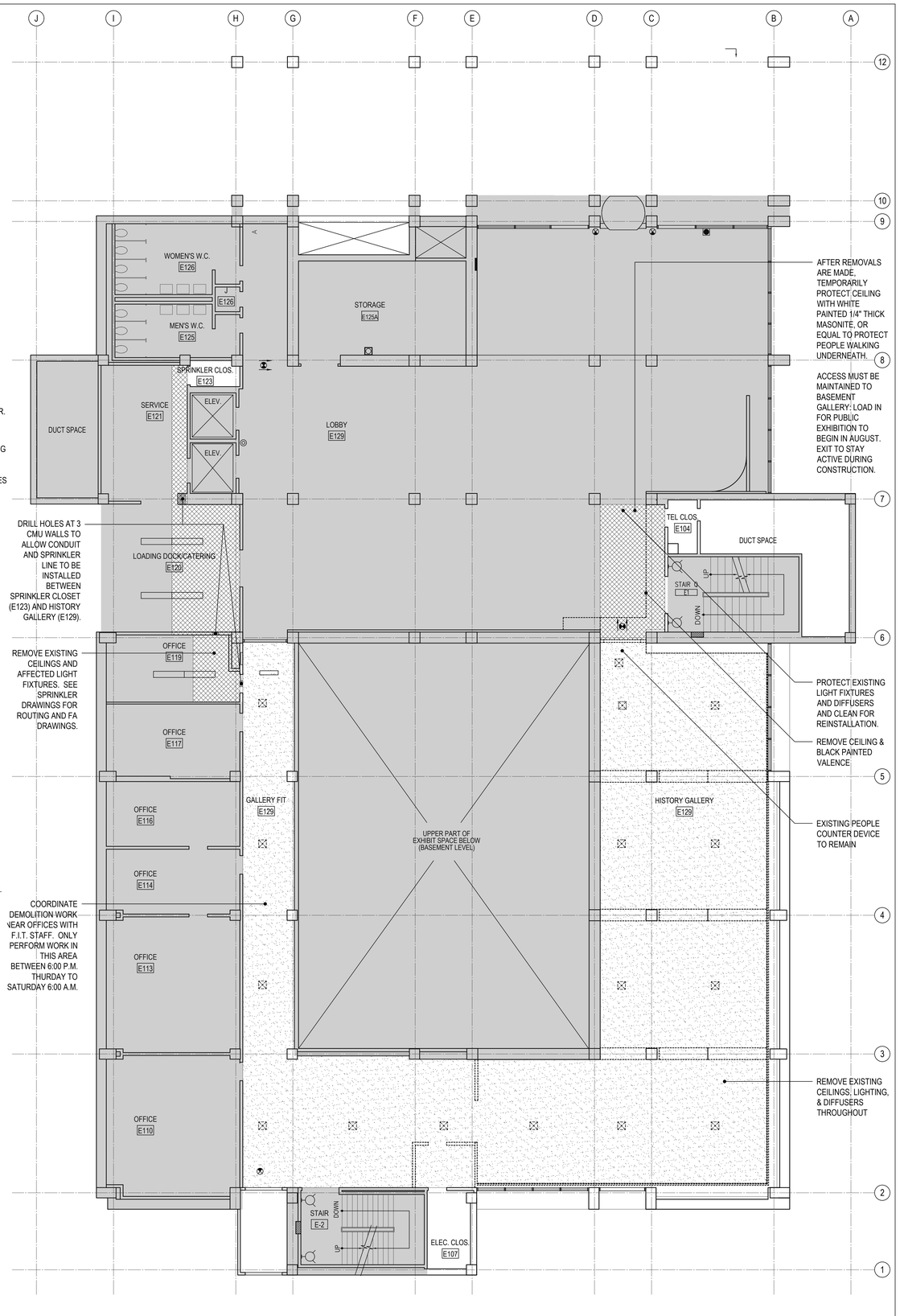
DRAWN BY: IIC CHECKED BY: KKB/SA
SCALE: PROJECT#: 8969.93

SHEET TITLE:
COVER SHEET

SHEET NUMBER:
G-000



1 **DEMOLITION PLAN**
1/8" = 1'-0"



2 **DEMOLITION RCP**
1/8" = 1'-0"

NOTES

1. **COORDINATE DEMOLITION WITH F.I.T.**
2. EXISTING FIRE ALARM AND WI-FI DEVICES IN USE TO BE PROTECTED AND ACTIVE DURING REMOVALS. SEE ELECTRICAL DRAWINGS.

LEGEND

PARTITION REMOVALS
PLAN REMOVALS
CEILING REMOVALS
WALL REMOVALS
CEILING REMOVALS WITH EXCEPTIONS

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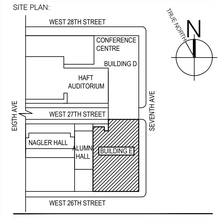
SITE PLAN:



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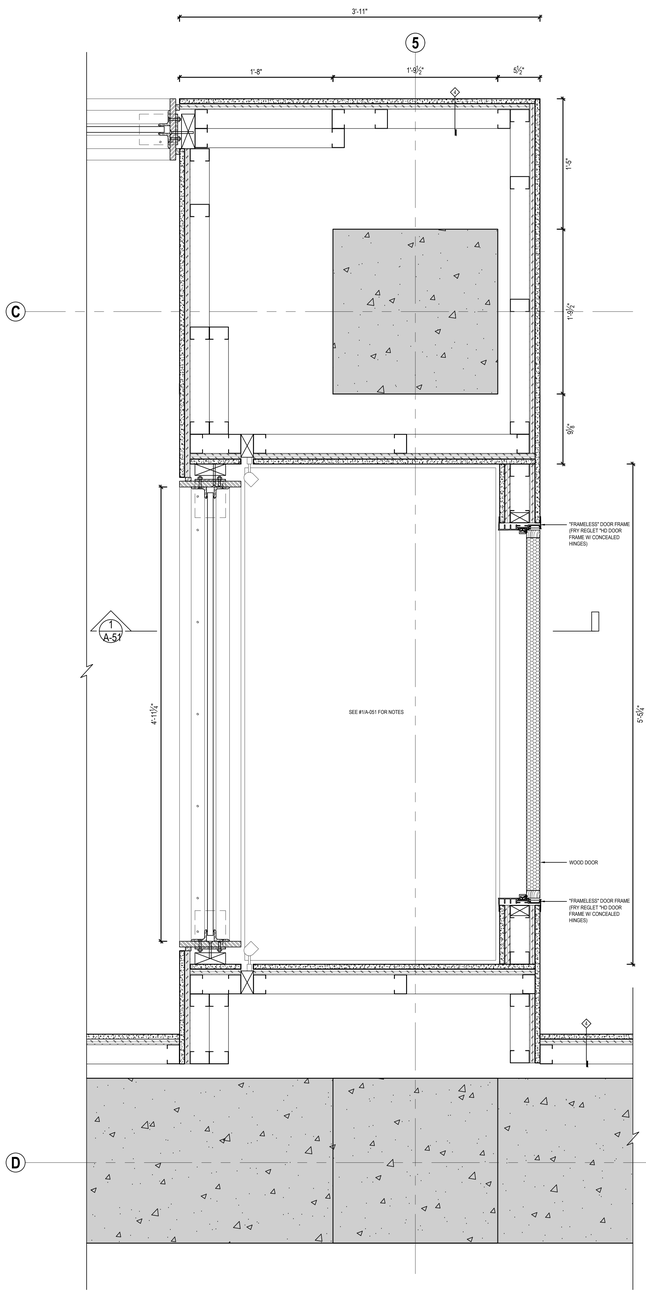
SEAL & SIGNATURE:

DRAWN BY: IIC CHECKED BY: KKB/SA

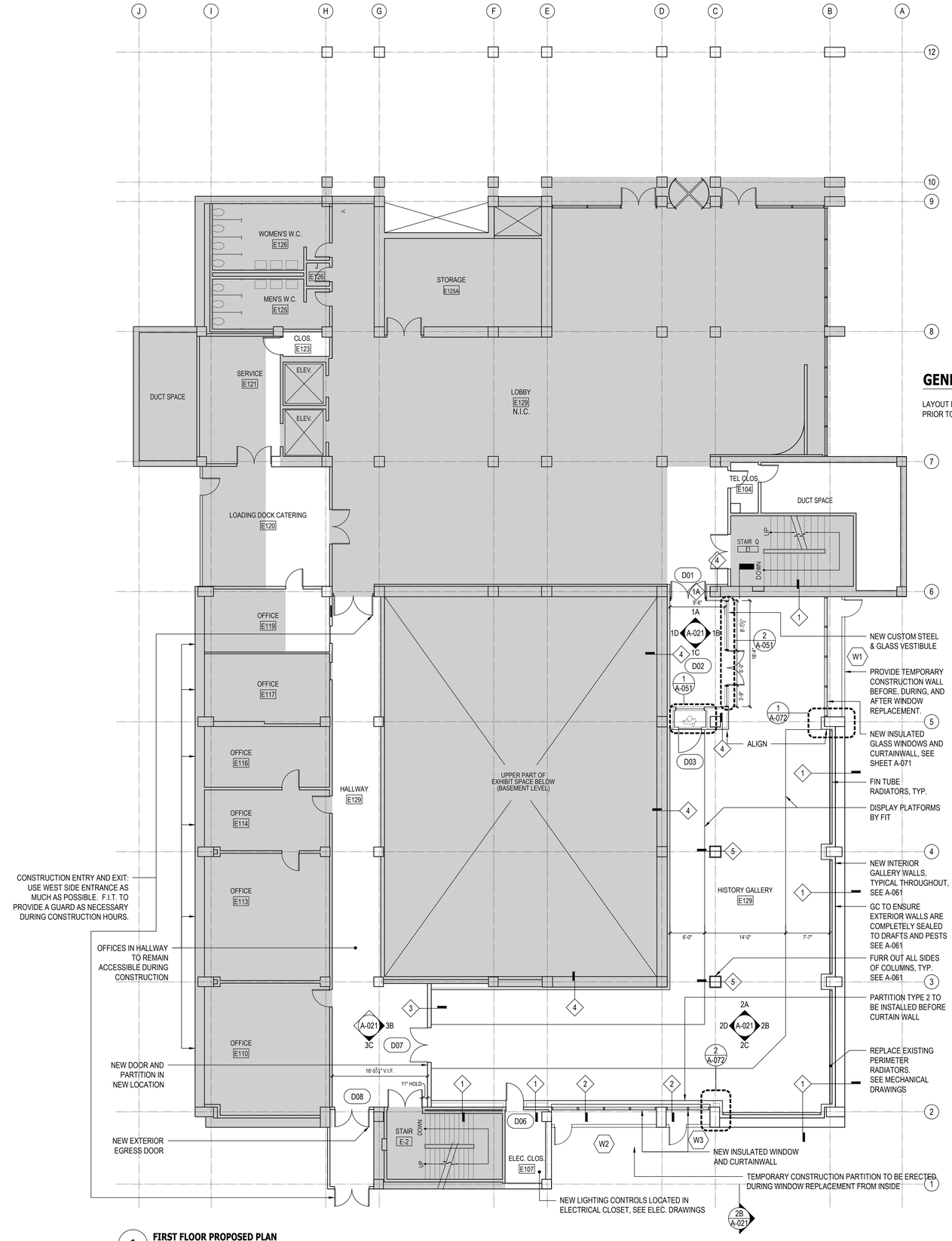
SCALE: PROJECT#: 8969.93
1/8" = 1'-0"

SHEET TITLE:
DEMOLITION PLAN & RCP

SHEET NUMBER:
D-001



2 **PLAN DETAIL AT ENTRY VESTIBULE DISPLAY NICHE**
1-1/2" = 1'-0"



1 **FIRST FLOOR PROPOSED PLAN**
1/8" = 1'-0"

GENERAL NOTE:

LAYOUT DIMS. TO BE PROVIDED PRIOR TO START OF CONSTRUCTION.

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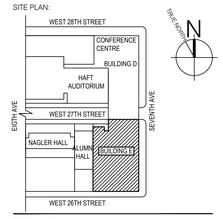
SITE PLAN:



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SEAL & SIGNATURE:

DRAWN BY: IIC CHECKED BY: KKB/SA

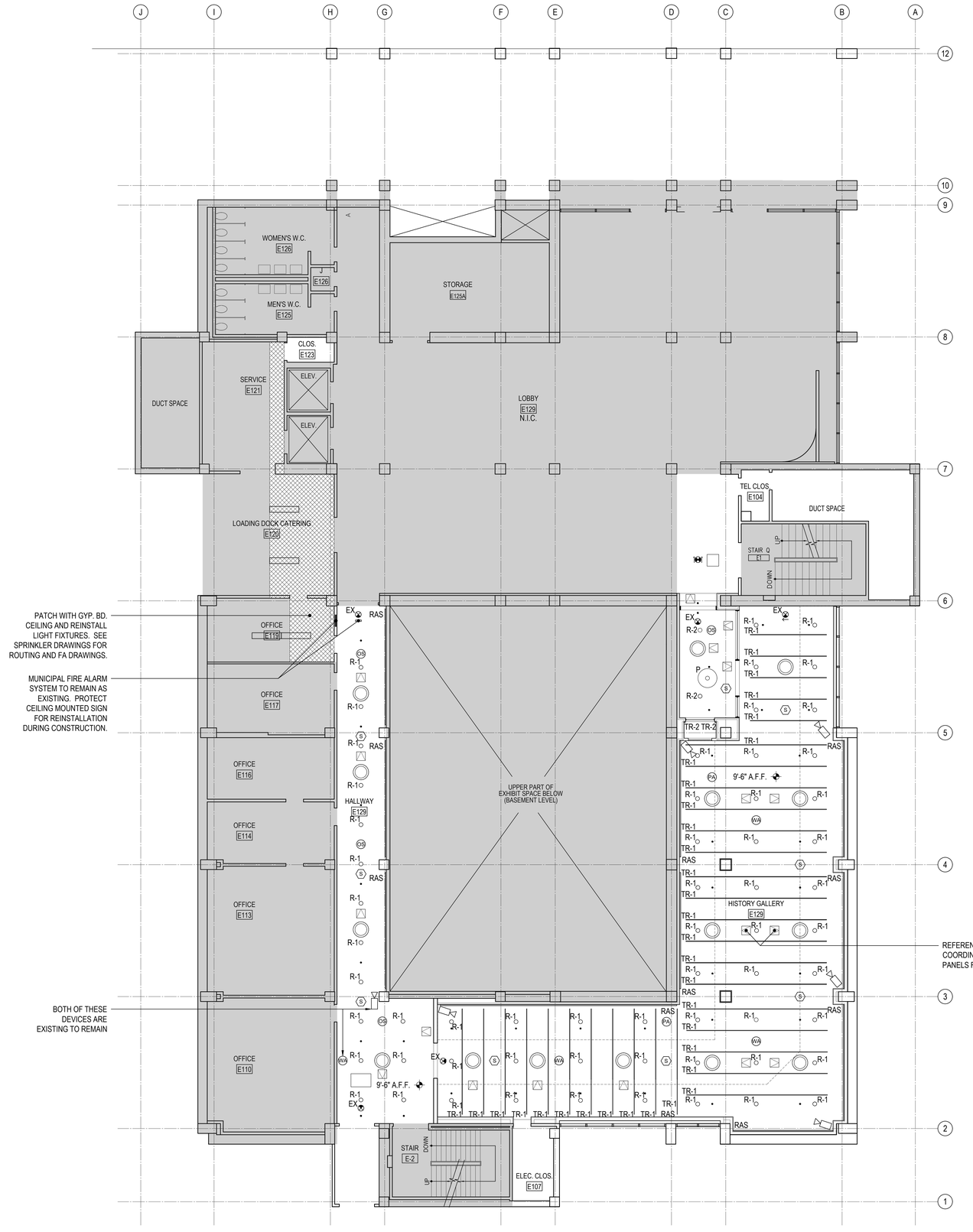
SCALE: AS NOTED PROJECT #: 8969.93

SHEET TITLE:

FIRST FLOOR PROPOSED PLAN

SHEET NUMBER:

A-001



FIT Museum Renovation - Fixture Schedule - Bid Set

Type	Manufacturer	Model Number	Description	Mounting	Wattage	Comments
T-1	Litelab	C3Z-L119827-9TCE1PA-MB	Static White 10°- 30° Zoom Cylinder Object Fixture w/ integral dimmer, Black	Track	19 W	Total: (50)
T-2	Litelab	C30-L119827-9TC-E1PA-MB-2	Static White 20° Fixed Object Cylinder Fixture w/ integral dimmer, Black	Track	19 W	Total: (50)
T-3						
T-4	Litelab	C3P-L159827-9TCE1PA-MB-3	Static White Framing Projector w/33° Optic and Integral dimmer, Black	Track	23 W	Total: (40)
T-5	Luxam	L-MTSP-02-PWM-B	Micro Track Head, 3W, 3000K, Zoom lens, PWM Integral dimmer, Black	Track	3 W	Total: (12)
TR-1	LiteLab	BUS-14R Series	Recessed D-Bar, Trimmed, Black	Recessed		Located in Gallery
TR-2	Luxam	L-MTHTK-B	Surface mounted Micro Track, Black	Surface		Located in Vestibule Niche
R-1	Prescolite	LTR-4RD-H-SL15L-DM1-BAA-LTR-4RD-T-SL35K8WD-S-BAA	4" architectural recessed downlight delivering 1500 lumens, 3500K, 60° beam, 0-10v dimming, specular clear reflector.	Recessed	22.5 W	Located in Gallery and Hallway
R-2	Prescolite	LTR-4RD-H-SL15L-DM1-BAA-LTR-4RD-T-SL30K8MD-S-BL-BAA	4" architectural recessed downlight delivering 1500 lumens, 3500K, 44° beam, 0-10v dimming, specular black reflector.	Recessed	22.5 W	Located in Gallery Vestibule
P	Atelier 001	Cosmic Pendant Light, 39"	Christina Schiavone, Garde Design, gardeny@gardeshop.com, 223 East 60th St, New York, NY, 10022, 646.370.4642	Ceiling	26 W	
EX	AtLite	SC-1-8-GC-WH-120/277	Marathon Recessed Edge-lit Exit Sign	Recessed		See Elec. Drawings

NOTES

1. **COORDINATE AL TRADES WITH ARCHITECTURAL RCP.**
2. NEW GWB. CLG. THROUGHOUT HISOTRY GALLERY PAINTED MATTE BLACK - SEE FINISH SCHEDULE. ALL FIXTURES AND DEVICES IN CEILING TO BE BLACK.
3. ALL WALLS TO BE PAINTED FLAT GRAY.
4. ALSO SEE M.E.P. DRAWINGS.
5. LOBBY, OFFICE, LOADING DOCK, SERVICE, AND SPRINKLER CLOSET CEILINGS TO BE PATCHED TO MATCH EXISTING. FIXTURES AND DEVICES IN THOSE AREAS ARE EXISTING TO REMAIN. EXISTING DIFFUSERS AND RETURN GRILLES TO BE CLEANED AND REINSTALLED.
6. LAYOUT DIMS. FOR ALL LIGHT FIXTURES AND DEVICES WILL BE PROVIDED BEFORE START OF CONSTRUCTION.

LEGEND

- RECESSED LIGHT TRACK
- RECESSED DOWNLIGHT
- DECORATIVE PENDANT LIGHT IN VESTIBULE
- SUPPLY AIR DIFFUSER
- RETURN AIR SLOT (LABELED AS "RAS")
- SPRINKLER HEAD
- EXIT LIGHT, CEILING MOUNTED
- OCCUPANCY SENSOR
- SMOKE DETECTOR
- SECURITY CAMERA
- PUBLIC ANNOUNCEMENT SYSTEM SPEAKER
- WIRELESS ACCESS POINT
- 24"x24" ACCESS PANEL, COLOR TO MATCH EXISTING LOBBY CEILING. SEE M.E. DRAWINGS.

NOT FOR CONSTRUCTION

FIT History Gallery Renovation

Project No. 2448

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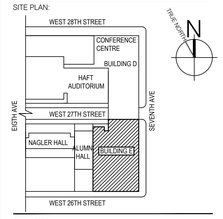
NEW YORK, NY 10001
212.206.8356

SITE PLAN:



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SEAL & SIGNATURE:

DRAWN BY: IIC CHECKED BY: KKB/SA

SCALE: PROJECT#: 8969.03

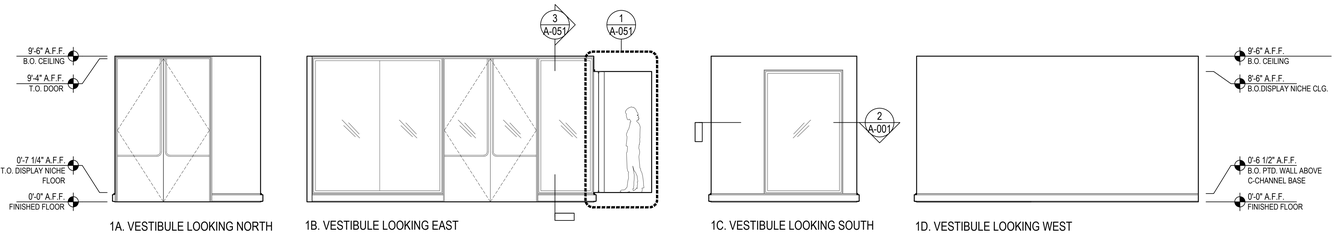
1/8" = 1'-0"

SHEET TITLE:

PROPOSED RCP

SHEET NUMBER:

A-011



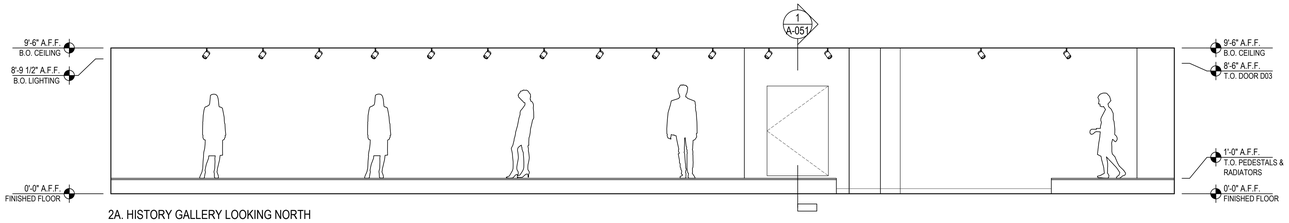
1A. VESTIBULE LOOKING NORTH

1B. VESTIBULE LOOKING EAST

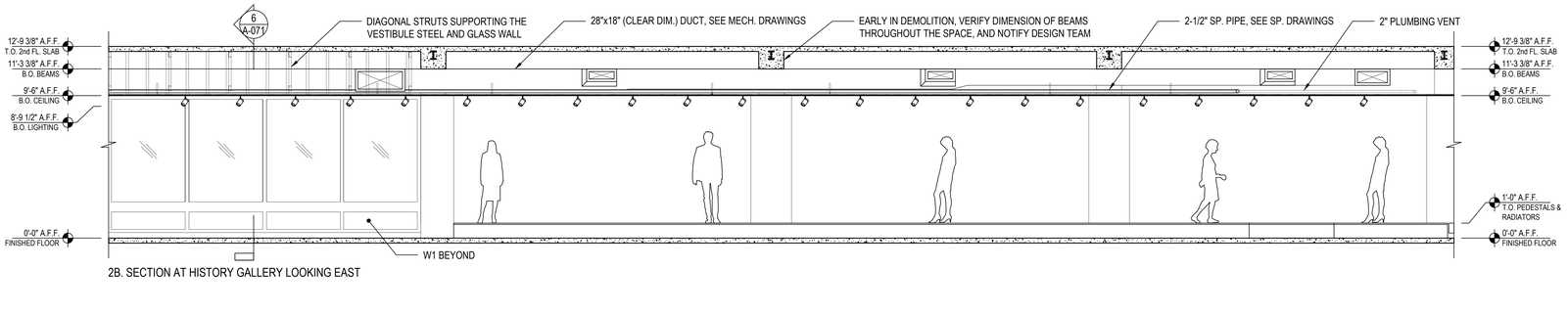
1C. VESTIBULE LOOKING SOUTH

1D. VESTIBULE LOOKING WEST

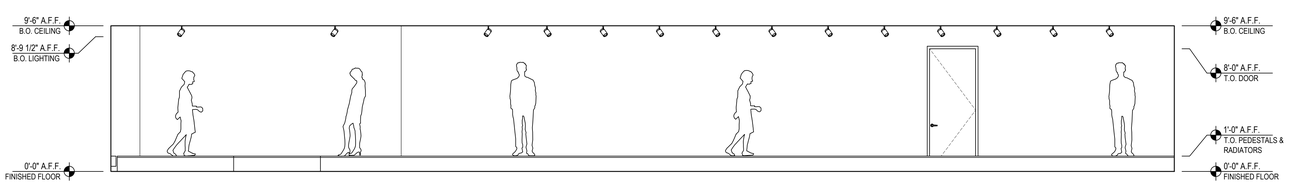
1 VESTIBULE ELEVATIONS
1/4" = 1' - 0"



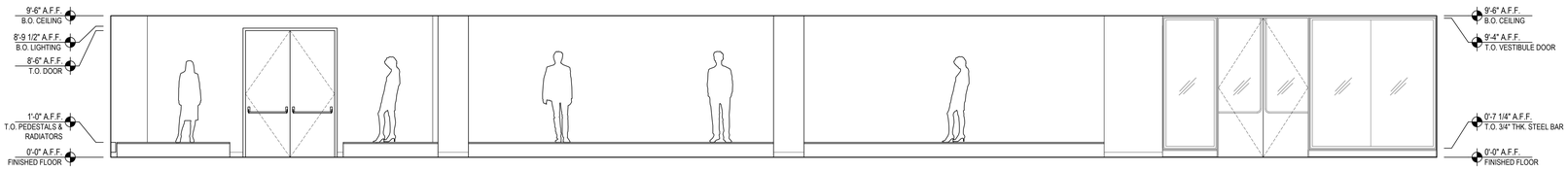
2A. HISTORY GALLERY LOOKING NORTH



2B. SECTION AT HISTORY GALLERY LOOKING EAST

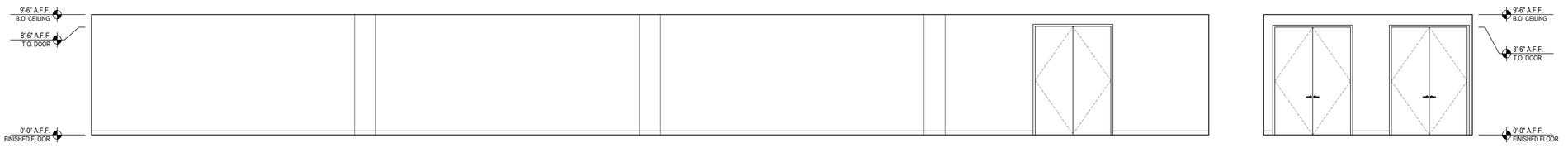


2C. HISTORY GALLERY LOOKING SOUTH



2D. HISTORY GALLERY LOOKING WEST

2 HISTORY GALLERY ELEVATIONS
1/4" = 1' - 0"



3B. HALLWAY LOOKING EAST

3C. HALLWAY LOOKING SOUTH

3 HALLWAY ELEVATIONS
1/4" = 1' - 0"

NOT FOR CONSTRUCTION

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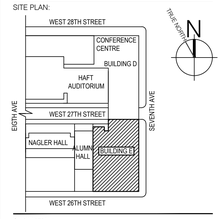

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SEAL & SIGNATURE:

DRAWN BY: IIC CHECKED BY: KKB/SA

SCALE: PROJECT#: 8969.03

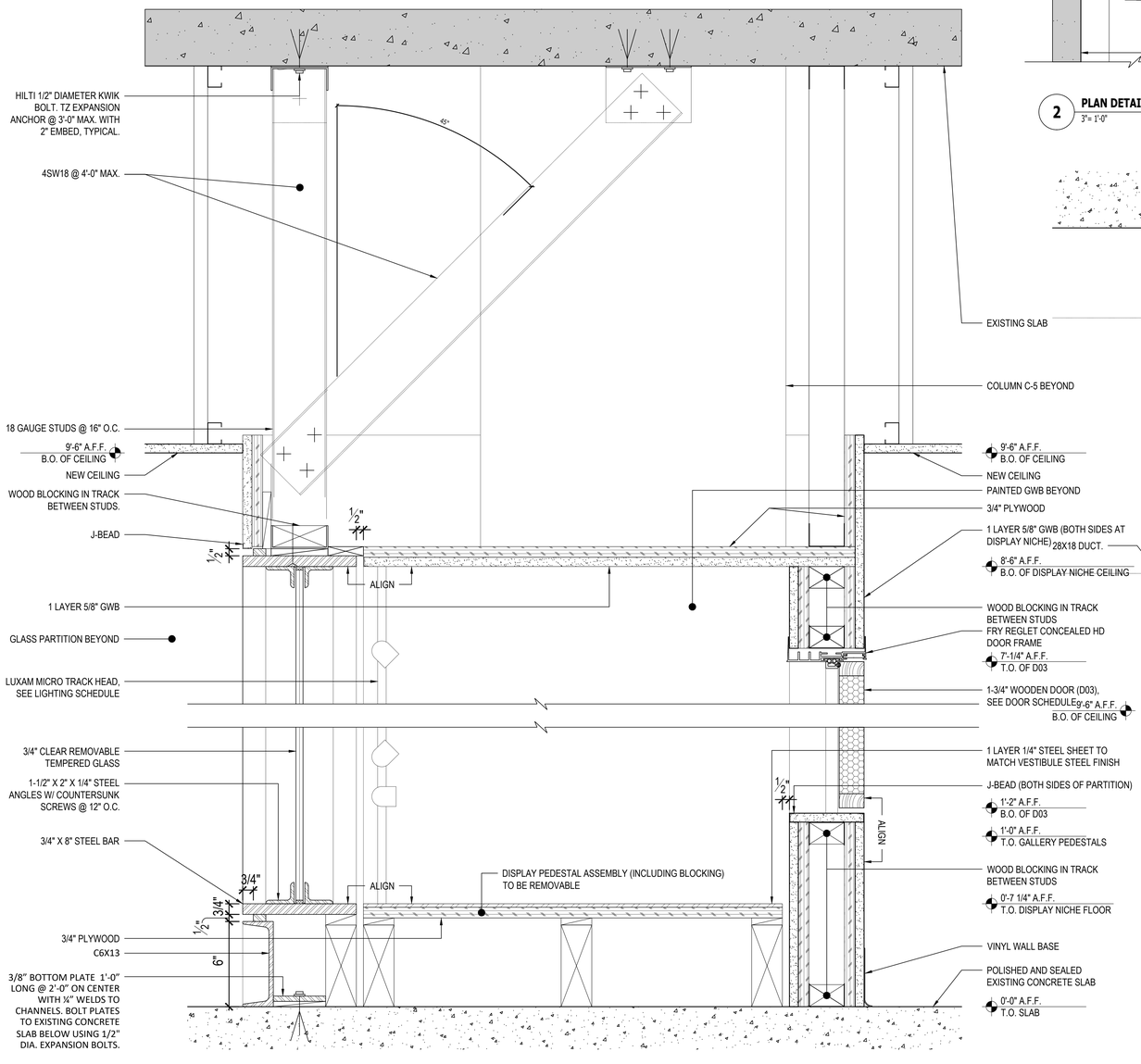
1/4" = 1'-0"

SHEET TITLE:

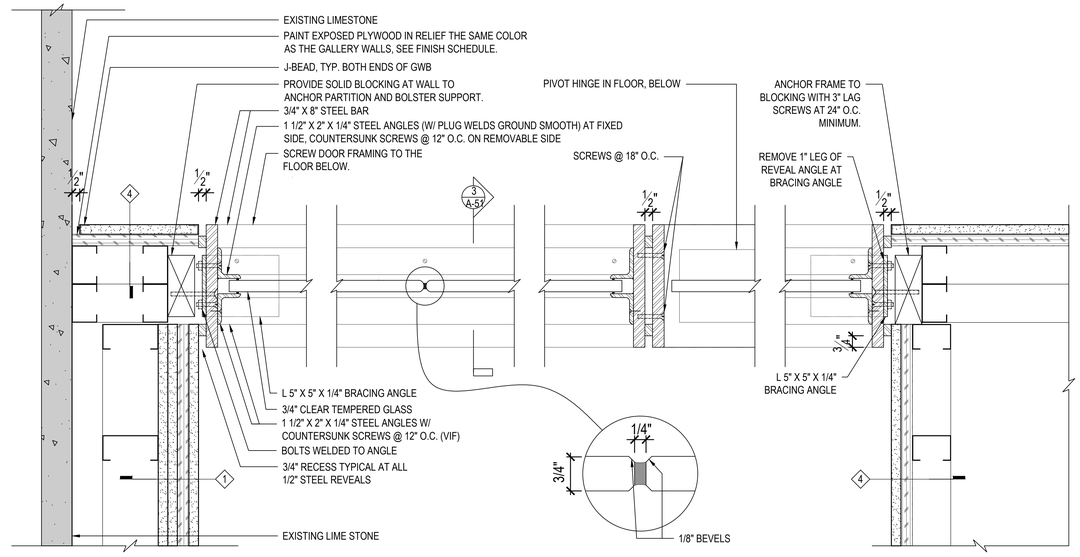
INTERIOR SECTIONS & ELEVATIONS

SHEET NUMBER:

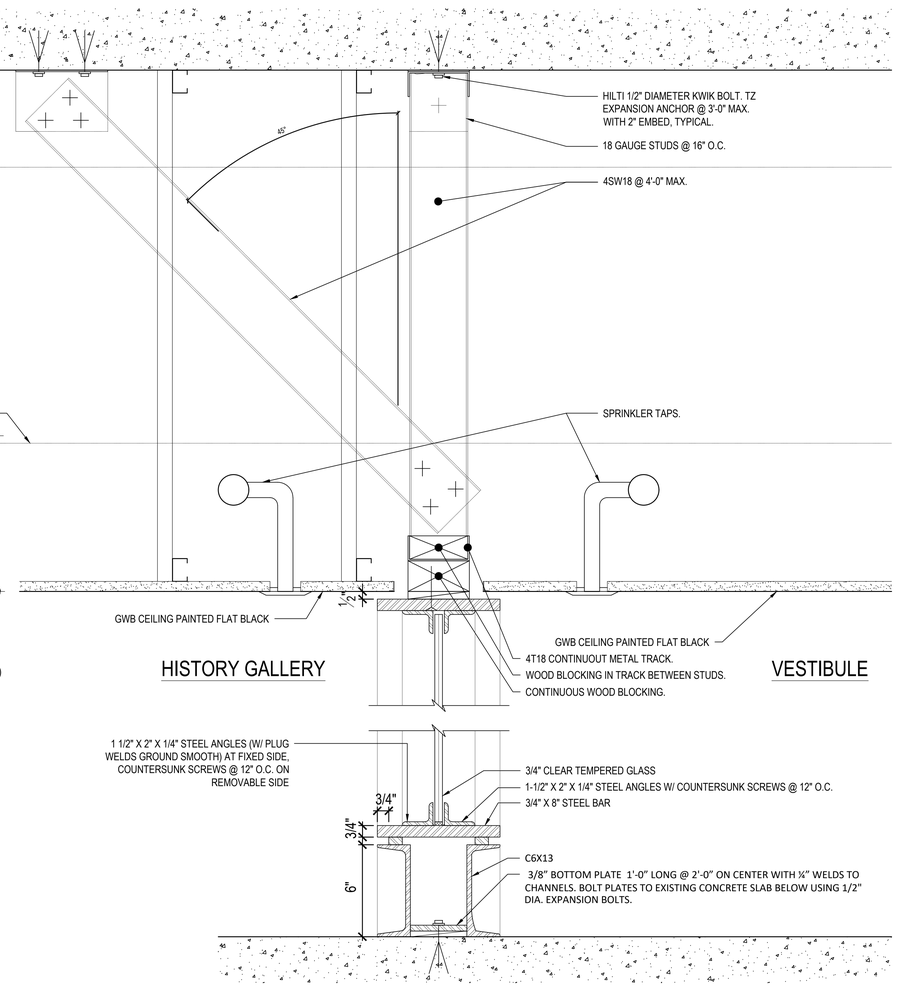
A-021



1 SECTION DETAIL AT ENTRY VESTIBULE DISPLAY NICHE
3"= 1'-0"



2 PLAN DETAIL AT CUSTOM GLAZED PARTITION WITH GLASS DOORS
3"= 1'-0"



3 SECTION DETAIL AT CUSTOM GLAZED PARTITION
3"= 1'-0"

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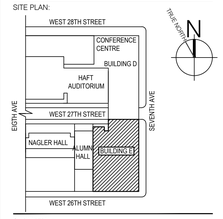
SITE PLAN:



SUBMITTAL:

Bid Set

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% SCHEMATIC DESIGN	2025.02.06
02	100% DESIGN DEVELOPMENT	2025.11.24
03	BID SET	2026.03.27
04	REVISED BID SET	2026.04.24
05	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: IIC CHECKED BY: KKB/SA

SCALE: PROJECT#: 8969.93

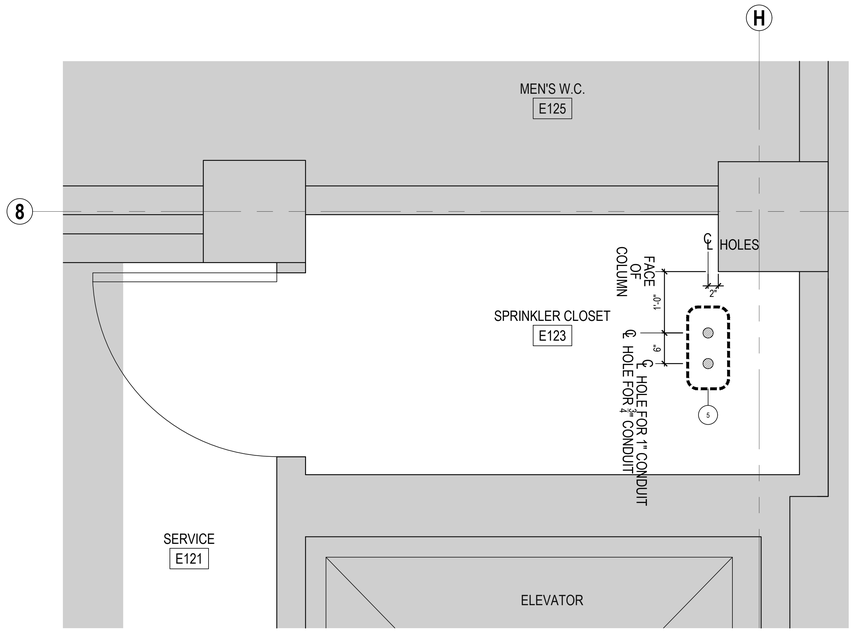
3" = 1'-0"

SHEET TITLE:

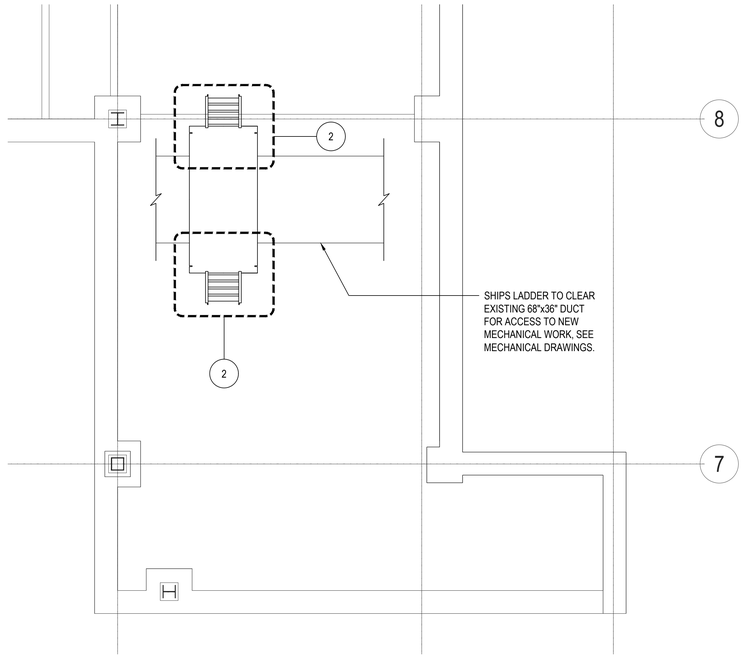
DETAILS

SHEET NUMBER:

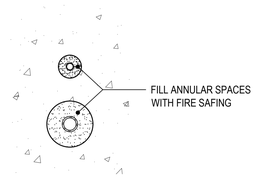
A-051



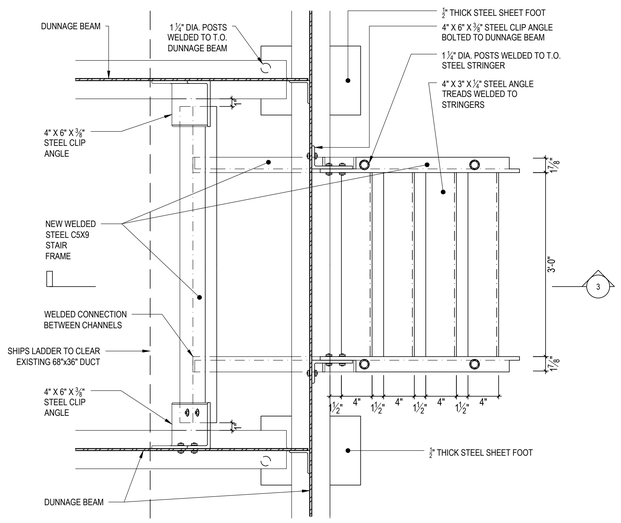
4 CORE DRILL DETAIL
1" = 1'-0"



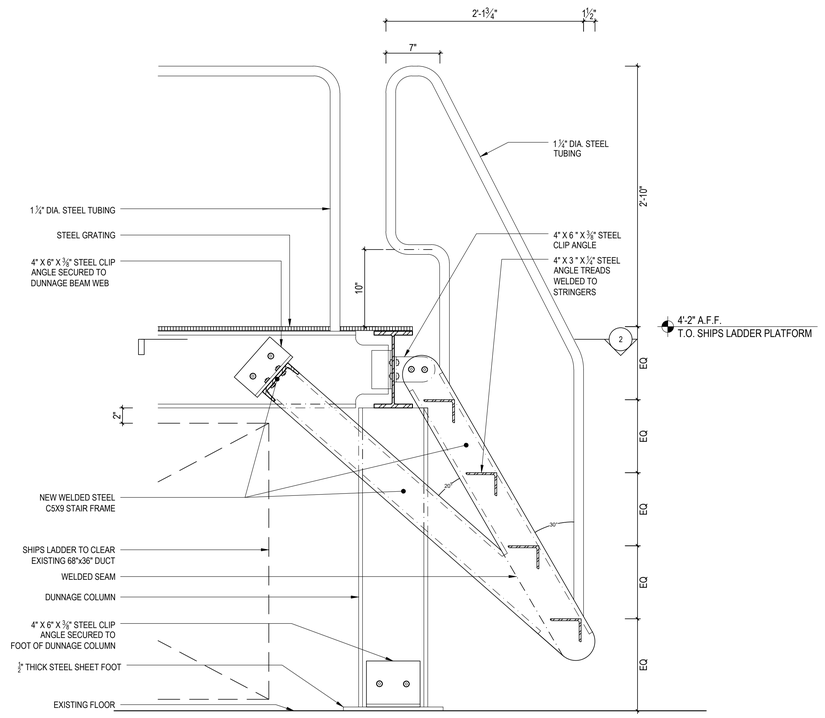
1 SUB-BASEMENT PARTIAL PLAN
1/4" = 1'-0"



5 CORE DRILL DETAIL
1-1/2" = 1'-0"



2 SHIPS LADDER PLAN
1-1/2" = 1'-0"



3 SHIPS LADDER
1-1/2" = 1'-0"

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FIT History Gallery Renovation

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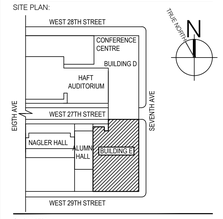

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04	REVISED BID SET	2026.04.13
05	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: IIC CHECKED BY: KKB/SA

SCALE: AS NOTED

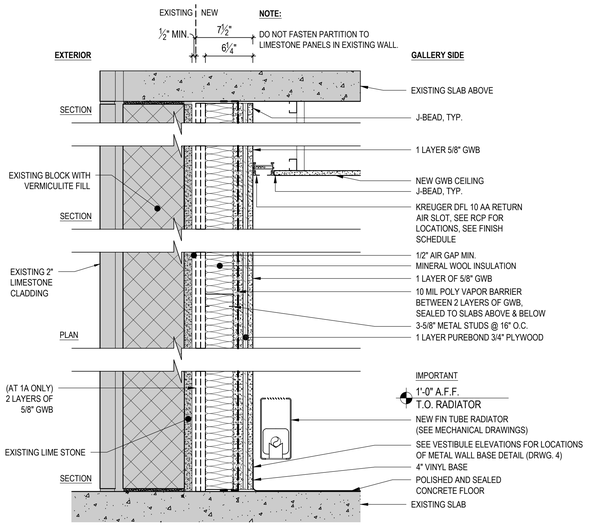
PROJECT#: 8969.93

SHEET TITLE:

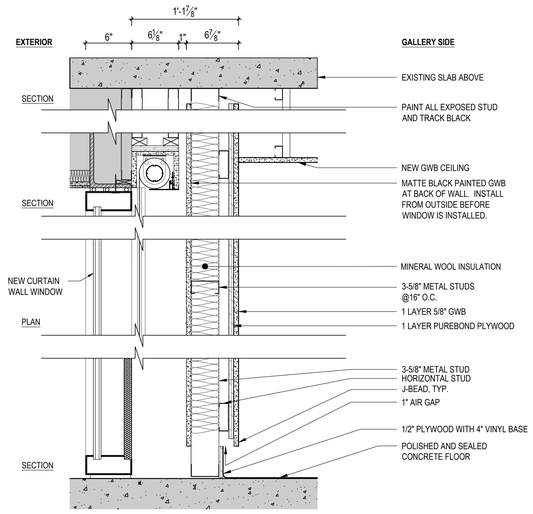
DETAILS

SHEET NUMBER:

A-052



1 PARTITION AT EXTERIOR WALL
1-1/2" = 1'-0"

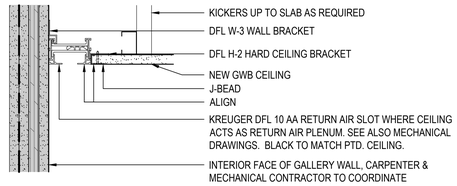


2 PARTITION AT CURTAIN WALL WINDOWS
1-1/2" = 1'-0"

3A 2 HR. RATED PARTITION AT AND ABOVE DOOR D-01 UL U419
1-1/2" = 1'-0"

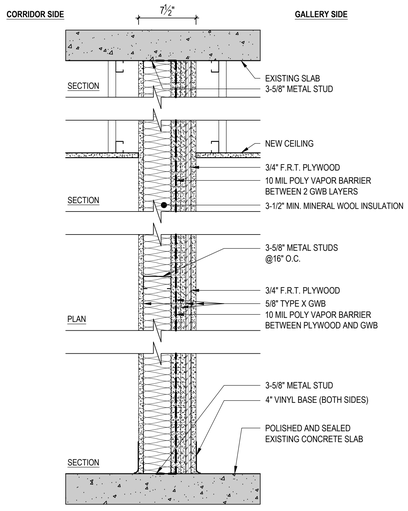
FINISH SCHEDULE

LOCATION	FLOOR	PARTITIONS	CEILINGS	COLUMNS
HISTORY GALLERY	POLISH AND SEAL EXISTING CONCRETE SLAB. ADD STAIN.	PAINTED GWB: LEVEL 5 FINISH, WHITE	PAINTED GWB LEVEL 4 FINISH, FLAT BLACK	PAINTED GWB, WHITE: LEVEL 5 FINISH
HALLWAY	POLISH AND SEAL EXISITING CONCRETE SLAB. ADD STAIN.	PAINTED GWB: LEVEL 4 FINISH, WHITE	PAINTED GWB LEVEL 4 FINISH, WHITE	

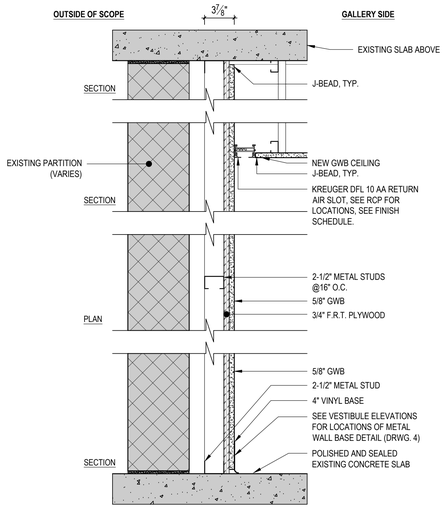


3 **RETURN AIR SLOT AT CEILING PERIMETER**
3" = 1'-0"

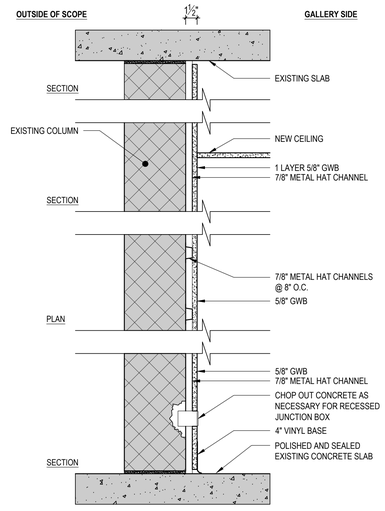
1 **PARTITION TYPES AT EXTERIOR WALL**
1-1/2" = 1'-0"



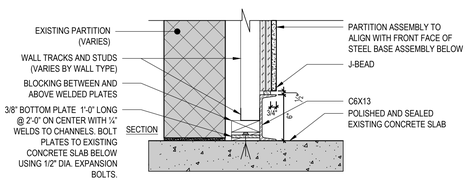
3 2 HR. RATED INTERIOR PARTITION UL U408
1-1/2" = 1'-0"



4 PARTITION AT INTERIOR WALL & ENTRY COLUMNS
1-1/2" = 1'-0"



5 PARTITION AT COLUMNS
1-1/2" = 1'-0"



4 **VESTIBULE WALL BASE**
1-1/2" = 1'-0"

2 **PARTITION TYPES**
1-1/2" = 1'-0"

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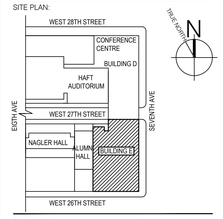

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SCALE: AS NOTED PROJECT#: 8969.93

SHEET TITLE:

PARTITION TYPES AND FINISH SCHEDULE

SHEET NUMBER:

A-061

DOOR SCHEDULE

DOOR NO.	DOOR LOCATION	FRAMES MATL.	FRAMES ELEV.	FRAMES TYPE	FRAMES JAMB	FRAMES HEAD	FRAMES SILL	DOORS MATL.	DOORS ELEV.	DOORS WIDTH	DOORS HEIGHT	DOORS LEAVES	DOORS THKNS.	UNDRCUT	HDWR	U.L. RATING	COMMENTS
D01	ENTRY DOOR	STEEL	III					ST/GL	5C	6'-0"	9'-4"	2 @ 3'-0"	3/4"	3/8"	1	N/A	1. SECURE HARDWARE 2.CUSTOM STEEL FRAMED GLASS DOOR AND WINDOW WITH ARCHITECTURAL HARDWARE 3. SPRINKLER HEADS PROVIDED AT DOOR TO PROVIDE RATING
D02	HISTORY GALLERY E129	STEEL	III					ST/GL	5C	6'-0"	9'-4"	2 @ 3'-0"	3/4"	3/8"	2	N/A	CUSTOM STEEL FRAMED GLASS DOOR AND WINDOW WITH ARCHITECTURAL HARDWARE
D03	DISPLAY NICHE AT VESTIBULE	FRAMELESS	IV					WD	5D	4'-0"	5'-10 1/4"	1 @ 4'-0"	1 3/4"	3/8"	3	N/A	PAINT TO MATCH ADJACENT GALLERY WALLS, KEY, & CUSTOM POWDERCOAT METAL DOOR PULLS
D06	ELECTRICL CLOSET E107	HM	I					HM	5A	3'-0"	8'-0"	1 @ 3'-0"	1 3/4"	3/8"	4	90 MINS.	SECURE (LOCKING) HARDWARE
D07	HISTORY GALLERY E129	HM	II					HM	5B	6'-0"	8'-6"	2 @ 3'-0"	1 3/4"	3/8"	5	90 MINS.	EGRESS HARDWARE
D08	HALLWAY E129	HM	II					HM	5B	6'-0"	8'-6"	2 @ 3'-0"	1 3/4"	3/8"	5A	N/A	EGRESS HARDWARE
D09	DUCT SHAFT	HM	I					HM	5A	3'-0"	8'-0"	1 @ 3'-0"	1 3/4"	3/8"	4	90 MINS.	SECURE (LOCKING) HARDWARE

1 DOOR SCHEDULE

GLAZING TYPES

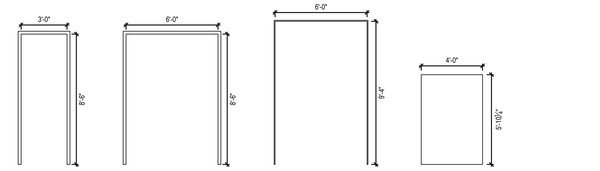
TYPE	USE	DESCRIPTION	EDGES	MANUFACTURER/MODEL	NOTES
GL-1	CLEAR INSULATED GLASS UNITS IN EXTERIOR CURTAIN WALL WINDOWS	IGU	POLISHED	SEE IGU SPECIFICATIONS	SEE SPECS CUSTOM ETCHING ON GLASS
GL-2	GLAZING FOR D-01, D-02, AND VESTIBULE GLASS PARTITION	3/4" THICK CLEAR LAMINATED GLASS	POLISHED, SEE 2/A-51	SEE IGU SPECIFICATIONS	PVB INTERLAYER FOR LAMINATED GLASS TO INCLUDE UV FILTER FOR 99.9% UV FILTRATION SEE SPECS CUSTOM ETCHING ON GLASS

2 GLAZING TYPES

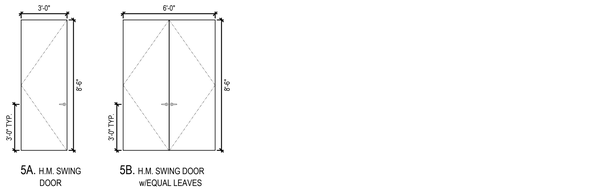
WINDOW SCHEDULE

NO.	LOCATION	MATERIAL	DIMENSIONS (W,H)	FRAME TYPE	DETAILS	COMMENTS	DETAILS	SHADES	GLAZING TYPE
W1	HISTORY GALLERY NORTH	NEW THERMALLY BROKEN ALUMINIUM CURTAIN WALL TO MATCH EXISITING WITH INSULATED GLASS UNITS	20'-9 1/2", 9'-6" VIF	AL	KAWNEER 1600UT SYSTEM 1™ CURTAIN WALL OR APPROVED EQUAL (REFER TO SPECIFICATIONS)	1. PERMAFLUOR UC135973 COLOR BLACK MAGIC 2. MANUAL ROLL DOWN BLACKOUT SHADES BY MECHOSHADE	1 & 6/ A-071	PROVIDE RECESSED MECHOSHADE MANUAL BLACKOUT SHADE WITH SIDE & SILL CHANNELS	GL-1
W2	HISTORY GALLRY SOUTH	NEW THERMALLY BROKEN ALUMINIUM CURTAIN WALL TO MATCH EXISITING WITH INSULATED GLASS UNITS	18'-2", 9'-6" VIF	AL	KAWNEER 1600UT SYSTEM 1TM CURTAIN WALL OR APPROVED EQUAL (REFER TO SPECIFICATIONS)	1. PERMAFLUOR UC135973 COLOR BLACK MAGIC	1 & 6/ A-071	PROVIDE RECESSED MECHOSHADE MANUAL BLACKOUT SHADE WITH SIDE & SILL CHANNELS	GL-1
W3	HISTORY GALLERY SOUTH	NEW THERMALLY BROKEN ALUMINIUM CURTAIN WALL TO REPLACE EXISITING WITH INSULATED GLASS UNITS	7'-7",9'-6" VIF	AL	KAWNEER 1600UT SYSTEM 1TM CURTAIN WALL OR APPROVED EQUAL (REFER TO SPECIFICATIONS)	1. PERMAFLUOR UC135973 COLOR BLACK MAGIC	6/ A-071	PROVIDE RECESSED MECHOSHADE MANUAL BLACKOUT SHADE WITH SIDE & SILL CHANNELS	GL-1

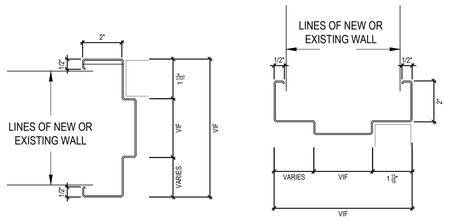
3 WINDOW SCHEDULE



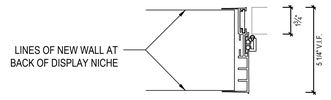
4 FRAME ELEVATIONS
1/4" = 1'-0"



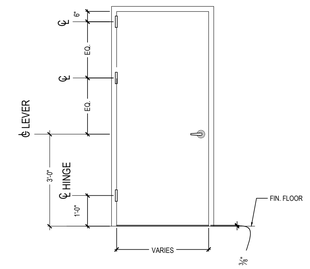
5 DOOR ELEVATIONS
1/4" = 1'-0"



6 METAL FRAME DETAIL
3" = 1'-0"



7 FRAMELESS DOOR FRAME DETAIL
3" = 1'-0"



7 HINGE LOCATIONS
1/2" = 1'-0"

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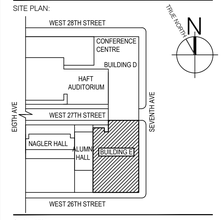
SITE PLAN:



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SCALE: AS NOTED

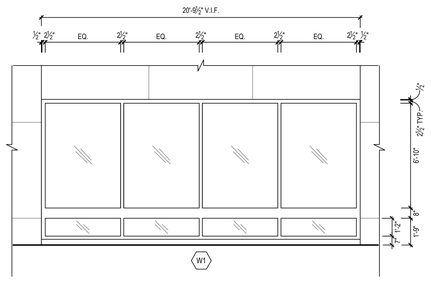
PROJECT #: 8969.93

SHEET TITLE:

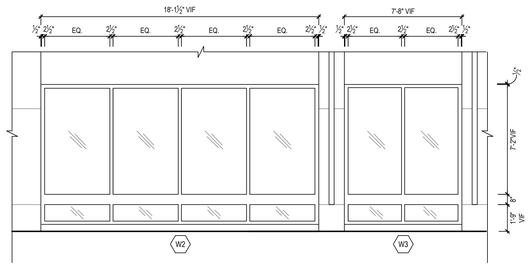
DOOR, WINDOW & GLAZING SCHEDULES

SHEET NUMBER:

A-070

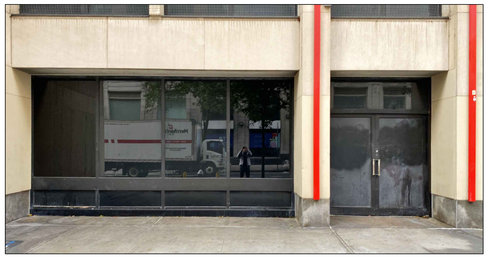


1 EAST WINDOW
1/4" = 1' - 0"

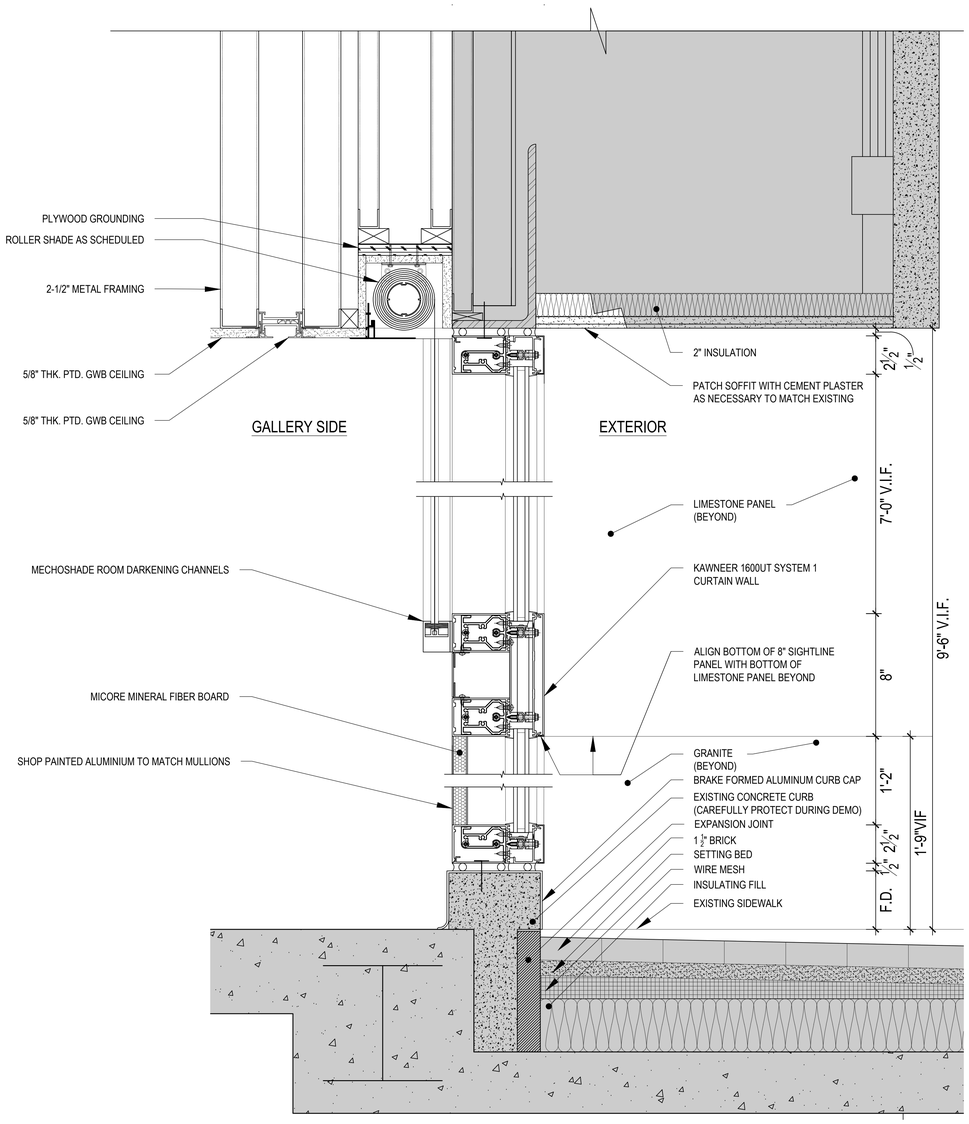


2 SOUTH WINDOW
1/4" = 1' - 0"

3 EAST WINDOW PHOTO



4 SOUTH WINDOW PHOTO



6 EAST WINDOW SECTION DETAIL
3" = 1' - 0"

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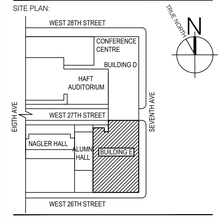

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SCALE: PROJECT#: 8969.93

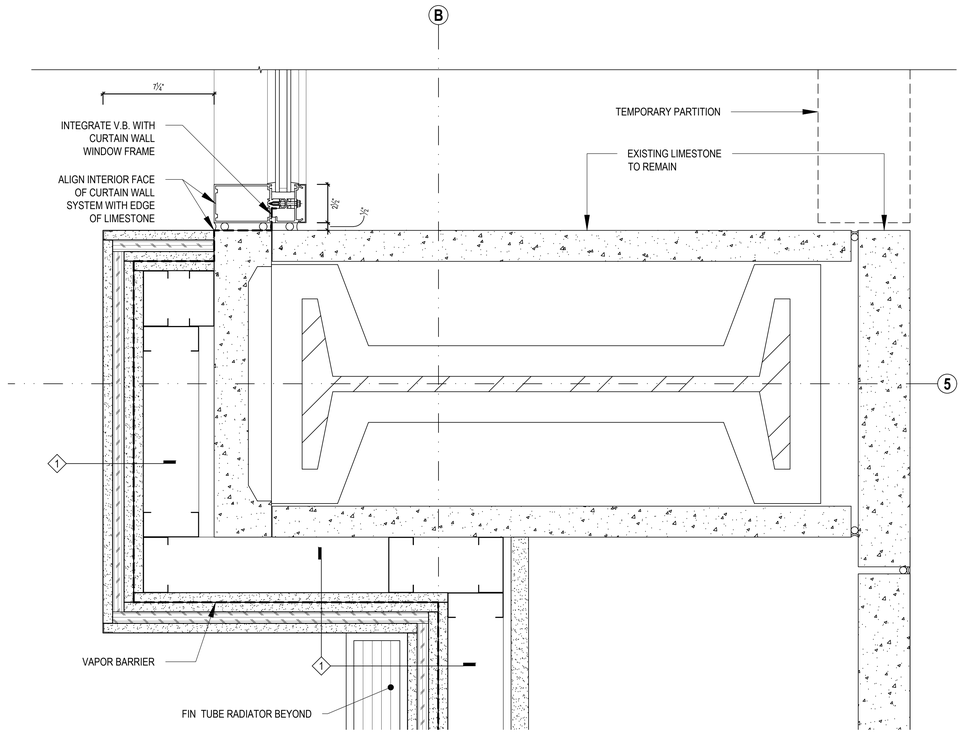
AS NOTED

SHEET TITLE:

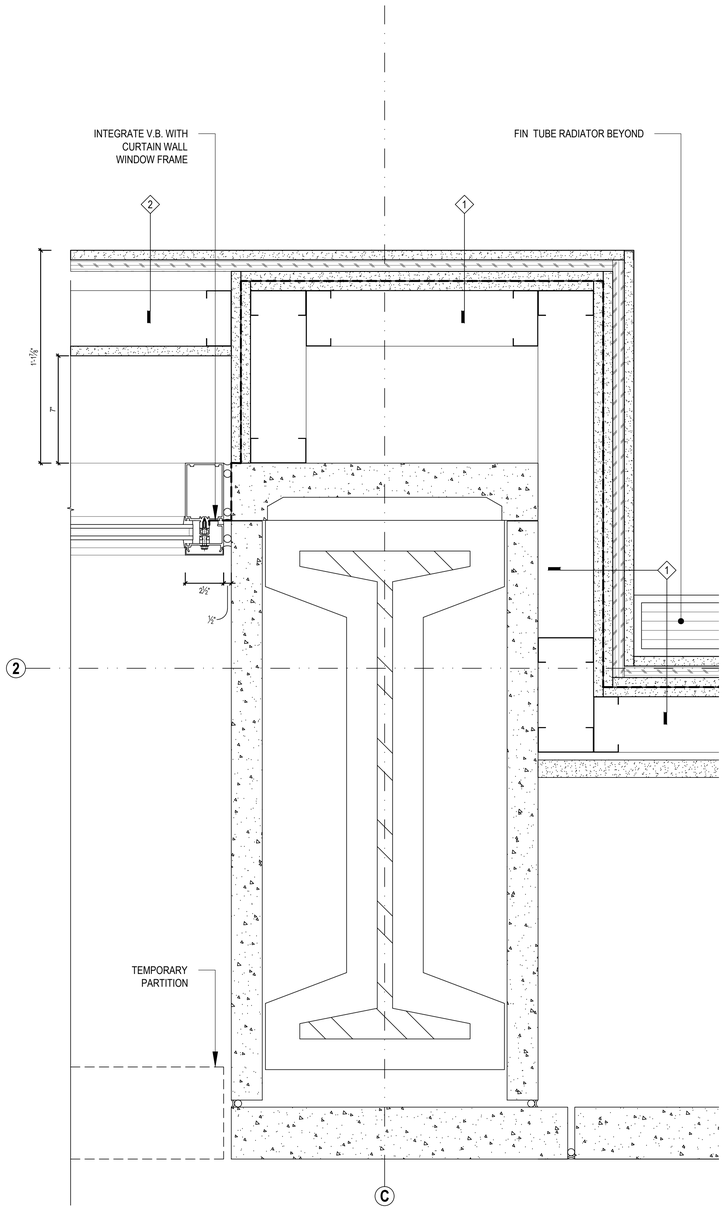
CURTAIN WALL WINDOW DETAILS

SHEET NUMBER:

A-071



1 CURTAINWALL PLAN DETAIL
3" = 1' - 0"



2 CURTAINWALL PLAN DETAIL
3" = 1' - 0"

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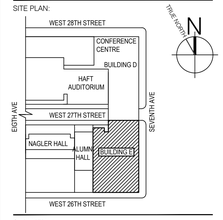
SITE PLAN:



SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
01	100% SCHEMATIC DESIGN	2025.02.06
02	100% DESIGN DEVELOPMENT	2025.11.24
03	BID SET	2026.03.27
04	REVISED BID SET	2026.04.24
05	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: AS CHECKED BY: KKB/SA

SCALE: PROJECT#: 8969.93

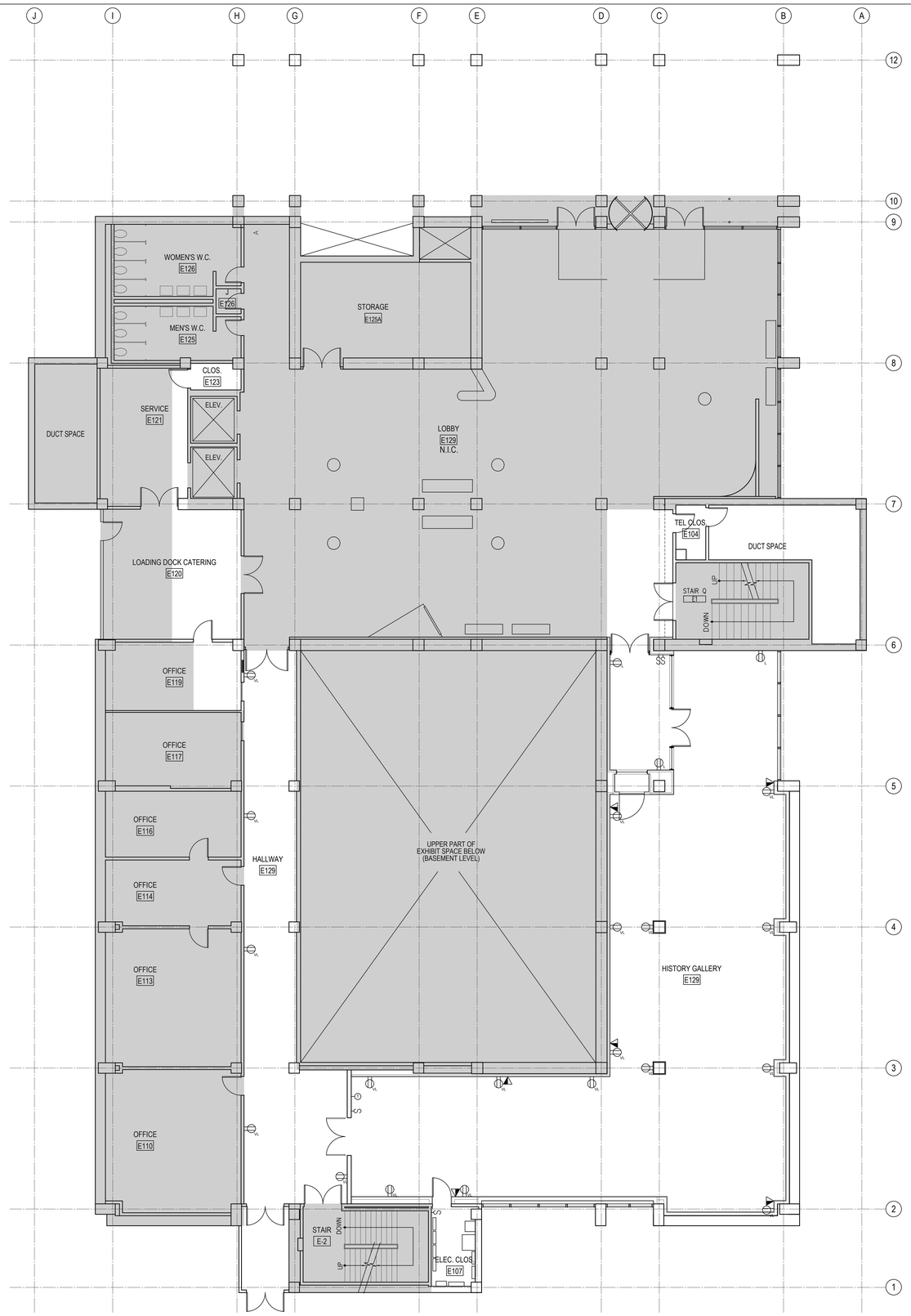
AS NOTED

SHEET TITLE:

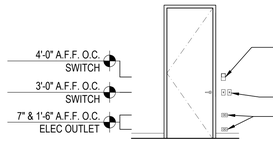
CURTAIN WALL WINDOW DETAILS

SHEET NUMBER:

A-072



1 **DEVICE PLAN**
1/8" = 1'-0"



2 **TYP. DEVICE DATUM AT DOOR DIAGRAM**
1/4" = 1'-0"

GENERAL NOTES:

1. **COORDINATE THE INSTALLATION OF DEVICES (SECURITY CAMERAS, W.A.P., AND P.A. SPEAKERS, ETC.) WITH F.I.T.**
2. DEVICES TO BE INSTALLED PER ARCHITECTURAL DRAWINGS. BRING ANY CONFLICTS TO THE ARCHITECT'S ATTENTION.
3. FOR ALL DEVICES IN CEILING, SEE RCP ON A-011.

NOTE:

1. ALL OUTLETS TO BE INSTALLED HORIZONTALLY U.O.N.
2. ALL DEVICES SHALL BE LOCATED IN ACCORDANCE WITH THE INFORMATION ON THIS SHEET UNLESS MORE SPECIFIC INFORMATION IS SHOWN ON THE ARCHITECTURAL DETAILS. NOTIFY ARCHITECT OF ANY UNCERTAINTIES, DISCREPANCIES OR CONFLICTS PRIOR TO PROCEEDING.
3. OUTLETS TO BE CENTERED AT VL: 7" A.F.F., AND SWITCHES TO BE AT M: 3'-0" A.F.F. U.O.N. ADDITIONAL SUBSCRIPTS ARE DESCRIBED BELOW:
   H: HIGH HEIGHT MOUNT @ 9'-0" A.F.F. O.C.
   M: MEDIUM LOW HEIGHT MOUNT@ 3'-0" A.F.F. O.C.
   L: LOW HEIGHT MOUNT @ 1'-6" A.F.F.
   VL: VERY LOW MOUNT @ 7" A.F.F. O.C.
4. PULL STATIONS TO BE AT 4'-0" A.F.F. O.C. U.O.N. OPERATING HANDLE HEIGHT MUST NOT EXCEED 4'-0".

DEVICE LEGEND

	WALL DUPLEX OUTLET. REF: ELEC.
S	LIGHT SWITCH
T	WALL MOUNTED THERMOSTAT @ 48" A.F.F., U.O.N., INCLUDES TAMPER PROOF COVER, SEE FINISH SCHEDULE FOR COLOR
	WALL TEL./DATA OUTLET TO CONTAIN 2 DATA, REF: I.T.

NOT FOR CONSTRUCTION

FIT History Gallery Renovation

Project No. 2448

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150 WEST 28TH STREET, SUITE 1603
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SITE PLAN:

SUBMITTAL:

Bid Set

ISSUE / REVISION:

No.	DESCRIPTION	DATE
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SEAL & SIGNATURE:

DRAWN BY: IIC CHECKED BY: KKB/SA

SCALE: PROJECT#: 8969.93

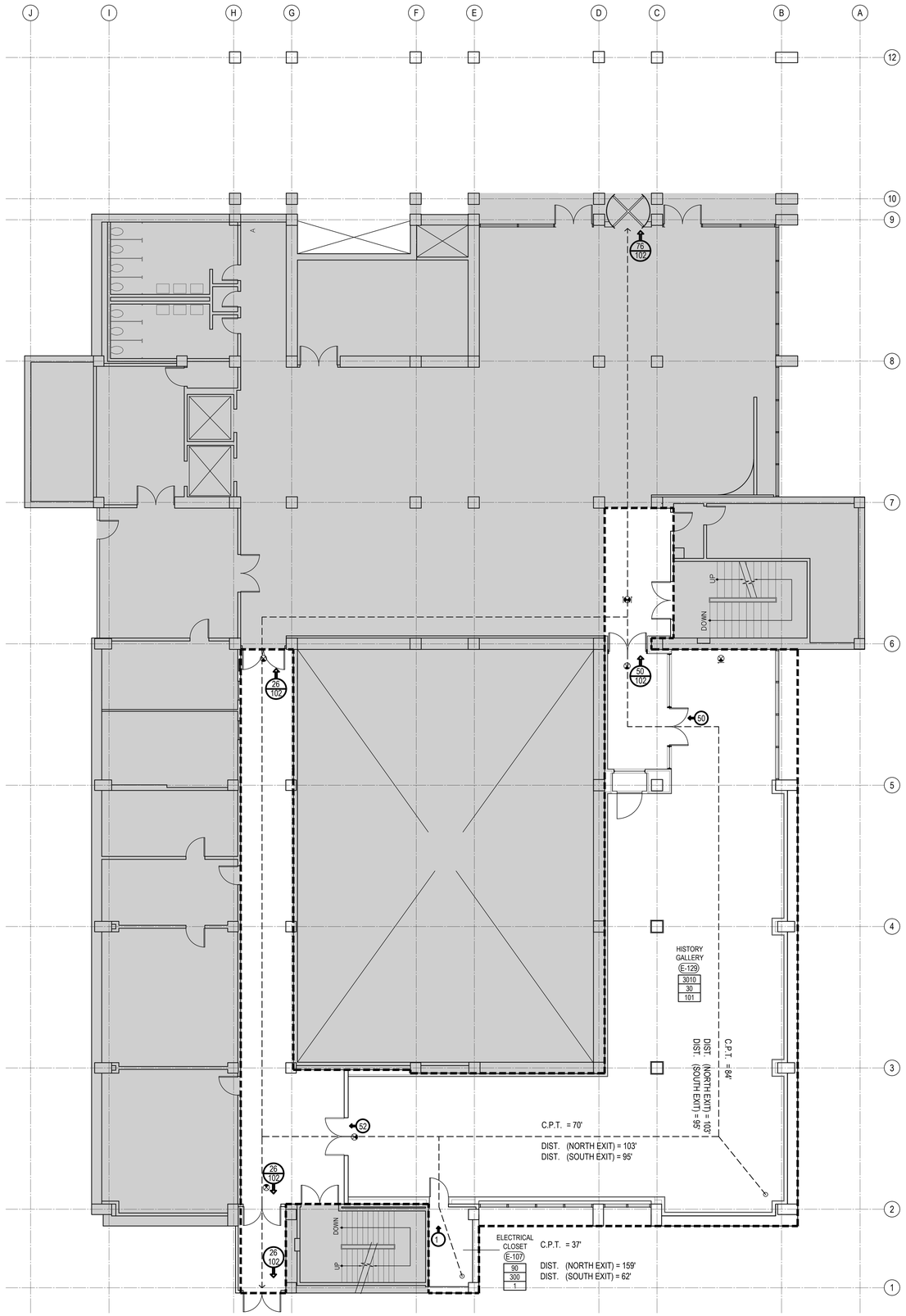
1/8" = 1'-0"

SHEET TITLE:

FIRST FLOOR DEVICE PLAN

SHEET NUMBER:

A-081



1 **FIRST FLOOR EGRESS PLAN**
1/8" = 1'-0"

SUMMARY

FIT MUSEUM HISTORY GALLERY OCCUPANT LOAD :
101 OCCUPANTS

REQUIRED # OF EXITS FROM FIRST FLOOR:
2 EXITS

PROPOSED # OF EXITS FROM FIRST FLOOR:
2 EXITS

SHEET NOTE

NON-GALLERY SPACES ARE ASSUMED TO BE USE GROUP B BUSINESS OCCUPANCY.

KEY

- MECH. ROOM — ROOM NAME
- (X-XX) — ROOM NUMBER
- 6389 — AREA OF SPACE IN NET SF
- 300 — OCCUPANT LOAD FACTOR
- 22 — OCCUPANCY
- 314 / 360 — NUMBER OF OCCUPANTS EXITING AT LAST POINT OF EGRESS / FULL CAPACITY OF EGRESS DOOR
- 40 OF 130 — ASSUMED NUMBER OF OCCUPANTS EXITING AT INTERMEDIATE POINTS/JUNCTURE ALONG EGRESS PATH
- C.P.T. = XX' — COMMON PATH OF TRAVEL/EXIT ACCESS TRAVEL DISTANCE
  Maximum Common Path of Travel: 100 feet
  Maximum Exit Access Travel Distance: 300 feet
- DIST. (NORTH EXIT) = 125' / DIST. (SOUTH EXIT) = 225' — DISTANCE TO (NORTH EXIT) / DISTANCE TO (SOUTH EXIT)
- PROJECT LIMIT LINE
- EXIT LIGHT FIXTURE, CEILING OR WALL MOUNTED WITH DIRECTIONAL ARROW AS NOTED.

NOT FOR CONSTRUCTION

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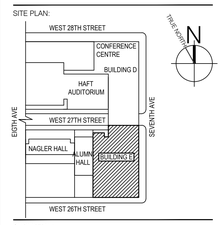

SUBMITTAL:

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05	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: IIC CHECKED BY: KKB/SA

SCALE: AS NOTED

PROJECT#: 8969.03

SHEET TITLE:

EGRESS PLAN

SHEET NUMBER:

A-091

PROGRESS INSPECTIONS FOR ENERGY CODE COMPLIANCE COMMERCIAL BUILDINGS

	INSPECTION/TEST	PERIODIC (MINIMUM)	REFERENCE STANDARD (SEE ECC CHAPTER 6) OR OTHER CRITERIA	ECC OR OTHER CITATION
IIB MECHANICAL AND SERVICE WATER HEATING INSPECTIONS				
IIB4	HVAC-R AND SERVICE WATER HEATING SYSTEM CONTROLS: NO LESS THAN 20% OF EACH TYPE OF REQUIRED CONTROLS MUST BE VERIFIED BY VISUAL INSPECTION AND TESTED FOR FUNCTIONALITY AND PROPER OPERATION. SUCH CONTROLS MUST INCLUDE, BUT ARE NOT LIMITED TO: - THERMOSTATIC - OFF-HOUR - ZONES - FREEZE PROTECTION/SNOW-AND ICE-MELT SYSTEM - VENTILATION SYSTEM AND FAN CONTROLS - ENERGY RECOVERY SYSTEMS - FAN SYSTEMS SERVING SINGLE AND MULTIPLE ZONES - AIR/WATER ECONOMIZERS & CONTROLS - HYDRONIC SYSTEMS - HEAT REJECTION SYSTEMS - HOT GAS BYPASS LIMITATION - REFRIGERATION SYSTEMS CONTROLS WITH SEASONALLY DEPENDENT FUNCTIONALITY: CONTROLS WHOSE COMPLETE OPERATION CANNOT BE DEMONSTRATED DUE TO PREVAILING WEATHER CONDITIONS TYPICAL OF THE SEASON DURING WHICH PROGRESS INSPECTIONS WILL BE PERFORMED SHALL BE PERMITTED TO BE SIGNED OFF FOR THE PURPOSE OF A TEMPORARY CERTIFICATE OF OCCUPANCY WITH ONLY A VISUAL INSPECTION, PROVIDED, HOWEVER, THAT THE PROGRESS INSPECTOR MUST PERFORM A SUPPLEMENTAL INSPECTION WHERE THE CONTROLS ARE VISUALLY INSPECTED AND TESTED FOR FUNCTIONALITY AND PROPER OPERATION DURING THE NEXT IMMEDIATE SEASON THEREAFTER. THE OWNER MUST PROVIDE FULL ACCESS TO THE PROGRESS INSPECTOR WITHIN TWO WEEKS OF THE PROGRESS INSPECTOR'S REQUEST FOR SUCH ACCESS TO PERFORM THE PROGRESS INSPECTION. FOR SUCH SUPPLEMENTAL INSPECTIONS, THE DEPARTMENT MUST BE NOTIFIED BY THE APPROVED PROGRESS INSPECTION AGENCY OF ANY UNRESOLVED DEFICIENCIES IN THE INSTALLED WORK WITHIN 180 DAYS OF SUCH SUPPLEMENTAL INSPECTION.	AFTER INSTALLATION AND PRIOR TO FINAL ELECTRICAL AND CONSTRUCTION INSPECTION, EXCEPT THAT FOR CONTROLS WITH SEASONALLY DEPENDENT FUNCTIONALITY, SUCH TESTING SHALL BE PERFORMED BEFORE SIGN_OFF FOR ISSUANCE OF A FINAL CERTIFICATE OF OCCUPANCY.	APPROVED CONSTRUCTION DOCUMENTS INCLUDING CONTROL SYSTEM NARRATIVES; ASHRAE GUIDELINE 1; THE HVAC COMMISSIONING PROCESS WHERE APPLICABLE	C403.2.4, C403.2.6.1, C403.2.13, C403.3, C403.4, C404.2, C404.6.1, C404.9,
IIB5	HVAC-R AND SERVICE WATER PIPING DESIGN AND INSULATION: INSTALLED PIPING INSULATION MUST BE VISUALLY INSPECTED TO VERIFY PROPER INSULATION PLACEMENT AND VALUES.	AFTER INSTALLATION AND PRIOR TO CLOSING SHAFTS, CEILINGS AND WALLS.	APPROVED CONSTRUCTION DOCUMENTS;	C403.11, C404.4, C404.5; MC 603.9;
IIB6	DUCT LEAKAGE TESTING, INSULATION AND DESIGN: FOR DUCT SYSTEMS DESIGNED TO OPERATE AT STATIC PRESSURES IN EXCESS OF 3 INCHES W.G. (747 PA), REPRESENTATIVE SECTIONS, AS DETERMINED BY THE PROGRESS INSPECTOR, TOTALING AT LEAST 25% OF THE DUCT AREA, MUST BE TESTED TO VERIFY THAT ACTUAL AIR LEAKAGE IS BELOW ALLOWABLE AMOUNTS. INSTALLED DUCT INSULATION MUST BE VISUALLY INSPECTED TO VERIFY PROPER INSULATION PLACEMENT AND VALUES. JOINTS, LONGITUDINAL AND TRANSVERSE SEAMS AND CONNECTIONS IN DUCTWORK MUST BE VISUALLY INSPECTED FOR PROPER SEALING.	AFTER INSTALLATION AND SEALING AND PRIOR TO CLOSING SHAFTS, CEILINGS AND WALLS.	APPROVED CONSTRUCTION DOCUMENTS; SMACNA HVAC AIR DUCT LEAKAGE TEST MANUAL; SMACNA DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE	C403,11;
IIC ELECTRICAL POWER AND LIGHTING SYSTEMS				
IIC6	ELECTRIC MOTORS AND ELEVATORS: WHERE REQUIRED BY THE CONSTRUCTION DOCUMENTS FOR ENERGY CODE COMPLIANCE, MOTOR LISTING OR LABELS BE VISUALLY INSPECTED TO VERIFY THAT THEY COMPLY WITH THE RESPECTIVE ENERGY REQUIREMENTS IN THE CONSTRUCTION DOCUMENTS. ELEVATORS AND ESCALATORS MUST BE INSPECTED FOR COMPLIANCE WITH REGENERATIVE DRIVE REQUIREMENTS.	PRIOR TO FINAL ELECTRICAL AND CONSTRUCTION INSPECTION.	APPROVED CONSTRUCTION DOCUMENTS.	C403,8, C405.6, C405.7, C405.8, C405.9;
IID OTHER				
IID1	MAINTENANCE INFORMATION: MAINTENANCE MANUALS FOR MECHANICAL, SERVICE HOT WATER AND ELECTRICAL EQUIPMENT AND SYSTEMS REQUIRING PREVENTIVE MAINTENANCE MUST BE REVIEWED FOR APPLICABILITY TO INSTALLED EQUIPMENT AND SYSTEMS BEFORE SUCH MANUALS ARE PROVIDED TO THE OWNER. LABELS REQUIRED FOR SUCH EQUIPMENT OR SYSTEMS MUST BE INSPECTED FOR ACCURACY AND COMPLETENESS.	PRIOR TO SIGN-OFF OR ISSUANCE OF FINAL CERTIFICATE OF OCCUPANCY.	APPROVED CONSTRUCTION DOCUMENTS, INCLUDING ELECTRICAL DRAWINGS WHERE APPLICABLE. ASHRAE GUIDELINE 4; PREPARATION OF OPERATING AND MAINTENANCE DOCUMENTATION FOR BUILDING SYSTEMS.	C408.11, C408.2.5.2, C408.3.2;

2020 NYCECC TABULAR ANALYSIS
COMMERCIAL BUILDING IN COMPLIANCE WITH ECC

NYCECC Citation	Provision	Item Description	Code Prescriptive Value (ECC)	Proposed Design Value	Supporting Documentation
C403.1.1	**Calculation of heating and cooling loads (Mandatory)**	*Load calculations for HVAC systems*	*Determined in accordance with ANSI/ASHRAE/ACCA Standard 183 HVAC Systems and Equipment Handbook*	*Design loads are determined in accordance with the procedures described in the ANSI/ASHRAE/ACCA Standard183.*	*Signed and sealed statement from Engineer certifying compliance with Energy Code*
C403.2.2	**Ventilation (Mandatory)**	*Ventilation cfm and Outdoor air control*	*Where mechanical ventilation is provided, systems shall be capable of reducing outdoor air to the minimum requirements from Chapter 4 of the NYC MC*	*Motorized dampers shall have ability to operate at minimum required ventilation rates*	*See mechanical floor plans M-101, mechanical schedules M-701, and mechanical control drawings M-802*
C403.3.1	**Equipment sizing (Mandatory)**	*HVAC systems sizing based on load calculations*	*Heating and cooling equipment shall not exceed calculated loads*	*Specified equipment sized within load calculation limits*	*Signed and sealed statement from Engineer certifying compliance with Energy Code*
C403.4.1	**Thermostatic controls (Mandatory)**	*Thermostats/humidistats for mechanical zones*	*Minimum one thermostat/humidistat required per zone*	*One thermostat is provided for each zone*	*Thermostats shown on mechanical control drawing M-802*
C403.5.1	**Integrated economizer control**	*Economizer control on SF-1E*	*Economizer systems shall be integrated with the mechanical cooling system and be capable of providing partial cooling even where additional mechanical cooling is required to provide the remainder of the cooling load. Controls shall not be capable of creating a false load in the mechanical cooling systems by limiting or disabling the economizer or any other means, except at the lowest stage of mechanical cooling.*	*Economizers systems are integrated with the mechanical cooling system and capable of providing partial cooling, per control sequence*	*See mechanical control drawing M-803*
C403.5.2	**Economizer heating system impact**	*Economizer heating system impact*	*Economizer operation does not increase building heating energy use during normal operation*	*Economizer operation does not increase building heating energy use during normal operation*	*See mechanical control drawing M-803*
C403.6.5	**Supply-air temperature reset controls**	*HVAC system serving zones*	*Control system shall automatically reset supply-air temperature in response to building load or outdoor air temperature. The controls shall be capable of resetting the supply air temperature not less than 25% of the difference between the design supply-air temperature and the design room air temperature.*	*control sequences provided as required*	*See mechanical control drawing M-802*
C403.7.3	**Ventilation air heating control (Mandatory)**	*SF-1E*	*Units that provide ventilation air and operate in conjunction with heating/cooling systems shall not warm supply air to greater than 60F when majority of zones require cooling.*	*control sequences provided as required*	*See mechanical schedule M-701*
C403.8.1, TABLES C403.8.1(1) & C403.8.1(2)	**Allowable Fan Horsepower (Mandatory)**	*SF-1E*	*Total system fan hp shall not exceed limits in Table C403.8.1(1)*	*Total Fan power = XXX bhp*	*See mechanical details, drawing M-101*
C403.8.2	**Motor nameplate horsepower (Mandatory)**	*SF-1E*	*Motor selection does not except 1.5xbhp for fans less than 6bhp*	*Fan hp < 8 hp hp = 1.5 * 5.5bhp*	*See mechanical details, drawing M-101*
C403.8.3	**Fan Efficiency (Mandatory)**	*Fan efficiency for SF-1E*	*Minimum FEG = 67*	*Minimum FEG = 70*	*See mechanical details, drawing M-101*
C403.8.5.1	**Fan Airflow control**	*Fan controls for single-zone DX cooling system 135kBTU/h*	*Supply fans controlled by variable speed drives and configured to requirements in C403.8.5.1.*	*Variable speed fan controls provided per requirements*	*See mechanical schedule M-701*
C403.11.1	**Duct and plenum insulation and sealing (Mandatory)**	*All ductwork*	*Supply and return ducts and plenums in shall have a minimum of R-6 where located in unconditioned spaces and R-8 minimum where located outside the building. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8.*	*Unconditioned spaces: R-6 Conditioned spoces: None, exterior wall insulated >R-8*	*See mechanical drawing M-101*
C403.11.2	**Duct Construction (Mandatory)**	*Ductwork*	*Shall be constructed and erected in accordance with the NYCMC*	*Ductwork must be constructed and erected in accordance with the NYCMC*	*See mechanical drawing M-101*
C403.11.2.1	**Low-Pressure Duct Systems (Mandatory)**	*Low Pressure Ductwork*	*All low pressure ducts, operating at 2" of W.G. or less shall be properly sealed with approved methods*	*All low pressure ducts properly sealed as per requirements*	*See mechanical drawing M-101*
C403.11.2.2	**Medium-Pressure Duct Systems (Mandatory)**	*Medium Pressure Ductwork*	*Ducts operating between 2" and 3" W.G. shall be insulated and sealed per C403.11.1 and must be clearly indicated on the construction documents in accordance with NYCMC*	*All medium pressure ducts sealed as per requirements and insulated to R-XX*	*See mechanical drawing M-101*
TABLE C403.11.3	**Minimum Piping Insulation Thickness**	*40% Glycol water piping insulation: 1½ - 2 inches Refrigerant insulation: 1.5 inches Cold water make up insulation: 1 inch*	*Refrigerant insulation: <40F, 1.5 inches*	*Refrigerant insulation: 1.5 inches*	*See mechanical specifications*
C408.2	**Mechanical, renewable energy, and service water heating systems commissioning and completion requirements**	*Commissioning*	*Mechanical systems shall be commissioned and completed in accordance with Section C408*	*Commissioning is required for this project per requirements*	*See mechanical drawing M-802*

NOT FOR CONSTRUCTION

NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT History Gallery Renovation

Project No. 2448

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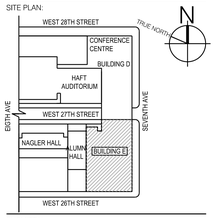

SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
	DESIGN DEVELOPMENT	11.24.2025
	CD PROGRESS	03.10.2026
	BID SET	03.27.2026
	REVISED BID SET	04.13.2026
	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: ASB CHECKED BY: RME

SCALE: NTS

PROJECT#: 8969.110

SHEET TITLE:

MECHANICAL ENERGY COMPLIANCE

SHEET NUMBER:

EN-001.00

GENERAL NOTES

1. THE CONTRACTOR SHALL VISIT AND EXAMINE THE PREMISES, PRIOR TO SUBMITTING THEIR PROPOSAL, IN ORDER TO UNDERSTAND THE EXISTING CONDITIONS RELATED TO THEIR WORK.
2. THE CONTRACTOR SHALL ADHERE TO ALL CONSTRUCTION RULES, REGULATIONS AND STANDARDS OF BUILDING.
3. MECHANICAL EQUIPMENT PERMITS SHALL BE DELIVERED TO THE LANDLORD FOR ALL MECHANICAL EQUIPMENT REQUIRING PERMITS.
4. ALL DUCTWORK AND MECHANICAL APPARATUS SHALL BE INSTALLED IN A NEAT AND PROFESSIONAL MANNER AND CLEANED. LABELS AND MARKINGS SHALL BE LOCATED ON DUCTWORK. DUCTWORK SHALL BE INSTALLED PER SMACNA STANDARDS.
5. ALL DUCTWORK SHALL BE INSTALLED TIGHT TO BOTTOM OF EXISTING BEAMS TO PROVIDE AS MUCH HEIGHT CLEARANCE AS POSSIBLE FOR THE INSTALLATION OF THE NEW CEILING AND TO AVOID CONFLICTS WITH PIPING, STEEL, LIGHT FIXTURES, ETC.
6. THE INSTALLATION OF ALL TENANT IMPROVEMENTS SHALL PERMIT ADEQUATE ACCESSIBILITY TO ALL NEW AND EXISTING EQUIPMENT FOR PROPER MAINTENANCE.
7. THE CONTRACTOR SHALL PROVIDE ACCESS TO ALL OVERHEAD VALVES, FIRE DAMPERS AND MAINTENANCE SENSITIVE EQUIPMENT, AND MAINTAIN ACCESS TO AREAS ALREADY ACCESSIBLE BY ACCESS DOORS.
8. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL VISIBLE EQUIPMENT, AIR DEVICES, ACCESS DOORS AND THERMOSTATS WITH ARCHITECTURAL PLANS AND NOTIFY OF ANY DISCREPANCIES.
9. CONTRACTOR TO INSPECT ALL SUPPLY MAINS FOR LEAKS AND SEAL AIRTIGHT WITH APPROVED SEALERS WHERE NECESSARY.
10. CONTRACTOR TO VERIFY ALL DAMPERS, NOT SHOWN, ARE IN THE OPEN POSITION THROUGHOUT THE SPACE. ALL DAMAGED OR CLOSED DAMPERS ARE TO BE REPLACED WITH APPROVED EQUALS TO MEET LOCAL CODE.
11. ALL EXISTING DUCTWORK SHALL REMAIN UNLESS OTHERWISE SHOWN. RELOCATE DIFFUSERS AS NEEDED WITH NEW FLEX BRANCH CONNECTIONS OR NEW SPOOL PIECE TO COORDINATE WITH NEW REFLECTED CEILING PLAN IF NEEDED. SUPPLY DIFFUSERS AND RETURN REGISTERS TO BE AS SPECIFIED ON DRAWING SCHEDULES. COORDINATE WITH ARCHITECT. WHERE SPECIFIED DEVICES ARE NOT CONSISTENT WITH EXISTING TO REMAIN, CONTRACTOR SHALL BRING TO THE ATTENTION OF THE DESIGN TEAM.
12. PROVIDE AIR BALANCE OF SYSTEM. INCLUDE EXISTING AC UNIT DATA (I.E., CFM, AMPERAGE, ETC), PROVIDE TOILET EXHAUST CONNECTION TO RISER TRAVERSE. THIS TO BE DONE AND REPORT ISSUED PRIOR TO START OF CONSTRUCTION, PROVIDE AIR SYSTEM BALANCING (CFM READINGS ON EXISTING DIFFUSERS) AND TAKE TRAVERSE READINGS ON ALL MAIN SUPPLY DUCTWORK BRANCHES. PROVIDE TRAVERSE READING ON TOILET EXHAUST DUCTWORK CONNECTION TO BUILDING RISER, COMPLETE AND ISSUE REPORT PRIOR TO THE START OF CONSTRUCTION, PROVIDE COMPLETE AIR SYSTEM BALANCING PER THE SPECIFICATIONS AT THE COMPLETION OF THE PROJECT. FINAL AIR BALANCING TO INCLUDE ANY COMFORT BALANCING REQUIRED BY THE CLIENT.
13. CONTRACTOR SHALL BE RESPONSIBLE TO BALANCE SYSTEM TO PROPERLY SATISFY NEW AND EXISTING WORK AREAS. CONTRACTOR TO SUBMIT AIR OUTPUT PRIOR TO CONSTRUCTION.
14. ALL NEW & EXISTING SHEET METAL SUPPLY DUCTWORK SHALL BE INSULATED WITH 1-1/2" THICK INSULATION.
15. ALL SHOP DRAWINGS AND ANY ADDITIONAL COORDINATION DRAWINGS AND SKETCHES OF ALL MECHANICAL SYSTEMS SHALL SUBMITTED TO THE PROPERTY MANAGEMENT OFFICE FOR REVIEW AND APPROVAL. NO WORK SHALL COMMENCE UNLESS APPROVALS ARE SECURED.
16. CONTRACTOR SHALL BE RESPONSIBLE TO RESTORE FIREPROOF AT ALL STEEL AREAS EXPOSED AS A RESULT OF THEIR WORK INCLUDING BUT NOT LIMITED TO THE EQUIPMENT, DUCTWORK, AND PIPING SUPPORT INSTALLATION.
17. CONNECT NEW BRANCH SUPPLY DUCTWORK TO EXISTING DUCTWORK. PROVIDE NEW MAIN DUCTWORK EXTENSIONS AND TRANSITION SECTIONS AS REQUIRED.
18. ALL BRANCH DUCT TAKE-OFFS TO AIR OUTLETS SHALL BE PROVIDED WITH VOLUME DAMPERS.
19. ALL VOLUME DAMPERS LOCATED ABOVE AN INACCESSIBLE CEILING SHALL BE CABLE OPERABLE FROM FACE OF AIR OUTLET.
20. CONTRACTOR TO VERIFY RETURN AIR PATH BACK TO BUILDING SHAFTS. MECHANICAL ROOMS AND SUPPLEMENTAL AIR CONDITIONING UNITS. CONTRACTOR SHALL PROVIDE OPENINGS AND TRANSFER DUCTWORK IN ALL FULL HEIGHT WALLS AS REQUIRED FOR TRANSFER OF RETURN AIR BACK TO SOURCES.
21. PROVIDE MERV 8 ASHRAE DUST SPOT AIR FILTERS ON MAIN RETURN DUCTS DURING DEMO PERIOD AND CONSTRUCTION TO KEEP DIRT AND DEBRIS FROM ENTERING THE MAIN AIR HANDLING SYSTEM.
22. FLEX DUCT TO DIFFUSERS SHALL NOT EXCEED 6'-0".
23. ALL DUCTS TO BE PRESSURE TESTED MEDIUM & LOW PRESSURE TO HOLD 4" ON MEDIUM AND 2" ON LOW PRESSURE AS PER SMACNA STANDARD. TESTING SHALL BE COORDINATED WITH AND WITNESSED BY BUILDING PERSONNEL.
24. CONTRACTOR IS RESPONSIBLE TO CLEAN AND RELOCATE EXISTING SUPPLY DIFFUSERS AND LINEAR DIFFUSERS SO AS TO SECURELY AND PROPERLY FIT AND PERFORM IN CEILING.
25. CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY CONTROL AND ACTUATORS FOR EXISTING VAV BOXES. NEW THERMOSTATS, TEMPERATURE SENSORS, AND CONTROLS TO MATCH EXISTING AS TO ENSURE PROPER OPERATION OF VAV UNITS.
26. FINAL LOCATION OF ALL WALL-MOUNTED HVAC CONTROL DEVICES SHALL BE COORDINATED IN THE FIELD WITH THE ARCHITECT AND THE ENGINEER PRIOR TO INSTALLATION.
27. ALL CONNECTIONS TO EXISTING CHILLED, CONDENSER, OR HOT WATER SHALL BE WET-TAPPED UNLESS OTHERWISE NOTED. PROVIDE FULL SIZED VALVED AND CAPPED FUTURES AT ALL CONNECTIONS.

DEMOLITION NOTES

1. GENERAL DEMOLITION
   a) ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW YORK CITY BUILDING CODE, NATIONAL ELECTRIC CODE AND OSHA RULES AND REGULATIONS.
   b) CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS BEFORE ANY WORK IS TO BEGIN.
   c) ALL EXITS SHALL BE KEPT READILY ACCESSIBLE AND UNOBSTRUCTED AT ALL TIMES.
   d) ALL WASTE AND DEBRIS SHALL BE REMOVED FROM THE INTERIOR AND EXTERIOR OF BUILDING, AND PLACED IN APPROVED CONTAINERS.
2. HVAC DEMOLITION
   a) HVAC CONTRACTOR SHALL VISIT THE PREMISES PRIOR TO SUBMITTING ITS PROPOSAL AND EXAMINE THE EXISTING AREAS AFFECTED BY THIS WORK TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND WITH DIFFICULTIES THAT WILL ATTEND THE EXECUTION OF THIS WORK.
   b) REMOVALS SHALL BE PERFORMED IN PHASES. COORDINATE WITH CONSTRUCTION MANAGER.
   c) MAINTAIN AIRFLOW TO OCCUPIED SPACES DURING NORMAL OCCUPIED HOURS.
   d) REMOVE AND DISPOSE ALL DUCTWORK, SUPPORTS, COIL CONDENSATE PUMPS, DRAIN PANS, DIFFUSERS, REGISTERS, GRILLES AND ALL MISCELLANEOUS ACCESSORIES ASSOCIATED WITH ANY REMOVED OR RELOCATED EQUIPMENT.
   e) THE CONTRACTOR, PRIOR TO THE REMOVAL AND DEMOLITION OF ANY EQUIPMENT (I.E., AIR HANDLERS, STEAM CONVECTORS, WINDOW AC UNITS, ETC.), IS TO INFORM THE OWNER OF THE EQUIPMENT BEING REMOVED AND TO DETERMINE IF THE OWNER WOULD LIKE TO TAKE POSSESSION OF THE EQUIPMENT.
   f) CONTRACTOR SHALL DEMOLISH ALL HVAC EQUIPMENT, DUCTWORK, AND APPURTENANCES APPEARING SHOWN AS EXISTING TO BE REMOVED.
   g) THE DEMOLITION DRAWING SHALL BE CONSIDERED ONLY AS A GUIDE AND IS NOT INTENDED TO SHOW EVERY SINGLE ITEM OF WORK AS REQUIRED. ACTUAL FIELD CONDITIONS WILL DETERMINE THE PRECISE WORK TO BE DONE. SHOULD ANY QUESTION ARISE AS TO WHETHER OR NOT ANY PIPING, EQUIPMENT OR ANY OTHER ITEM SHOULD BE REMOVED, OR REMAIN AS PRESENTLY INSTALLED, THIS CONTRACTOR SHALL REQUEST, IN WRITING, CLARIFICATION FROM THE ARCHITECT. BECAUSE THE MECHANICAL DRAWINGS INDICATE THE INTENT OF THE SCOPE OF WORK, NO EXTRA CHARGES WILL BE ALLOWED FOR ANY REMOVALS NECESSARY FOR THE COMPLETION OF THE WORK UNDER THIS PROJECT.
   h) ANY DEMOLITION OF EXISTING EQUIPMENT SHALL INCLUDE THE REMOVAL OF THEIR RELATED CONTROLS AND CONTROL WIRING.
   i) THIS CONTRACTOR SHALL CAP ALL REMAINING DUCTS, AT ALL POINTS OF DISCONNECTION, AIRTIGHT, UNLESS OTHERWISE NOTED.
   j) THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR WORK WITH ITS COMPLETION AND FINAL ACCEPTANCE AND SHALL REPLACE ANY OF THE SAME WHICH MAY BE DAMAGED, LOST OR STOLEN WITHOUT ADDITIONAL COST TO THE OWNER.
   k) THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE FAILURE OF ANY DUCTWORK SYSTEM OR EQUIPMENT TO FUNCTION PROPERLY UPON COMPLETION OF THEIR WORK UPON SAID SYSTEM OR EQUIPMENT.
   l) ALL RETURN AIR DUCT OPENINGS SHALL BE COVERED WITH TEMPORARY FILTER DURING THE DEMOLITION.
   m) PROVIDE PLUGS FOR ALL PIPING TAKE-OFFS WHERE THE BRANCH PIPING IS TO BE REMOVED.

DRAWING LIST

M-001.00	SYMBOL LIST, ABBREVIATIONS AND NOTES
M-011.00	1ST FLOOR MECHANICAL DEMOLITION PLAN
M-100.00	SUBCELLAR AND CELLAR MECHANICAL PLAN
M-101.00	1ST FLOOR MECHANICAL PLAN
M-501.00	MECHANICAL DETAILS 1
M-502.00	MECHANICAL DETAILS 2
M-601.00	GLYCOL WATER PIPING DIAGRAM
M-701.00	MECHANICAL SCHEDULES 1
M-702.00	MECHANICAL SCHEDULES 2
M-801.00	MECHANICAL CONTROL DIAGRAMS
M-802.00	GLYCOL WATER PIPING CONTROL DIAGRAM
M-803.00	BAS ARCHITECTURE

N.Y.C. BUILDING DEPARTMENT NOTES

1. ALL WORK SHALL COMPLY WITH THE APPLICABLE SECTIONS OF THE BUILDING CODE, NEW YORK CITY, EFFECTIVE NOVEMBER 7, 2022 AND ALL AMENDMENTS AND RULES AND REGULATIONS OF THE DEPARTMENT OF BUILDINGS TO DATE, AND MATERIALS AND EQUIPMENT SUBJECT TO SPECIAL INSPECTION.
2. THE FOLLOWING SPECIAL INSPECTIONS ARE REQUIRED BY THE NYC BUILDING CODE FOR HVAC SYSTEMS:
   a) FIRE-RESISTANT PENETRATIONS AND JOINTS - BC 1705.17
   b) MECHANICAL SYSTEMS - BC 1705.21
   c) HEATING SYSTEMS - BC 1705.31
3. THE FOLLOWING ITEMS REQUIRE PROGRESS INSPECTIONS:
   a) FIRE RESISTANT RATED CONSTRUCTION - BC 110,3,4
   b) ENERGY CODE COMPLIANCE INSPECTIONS - BC 110,3,5
   c) FINAL INSPECTIONS - UNDER DIRECTIVE 14
4. UPON COMPLETION OF THE WORK, A TEST SHALL BE CONDUCTED IN THE PRESENCE AND UNDER DIRECTION OF A SPECIAL INSPECTOR RETAINED BY THE OWNER QUALIFIED TO CONDUCT SUCH TESTS, THE TEST SHALL SHOW COMPLIANCE WITH THE CODE REQUIREMENTS FOR VENTILATION AND THE PROPER FUNCTIONING OF ALL OPERATING DEVICES, BEFORE THE SYSTEM IS APPROVED (BC 1705.21).
5. ALL INSPECTIONS AND TESTS WILL BE MADE IN COMPLIANCE WITH BC 1705.
6. CERTIFICATES OF COMPLIANCE (BC 110,6 AND 28-116,4) SHALL BE OBTAINED AND PAID FOR BY THE CONTRACTOR.
7. ALL HVAC SYSTEMS AND EQUIPMENT COMPLY WITH THE REQUIREMENTS OF THE ENERGY CONSERVATION CONSTRUCTION CODE OF THE STATE OF NEW YORK (MC 301.2).
8. THE FOLLOWING ENERGY CODE INSPECTIONS ARE REQUIRED BY THE NYC ENERGY CONSERVATION CODE FOR HVAC SYSTEMS:
   a) VENTILATION AND AIR DISTRIBUTION SYSTEM (IB2)
   b) HVAC-R AND SERVICE WATER HEATING EQUIPMENT - (IB3), (IIB3)
   c) HVAC-R AND SERVICE WATER HEATING SYSTEM CONTROLS - (IB4), (IIB4)
   d) HVAC-R AND SERVICE WATER PIPING DESIGN AND INSULATION - (IB5), (IIB5)
   e) DUCT LEAKAGE TESTING, INSULATION AND DESIGN - (IB6), (IIB6)
   f) MAINTENANCE INFORMATION - (ID1), (IID1)
   g) ELECTRICAL MOTORS - (IIC6)
9. TEST OF MECHANICAL SYSTEMS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION MC 108 AND THE FOLLOWING SECTIONS OF THE NEW YORK CITY MECHANICAL CODE:
   a) VENTILATION SYSTEM BALANCING - MC 403.3,1,6
   b) REFRIGERATION SYSTEMS - MC 1108
   c) HYDRONIC PIPING SYSTEMS - MC 1208
10. THE FOLLOWING WORK ITEMS, COMPONENTS, MATERIALS, CAPACITIES, ETC., SHALL COMPLY WITH THE FOLLOWING CODE REFERENCE:
    a) STANDARD OF HEATING - MC 309.1, MC 312
    b) NOISE CONTROL - MC 313, BC 1207
    c) DUCT CONSTRUCTION, SUPPORT - MC 603
    d) FIRE DAMPERS AND SMOKE DAMPERS AND SMOKE DETECTORS - MC 607
    e) PIPING AND INSULATION - MC 1201, MC 1204
    f) FANS - MC 503
    g) ELECTRIC WIRING & EQUIPMENT - MC 301.10
    h) CONTROLS - MC 405
    i) SAFETY CODE FOR MECHANICAL REFRIGERATION - MC 1101 THRU 1109
11. MINIMUM TEMPERATURE TO BE MAINTAINED DURING HEATING SEASON: BC 1204 - WHEN 13 DEGREES FAHRENHEIT OUTSIDE.
12. VENTILATION FOR ALL AREAS SHALL COMPLY WITH MC 401, MC 402, AND MC 403.
13. UPON COMPLETION OF THIS VENTILATION SYSTEM, A TEST SHALL BE CONDUCTED IN THE PRESENCE OF AND DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR HAVING NOT LESS THAN FIVE (5) YEARS OF EXPERIENCE SUPERVISING INSTALLATION OF VENTILATING SYSTEMS. THE TEST SHALL SHOW COMPLIANCE WITH THE CODE REQUIREMENTS FOR VENTILATION AND THE PROPER FUNCTIONING OF ALL OPERATING DEVICES BEFORE THE SYSTEM IS APPROVED. THE LICENSED PROFESSIONAL ENGINEER OR REGISTERED ARCHITECT WHO CONDUCTS THE TESTS SHALL FILE A CERTIFICATE AS TO WHETHER THE SYSTEM COMPLIES WITH THE APPLICABLE LAWS. HE SHALL ALSO FILE WITH THE CERTIFICATION, A REPORT OF THE TEST, THE TEST AND REPORT SHALL BE MADE IN A MANNER SATISFACTORY TO THE SUPERINTENDENT. A STATEMENT SHALL BE FILED BY THE OWNER OR TENANT IN POSSESSION THAT THE SYSTEM WILL BE KEPT IN CONTINUOUS OPERATION AT ALL TIMES DURING NORMAL OCCUPANCY OF THE STRUCTURE AS PROVIDED IN THE APPLICABLE SECTIONS OF THE CODE. BASE BUILDING PLANS ARE FILED FOR SINGLE TENANT OCCUPANCY. ALL TENANT PLANS WILL BE FILED UNDER SEPARATE APPLICATIONS.
14. ALL FIRE DAMPERS SHALL BE APPROVED BY THE NEW YORK CITY DEPARTMENT OF BUILDINGS AND SHALL BE MANUFACTURED AND INSTALLED IN ACCORDANCE WITH UL 555, STANDARD FOR FIRE DAMPERS AND CEILING DAMPERS.
15. COMBINATION FIRE/SMOKE DAMPERS AND SMOKE DAMPERS SHALL BE ACCEPTED FOR USE BY THE NEW YORK CITY DEPARTMENT OF BUILDINGS SHALL BE MANUFACTURED AND INSTALLED IN ACCORDANCE WITH UL 555S.
16. SMOKE DETECTORS, COMBINATION FIRE/SMOKE DAMPERS AND SMOKE DAMPERS SHALL BE INSTALLED AS REQUIRED TO CLOSE DAMPERS AND AUTOMATICALLY SHUT DOWN THE FAN-MC 606. AC EQUIPMENT SHALL REQUIRE MANUAL RESTART.
17. REFER TO ARCHITECTURAL DRAWING FOR FIRE RATED WALL LOCATIONS AND RATED CONSTRUCTION.

MECHANICAL DUCTWORK SYMBOLS

SYMBOL	DESCRIPTION
	SUPPLY DUCT UP (POSITIVE PRESSURE)
	RETURN OR EXHAUST DUCT UP (NEGATIVE PRESSURE)
	SUPPLY DUCT DOWN (POSITIVE PRESSURE)
	RETURN OR EXHAUST DUCT DOWN (NEGATIVE PRESSURE)
R R	SLOPING RISE IN DUCT IN DIRECTION OF ARROW
D D	SLOPING DROP IN DUCT IN DIRECTION OF ARROW
18x12 18x12	DUCT SIZE IN INCHES (CLEAR INSIDE DIMENSION) FIRST FIGURE INDICATES PLAN DIMENSION
24"Ø 24"Ø	ROUND DUCT DIAMETER SIZE
24/12 24/12	FLAT OVAL DUCT SIZE
	ACOUSTIC LINING IN DUCT (CLEAR INSIDE DIMENSION)
	FLEXIBLE CONNECTION
	ELBOW WITH TURNING VANES
	RADIUS ELBOW
	LINEAR SUPPLY DIFFUSER (CEILING, SIDEWALL)
	SUPPLY REGISTER
	CEILING DIFFUSER (4 WAY, 3 WAY, 2 WAY, 1 WAY, ROUND)
	RETURN GRILLE, EXHAUST GRILLE
6X6	NOZZLE DIFFUSER
	VOLUME DAMPER
MD MD	MOTORIZED DAMPER & ACCESS DOOR
FD FD	FIRE DAMPER & ACCESS DOOR
FSD FSD	FIRE SMOKE DAMPER & ACCESS DOOR
SD SD	SMOKE DAMPER
COD COD	CABLE OPERATED DAMPER
BD BD	BACK DRAFT DAMPER
BBD BBD	BAROMETRIC BACK DRAFT DAMPER
	VAV BOX
	TRANSFER GRILLE
	LOUVER
	ELECTRIC DUCT HEATER
	FLEX DUCT
	DUCT SOUND ATTENUATOR

MECHANICAL SYMBOLS

SYMBOLS	DESCRIPTION
	EXISTING WORK
	CONNECT NEW WORK TO EXISTING WORK
	EXISTING WORK TO BE DEMOLISHED/REMOVED
	NEW CONNECTION TO EXISTING
	CAP EXISTING TO REMAIN AT REMOVAL
	ACCESS DOOR
	CLEARANCE
SD	DUCT SMOKE DETECTOR
T	THERMOSTAT
TS	TEMPERATURE SENSOR
S	SWITCH
SP	STATIC PRESSURE SENSOR
FS	FREEZE STAT
RD	REFRIGERANT LEAK DETECTOR
LD	LEAK DETECTOR
C	CO2 SENSOR
H	HUMIDISTAT
BG	BREAK GLASS
CO	CARBON MONOXIDE SENSOR
N	NITROUS DIOXIDE SENSOR
	SUPPLY / DISCHARGE ARROW
	RETURN / INTAKE ARROW
	LOUVERED DOOR
	UNDERCUT DOOR
RISER #	RISER TAG (REFER TO ABBREVIATIONS)
EQUIPMENT TYPE / FLOOR DESIGNATION / SIZE — VAV-7-5 / (1,200)	MECHANICAL EQUIPMENT TAG INSTANCE (REFER TO SCHEDULES AND/OR ABBREVIATIONS)
EQUIPMENT TYPE / SIZE — VAV-8	MECHANICAL EQUIPMENT TAG TYPE (REFER TO SCHEDULES AND/OR ABBREVIATIONS)
SIZE / TAG — 24x24 CD / (500) CFM	GRD TAG (REFER TO SCHEDULES AND/OR ABBREVIATIONS)
ACTIVE PLENUM LENGTH / LINEAR DIFFUSER TAG — 4'-0" LD-A / (500) — 8'-0" TL TOTAL LENGTH	LINEAR DIFFUSER KEY

ABBREVIATIONS

AC	AIR CONDITIONING
ACC	AIR COOLED CONDENSER
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AL	ACOUSTIC LINING
BD	BACKDRAFT DAMPER
BBD	BAROMETRIC BACKDRAFT DAMPER
BG	BOTTOM GRILLE
BHP	BRAKE HORSEPOWER
BR	BOTTOM REGISTER
CAR	CONSTANT AIRFLOW REGULATOR
CD	CONDENSATE DRAIN
CFM	CUBIC FEET OF AIR PER MINUTE
CG	CEILING GRILLE
CHWS/R	CHILLED WATER SUPPLY AND RETURN
CO	CLEANOUT
COD	CABLE OPERATED DAMPER
COP	COEFFICIENT OF PERFORMANCE
CR	CEILING REGISTER
CT	COOLING TOWER
CTE	CONNECT TO EXISTING
CW	DOMESTIC COLD WATER MAKE-UP
CWS/R	CONDENSER WATER SUPPLY AND RETURN
DB	DRY BULB (TEMPERATURE)
DN	DOWN
DR	DRAIN
EAT	ENTERING AIR TEMPERATURE
EBH	ELECTRIC BASEBOARD HEATER
ESP	EXTERNAL STATIC PRESSURE
EUH	ELECTRIC UNIT HEATER
EWT	ENTERING WATER TEMPERATURE
FC	FLEXIBLE CONNECTION
FD	FIRE DAMPER
FLA	FULL LOAD AMPERES
FLR	FLOOR
FOF	FUEL OIL FILL
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOV	FUEL OIL VENT
FSD	COMBINATION FIRE/SMOKE DAMPER
FT	FEET
FTR	HOT WATER FINNED TUBE RADIATION
GA	GAUGE
GPM	GALLONS PER MINUTE
GS/R	GLYCOL SUPPLY AND RETURN
HPWLS/R	HEAT PUMP LOOP SUPPLY AND RETURN
HWS/R	HOT WATER SUPPLY AND RETURN
HZ	HERTZ

MECHANICAL PIPING SYMBOLS

SYMBOL	DESCRIPTION
	DIRECTION OF FLOW
	PITCH PIPE DOWN IN DIRECTION OF ARROW
	PIPE ANCHOR
	PIPE GUIDE
	PIPE EXPANSION JOINT
(3'-0"x6'-0")	EXPANSION LOOP (SIZE) 1ST DIMENSION IS OFFSET AND 2ND DIMENSION IS LENGTH
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	UNION
	ELBOW TURNED UP
	ELBOW TURNED DOWN
	BOTTOM PIPE CONNECTION
	TOP PIPE CONNECTION
	FLEXIBLE PIPE CONNECTION
	SHUTOFF / ISOLATION VALVE
	GLOBE VALVE
	BUTTERFLY VALVE
	BALL VALVE
	CHECK VALVE
	MOTORIZED CONTROL VALVE (3-WAY)
	MOTORIZED CONTROL VALVE (2-WAY)
	STRAINER
	PRESSURE REDUCING VALVE
	RELIEF VALVE
	ANGLE RELIEF VALVE
	THERMOMETER
	PRESSURE GAUGE WITH COCK
	AIR VENT
	PUMP
	CAPPED OUTLET
	HEAT TRACING
	PIPE RISER

ABBREVIATIONS

KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LD	LINEAR DIFFUSER
LRA	LOCKED ROTOR AMPS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
MCA	MINIMUM CIRCUIT AMPACITY
MD	MOTORIZED DAMPER
MFS	MAXIMUM FUSE SIZE
MHP	MOTOR HORSEPOWER
MIN	MINIMUM
MOCP	MAXIMUM OVERCURRENT PROTECTION
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OED	OPEN ENDED DUCT
PD	PRESSURE DROP
PH	PHASE
RG	RETURN GRILLE
RL	REFRIGERANT LIQUID PIPING
RLA	RUNNING LOAD AMPS
RR	RETURN REGISTER
RS	REFRIGERANT SUCTION PIPING
SEN	SENSIBLE
SPXF	SMOKE PURGE EXHAUST FAN
SR	SUPPLY REGISTER
TG	TOP GRILLE
TL	TOTAL LENGTH
TO	TRANSFER OPENING
TR	TOP REGISTER
TRXF	TRASH ROOM EXHAUST FAN
TSP	TOTAL STATIC PRESSURE
TX	TOILET EXHAUST
TYP	TYPICAL
UH	UNIT HEATER
UON	UNLESS OTHERWISE NOTED
V	VENT
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VRF	VARIABLE REFRIGERANT FLOW
VRV	VARIABLE REFRIGERANT VOLUME
WB	WET BULB (TEMPERATURE)
WC	WATER COLUMN
WCC	WATER COOLED CONDENSER
WMS	WIRE MESH SCREEN
WPD	WATER PRESSURE DROP

NOT FOR CONSTRUCTION

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NEW YORK CITY ENERGY CONSERVATION CODE

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FIT History Gallery Renovation

Project No. 2448

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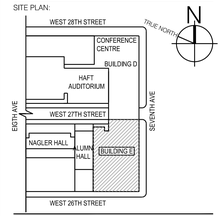
SITE PLAN:



SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
	DESIGN DEVELOPMENT	11.24.2025
	CD PROGRESS	03.10.2026
	BID SET	03.27.2026
	REVISED BID SET	04.13.2026
	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: ASB CHECKED BY: RME

SCALE: NTS

PROJECT#: 8969.110

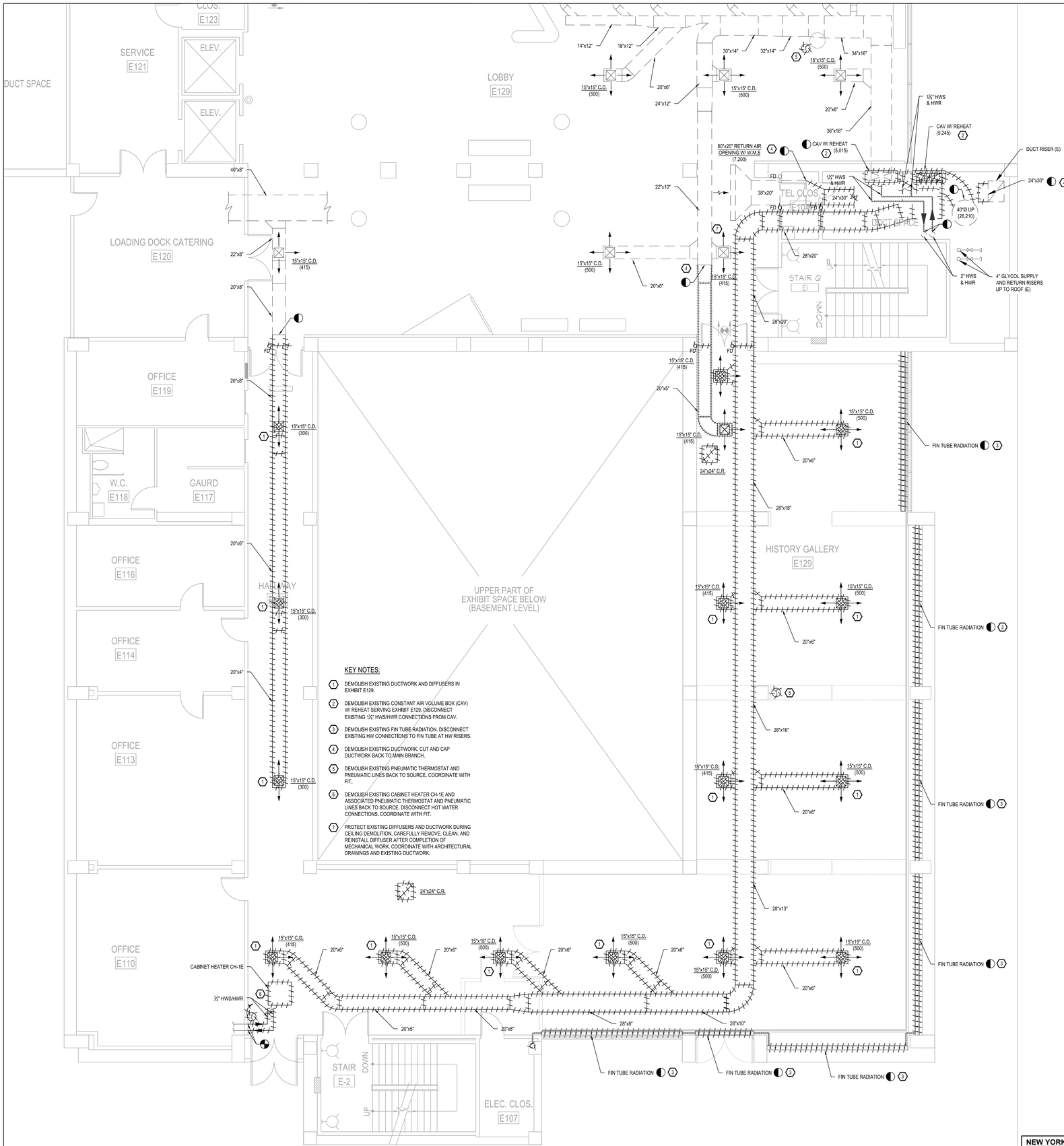
SHEET TITLE:

SYMBOL LIST, ABBREVIATIONS AND NOTES

SHEET NUMBER:

M-001.00

- OF -



KEY NOTES:

1. DEMOLISH EXISTING DUCTWORK AND DIFFUSERS IN EXHIBIT E129.
2. DEMOLISH EXISTING CONSTANT AIR VOLUME BOX (CAV) W/ REHEAT SERVING EXHIBIT E129. DISCONNECT EXISTING 1½" HWS/HWR CONNECTIONS FROM CAV.
3. DEMOLISH EXISTING FIN TUBE RADIATION. DISCONNECT EXISTING HW CONNECTIONS TO FIN TUBE AT HW RISERS.
4. DEMOLISH EXISTING DUCTWORK. CUT AND CAP DUCTWORK BACK TO MAIN BRANCH.
5. DEMOLISH EXISTING PNEUMATIC THERMOSTAT AND PNEUMATIC LINES BACK TO SOURCE. COORDINATE WITH FIT.
6. DEMOLISH EXISTING CABINET HEATER CH-1E AND ASSOCIATED PNEUMATIC THERMOSTAT AND PNEUMATIC LINES BACK TO SOURCE. DISCONNECT HOT WATER CONNECTIONS. COORDINATE WITH FIT.
7. PROTECT EXISTING DIFFUSERS AND DUCTWORK DURING CEILING DEMOLITION. CAREFULLY REMOVE, CLEAN, AND REINSTALL DIFFUSER AFTER COMPLETION OF MECHANICAL WORK. COORDINATE WITH ARCHITECTURAL DRAWINGS AND EXISTING DUCTWORK.

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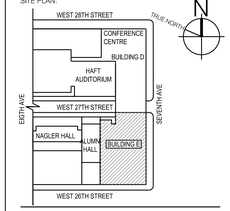

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SEAL & SIGNATURE:

DRAWN BY: ASB CHECKED BY: RME

SCALE: 3/16"=1'-0"

PROJECT#: 8969.110

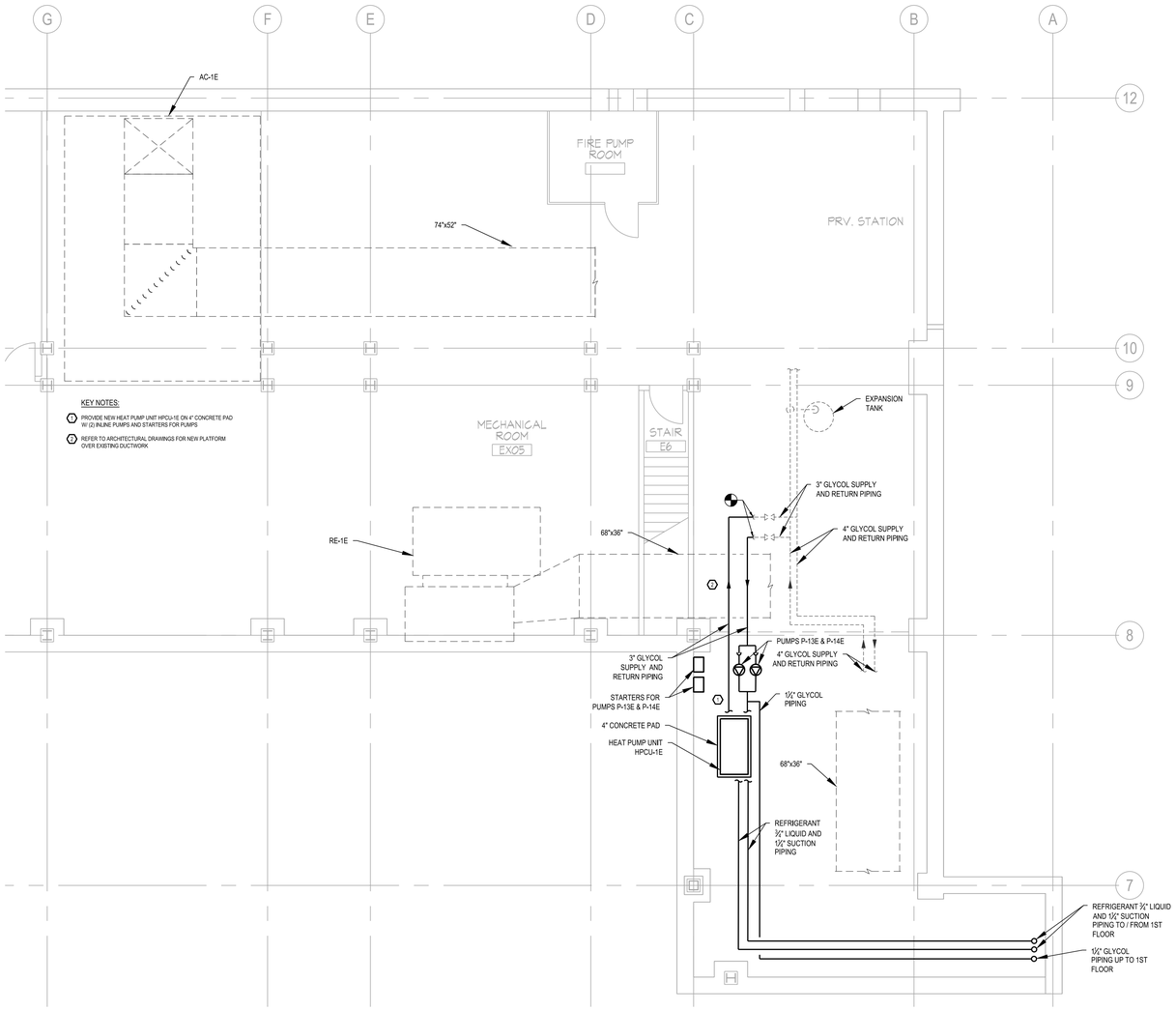
SHEET TITLE:

1ST FLOOR MECHANICAL DEMOLITION PLAN

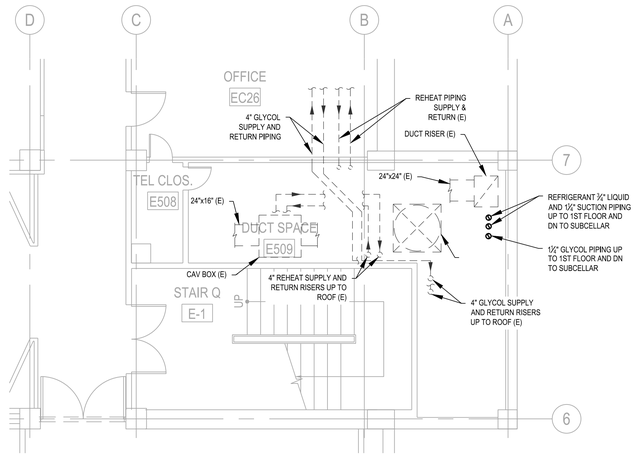
DOB NOW JOB#

SHEET NUMBER:

M-011.00



1 SUBCELLAR MECHANICAL PLAN
3/16"=1'-0"



2 CELLAR MECHANICAL PART PLAN
3/16"=1'-0"

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NEW YORK CITY ENERGY CONSERVATION CODE

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LIGHTING DESIGNER
JEFFREY NASH LIGHTING DESIGN
150 WEST 28TH STREET, SUITE 1603
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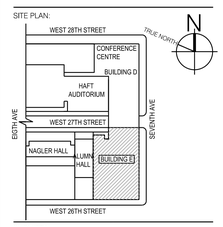
212.206.8356

SITE PLAN:



SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
	DESIGN DEVELOPMENT	11.24.2025
	CD PROGRESS	03.10.2026
	BID SET	03.27.2026
	REVISED BID SET	04.13.2026
	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: --
CHECKED BY: --

SCALE:
3/16"=1'-0"

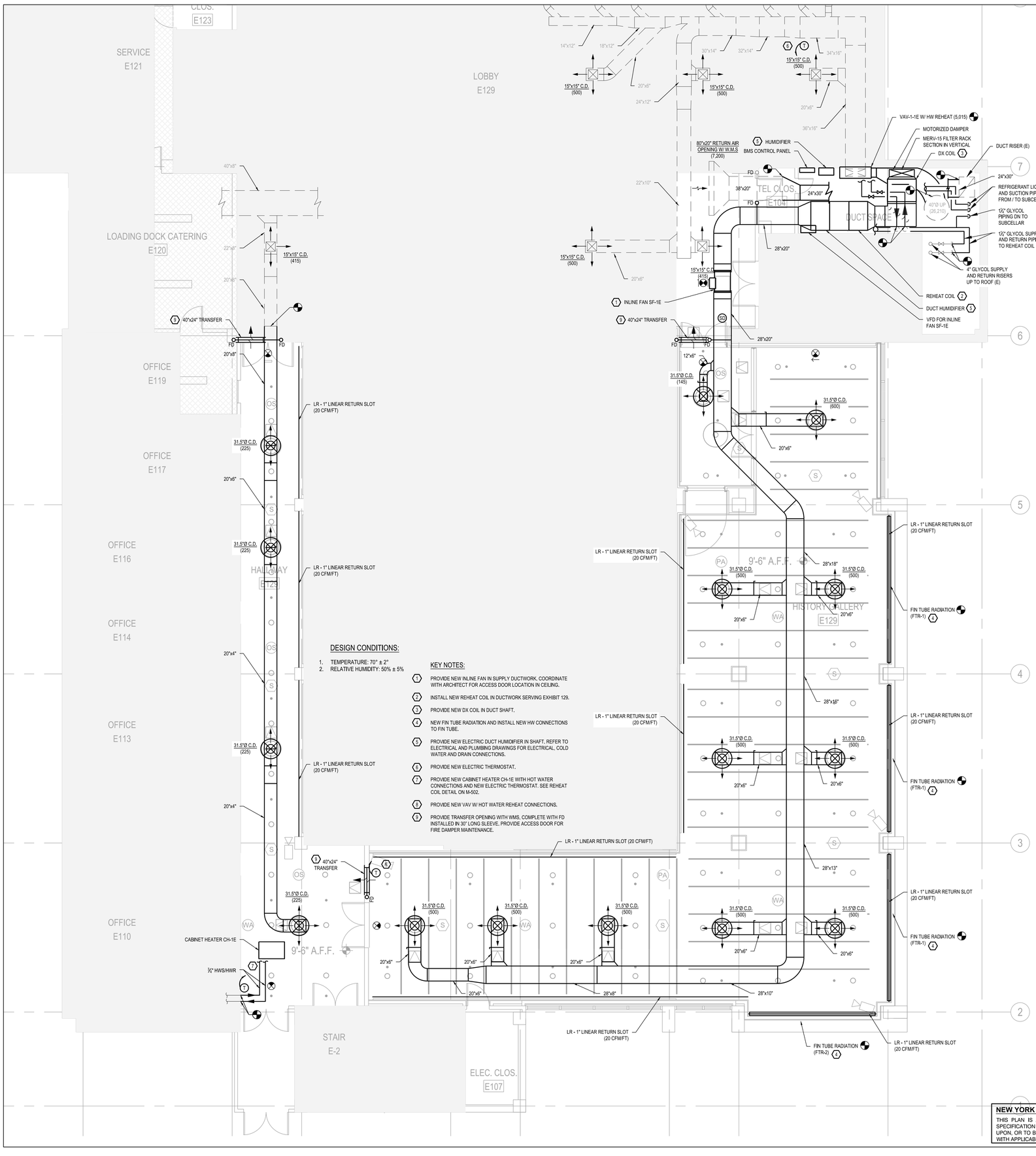
PROJECT#: 8969.110

SHEET TITLE:

SUBCELLAR AND CELLAR MECHANICAL PLANS

SHEET NUMBER:

M-100.00



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FIT History Gallery Renovation

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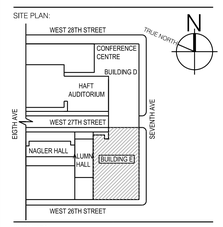

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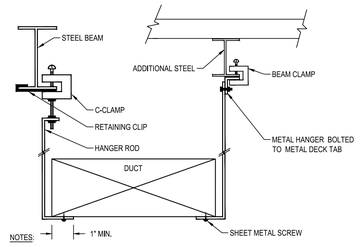
SHEET TITLE:

1ST FLOOR MECHANICAL PLAN

DOB NOW JOB#

SHEET NUMBER:

M-101.00



NOTES:

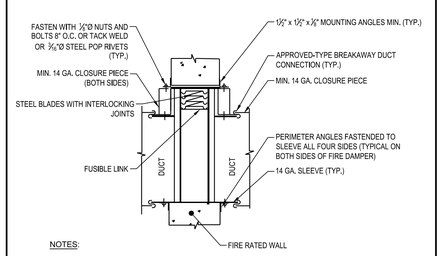
1. HANGERS SHALL BE OF METAL NOT LESS THAN $\frac{3}{16}$" FOR DUCTS 2 SQ.FT. & LESS, AND NOT LESS THAN $\frac{1}{4}$" FOR DUCTS LARGER THAN 2 SQ.FT.
2. WHERE CROSS-SECTIONAL AREA OF DUCT EXCEEDS 8 SQ.FT., HANGERS SHALL BE SPACED NOT MORE THAN 4 FT. ON CENTERS.
3. C-CLAMP FOR DUCTS UP TO 36" MAXIMUM DIMENSION.

DUCT SUPPORT ATTACHMENT TO STRUCTURE

DUCT SUPPORT SCHEDULE

HALF OF DUCT PERIMETER	PAIR AT 10 FT. SPACING		PAIR AT 8 FT. SPACING		PAIR AT 5 FT. SPACING		PAIR AT 4 FT. SPACING	
	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD	STRAP	WIRE/ ROD
30"	1" x 22 GA	10 GA (.135")	1" x 22 GA	10 GA (.135")	1" x 22 GA	12 GA (.135")	1" x 22 GA	12 GA (.135")
72"	1" x 18 GA	3/8"	1" x 20 GA	1/4"	1" x 22 GA	1/4"	1" x 22 GA	1/4"
96"	1" x 16 GA	3/8"	1" x 18 GA	3/8"	1" x 20 GA	3/8"	1" x 22 GA	1/4"
120"	10" x 16 GA	1/2"	1" x 16 GA	3/8"	1" x 18 GA	3/8"	1" x 20 GA	1/4"
168"	10" x 16 GA	1/2"	10" x 16 GA	1/2"	1" x 16 GA	3/8"	1" x 18 GA	3/8"
192"	-	1/2"	10" x 16 GA	1/2"	1" x 16 GA	3/8"	1" x 16 GA	3/8"

1 DUCT SUPPORT SCHEDULE
Not to Scale

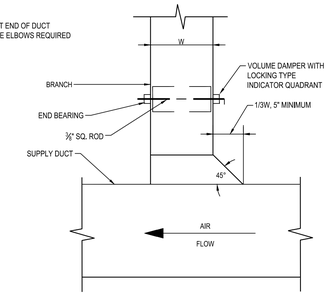


NOTES:

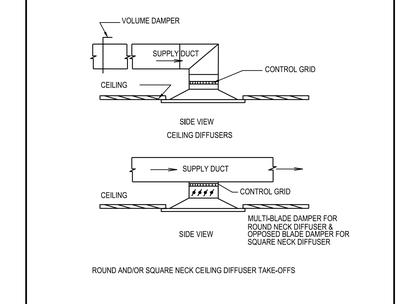
1. ACCESS DOORS FOR FIRE DAMPERS SHALL BE 12"x12" MIN. UNLESS NOTED OTHERWISE. FOR DUCTS SMALLER THAN 12", INCREASE DUCT WITH TRANSITION TO 12" IN ORDER TO ACCOMMODATE A 12"x12" ACCESS DOOR.
2. FIRE DAMPER INSTALLATION SHALL CONFORM WITH SMACNA & NFPA STANDARD.
3. DETAIL SHOWN IS FOR FIRE DAMPER IN HORIZONTAL DUCTWORK. FOR FIRE DAMPER IN VERTICAL DUCTWORK, DETAIL SHALL BE SIMILAR.
4. DAMPER BLADES SHALL BE OUT OF THE AIR STREAM.
5. INSTALLATION OF FIRE DAMPER MUST COMPLY WITH THE MANUFACTURER'S UL APPROVAL AND ASSOCIATED REQUIREMENTS.

(SEE FLOOR PLAN FOR REQUIREMENTS AND LOCATIONS)

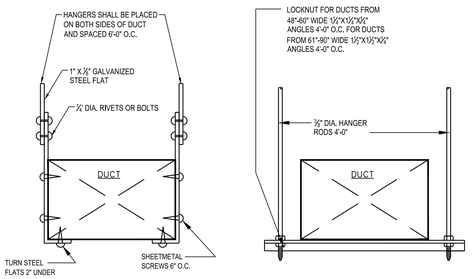
2 Fire Damper Detail
Not to Scale



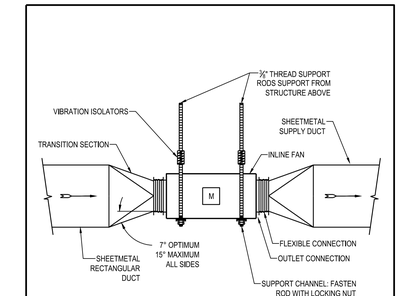
3 RECTANGULAR SUPPLY DUCT BRANCH THROAT CONNECTION
Not to Scale



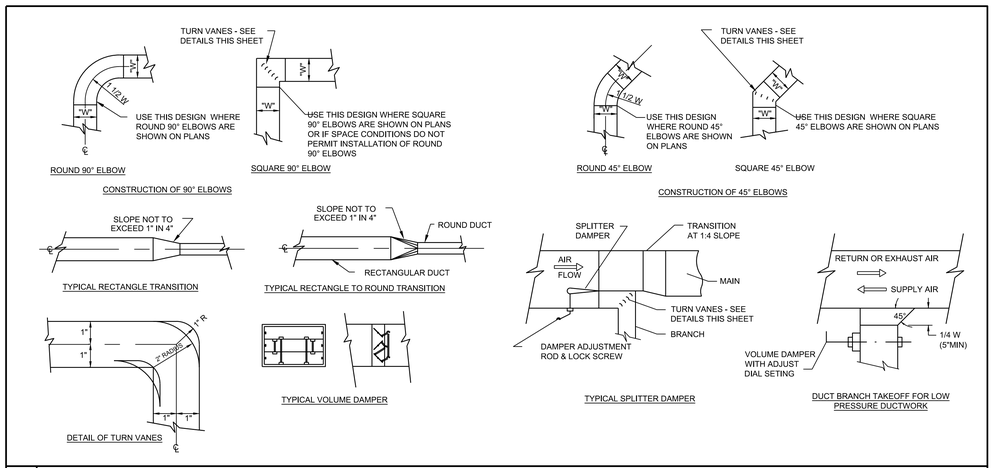
4 CEILING DIFFUSER TAKEOFF
Not to Scale



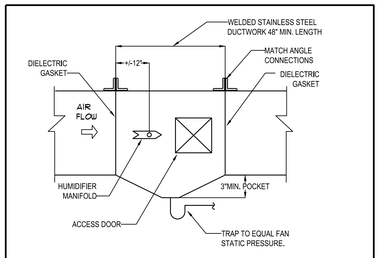
5 METHOD OF SUPPORTING DUCTS
Not to Scale



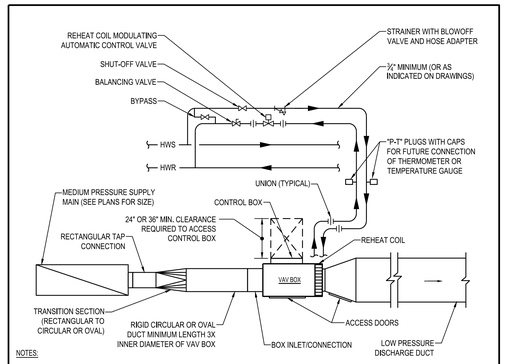
6 INLINE FAN DETAIL
Not to Scale



7 DUCTWORK DETAILS
Not to Scale



8 DETAIL OF DUCTWORK AT HUMIDIFIER
Not to Scale



NOTES:

1. THE OPERATION OF VARIABLE VOLUME TERMINAL UNITS ARE AFFECTED BY EXCESSIVE TURBULENCE OF THE ENTERING SIDE OF EACH TERMINAL UNIT. THEREFORE, TERMINAL UNITS MUST NOT BE INSTALLED TOO CLOSE TO MAIN DUCTS, ELBOWS AND FITTINGS.
2. WHEN MINIMUM UPSTREAM STRAIGHT DUCT CONNECTION TO TERMINALS AS INDICATED ABOVE CANNOT BE MAINTAINED, PROVIDE ORIFICE PLATE, STRAIGHTENING VANES OR OTHER DEVICE AS RECOMMENDED BY TERMINAL UNIT MANUFACTURER AND SUBMIT TO ENGINEER FOR REVIEW PRIOR TO INSTALLATION. ARRANGE ACCESS TO PERMIT EASY FIELD BALANCE AND MAINTENANCE OF TERMINAL UNIT.

9 VAV Box with Reheat Coil Detail
Not to Scale

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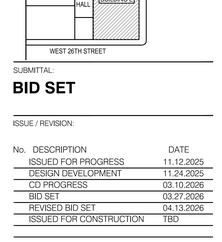

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SCALE: N.T.S

PROJECT #: 8969.110

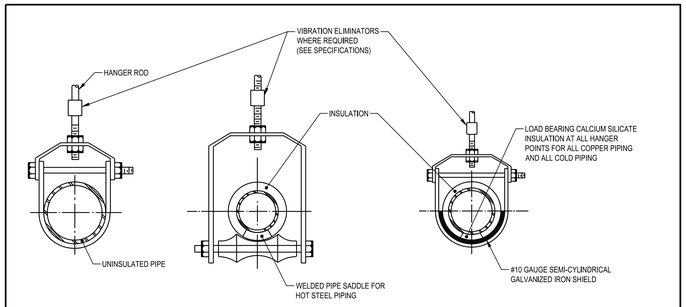
SHEET TITLE:

MECHANICAL DETAILS 1

DOB NOW JOB#

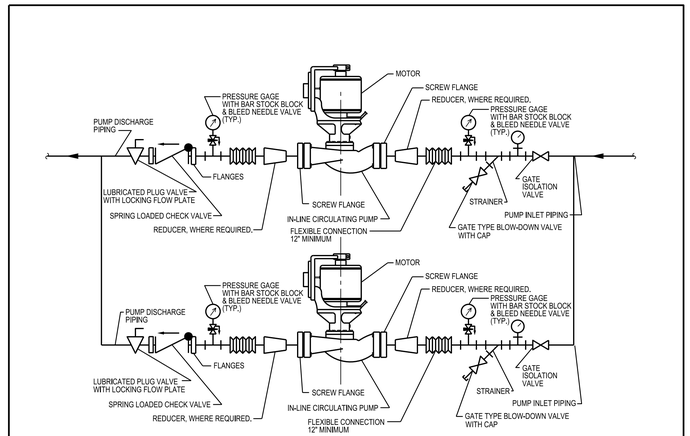
SHEET NUMBER:

M-501.00

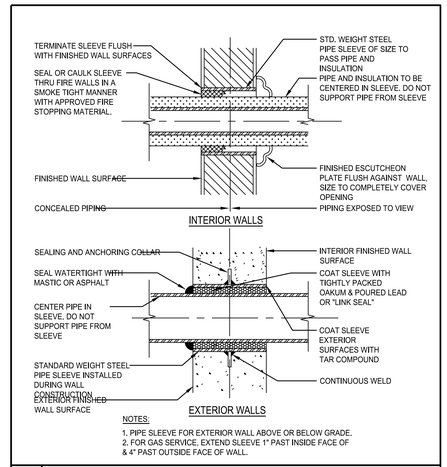


INDIVIDUAL PIPE HANGER ROD & SPACING SCHEDULE													
NOMINAL PIPE OR TUBE SIZE - INCHES	3/4	1	1 1/2	2	2 1/2	3	4	5	6	8	10	12
HANGER ROD SIZES -INCHES	3/8	3/8	3/8	3/8	1/2	1/2	5/8	5/8	7/8	7/8	7/8	7/8
MAXIMUM SPACING BETWEEN PIPE SUPPORT - FEET	6	7	9	10	11	12	14	16	17	19	22	23
MAX. SPACING BETWEEN COPPER, TUBE SUPPORTS - FEET	6	6	8	9	10	10	12	14	14	16	18	20

1 CLEVIS AND ROLLER HANGER DETAILS
Not to Scale

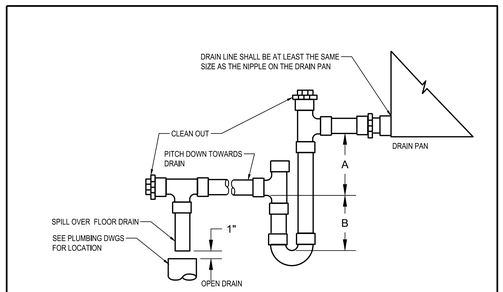


2 INLINE PUMP PIPING DETAIL
Not to Scale



NOTES:
1. PIPE SLEEVE FOR EXTERIOR WALL ABOVE OR BELOW GRADE.
2. FOR GAS SERVICE, EXTEND SLEEVE 1" PAST INSIDE FACE OF & 4" PAST OUTSIDE FACE OF WALL.

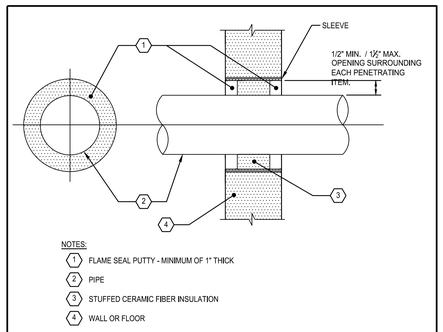
3 Pipe Sleeves Thru Walls
Not to Scale



UNT TYPE	A	B
DRAW THRU	X"	1.5X"
BLOW THRU	1" MIN.	2X"

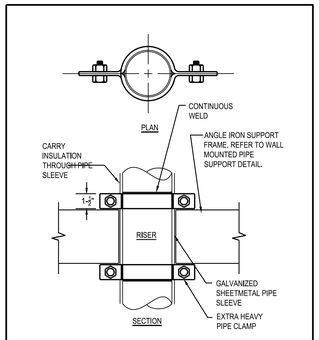
WHERE X=STATIC PRESSURE IN PAN

4 DX COOLING COIL DRAIN TRAP
Not to Scale



NOTES:
1. FLAME SEAL PUTTY - MINIMUM OF 1" THICK
2. PIPE
3. STUFFED CERAMIC FIBER INSULATION
4. WALL OR FLOOR

5 Fire Stopping for Fire/Smoke Rated Wall/Floor Openings
Not to Scale



6 Riser Anchor Detail
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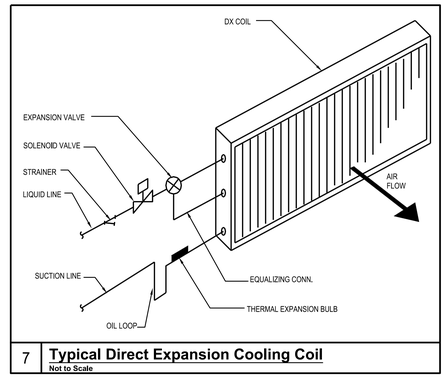
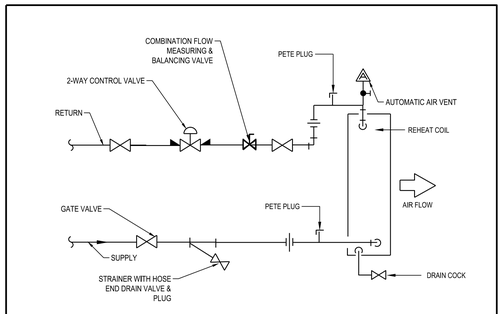
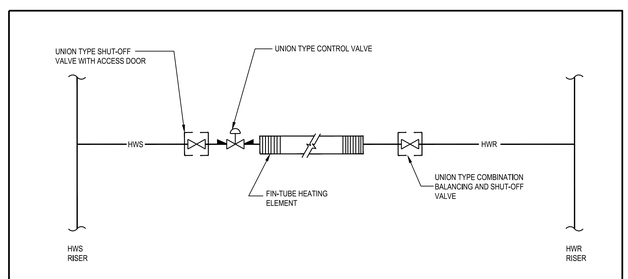


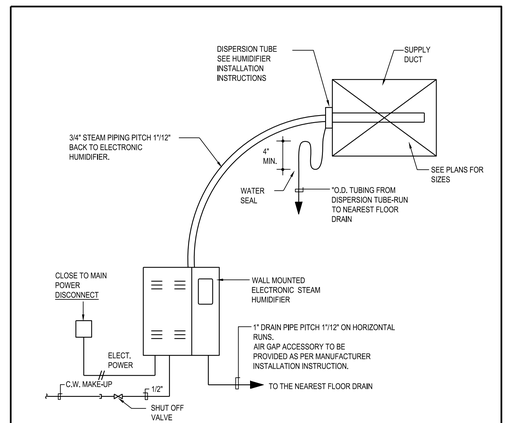
7 Typical Direct Expansion Cooling Coil
Not to Scale



8 REHEAT COIL PIPING DETAIL
Not to Scale



9 HOT WATER FIN TUBE RADIATION PIPING
Not to Scale



10 ELECTRIC HUMIDIFIER PIPING DETAIL
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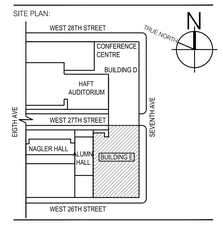

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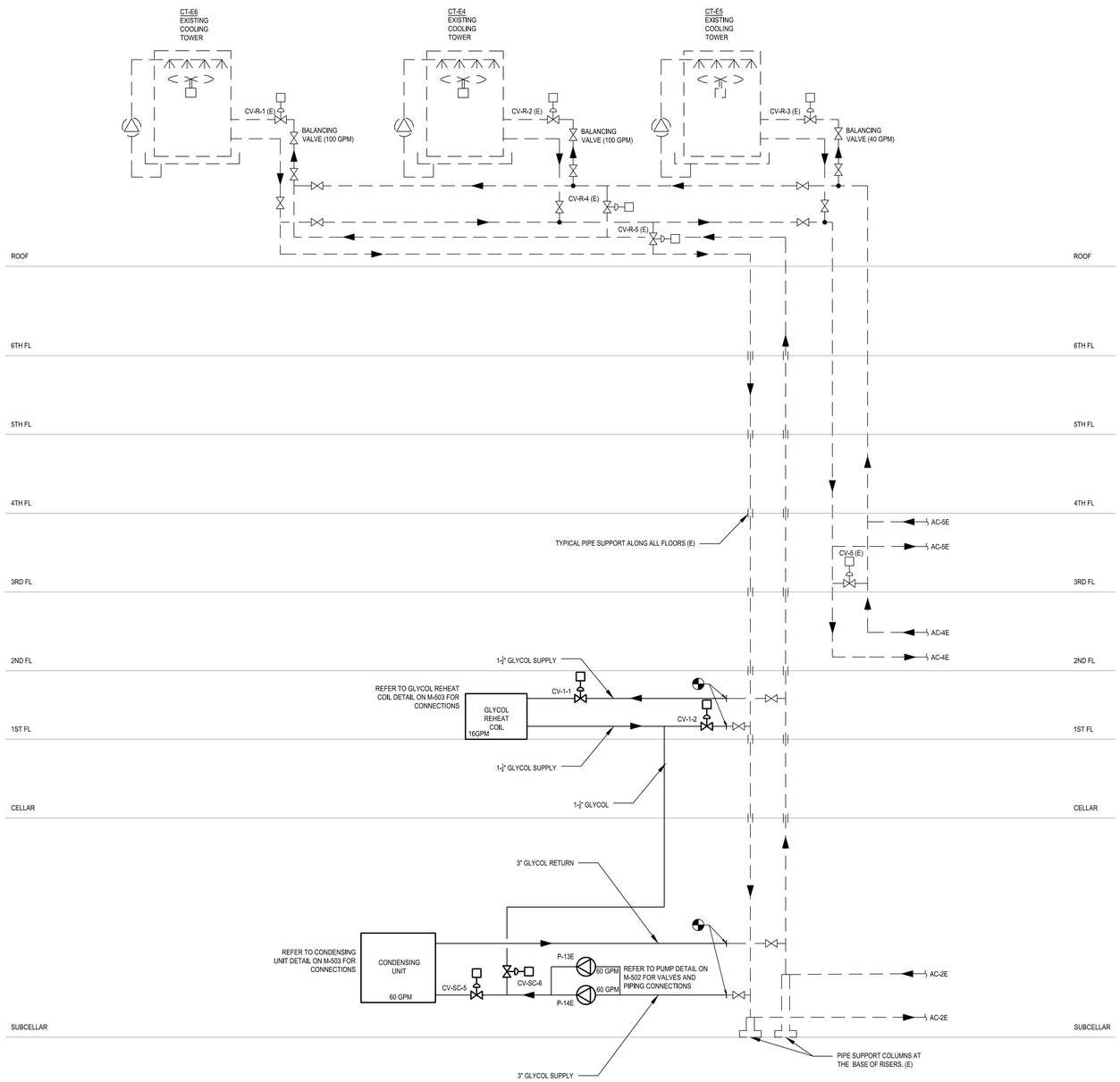
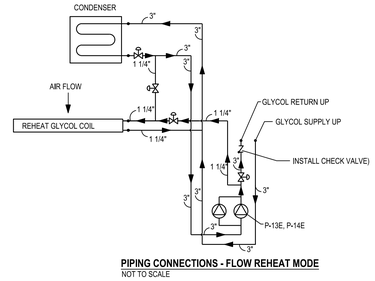
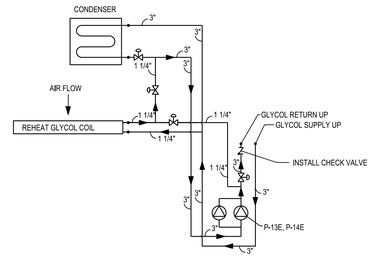


GLYCOL WATER PIPING DIAGRAM
NTS



PIPING CONNECTIONS - FLOW REHEAT MODE
NOT TO SCALE



PIPING CONNECTION FLOW ECONOMIZER MODE
NOT TO SCALE

NOT FOR CONSTRUCTION

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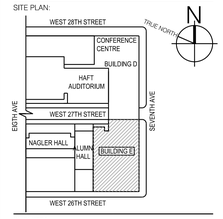

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SCALE: N.T.S

PROJECT#: 8969.110

SHEET TITLE:

GYLCOL WATER PIPING DIAGRAM

DOB NOW JOB#

SHEET NUMBER:

M-601.00

FAN SCHEDULE

BASIS OF DESIGN: "GREENHECK"

TAG	LOCATION	SERVICE	AIRFLOW CFM	EXTERNAL STATIC PRESSURE IN. WG	FAN RPM	TOTAL WEIGHT LBS	MOTOR DATA							SOUND INFORMATION				MODEL	TYPE	REMARKS
							BHP	HP	ELECTRICAL DATA			MOTOR RPM	ENCLOSURE	INLET dBA	INLET SONES	OUTLET dBA	OUTLET SONES			
									VOLTAGE	FREQUECY	PHASE									
SF-1E	1ST FLOOR	MUSEUM 1ST FLOOR GALLERY	5500	2.7	1822	409	3.6	5	208	60	3	1725	ODP	70	17	73	22	QEI-18	MIXED FLOW BELT DRIVE	

NOTES:
1. INCLUDE VIBRATION ISOLATORS.
2. PROVIDE DISCONNECT SWITCHES.
3. PROVIDE MOTOR WITH CLASS F OR GREATER INSULATION
4. PROVIDE VFD RATED MOTOR AND NEMA PREMIUM EFFICIENT MOTOR
5. PROVIDE THRUST RESTRAINTS
6. PROVIDE AIR FLOW STATION WITH ELECTRONICS

LINEAR DIFFUSER SCHEDULE

BASIS OF DESIGN: "KRUEGER"

TAG	AIRFLOW CFM PER LF	NUMBER OF SLOTS	SLOT WIDTH INCHES	NC LEVEL	MODEL	REMARKS
LR	25	1	1	<10	DFL	

NOTES:
1. PROVIDE PATTERN CONTROLLER FOR EASY ADJUSTMENT OF HORIZONTAL OR VERTICAL DISCHARGE FOR SUPPLY DIFFUSERS.
2. CONTINUOUS RUN WITH ACTIVE AND INACTIVE SECTIONS (RETURN), PROVIDE BLANK-OFF PLATES AND END CAPS AS REQUIRED.
3. MECHANICAL CONTRACTOR TO COORDINATE BORDER TYPES WITH CEILING CONSTRUCTION.
4. FOR EXACT LOCATIONS OF CEILING AIR OUTLETS, SEE ARCHITECTURAL REFLECTED CEILING PLANS. COORDINATION IS REQUIRED.
5. PROVIDE CABLE OPERATED DAMPERS ROOM SIDE ACCESS FOR INACCESSIBLE AREAS.
6. COLOR SELECTION: BLACK. COORDINATE WITH ARCHITECT FOR FINISH AND COLOR SELECTION

VARIABLE FREQUENCEY DRIVE SCHEDULE

BASIS OF DESIGN: "YASKAWA"

TAG	LOCATION	SERVICE	ELECTRICAL DATA			MOTOR		VFD		UNIT DIMENSIONS				MOUNTING LOCATION	INTEGRAL DISCONNECT (CIRCUIT BREAKER TYPE)	ENCLOSURE (NEMA TYPE)	BYPASS	BMS INTERFACE (VFD AND BYPASS)	MANUF. MODEL #	REMARKS
			VOLTS	PHASE	HZ	QUANTITY	HP	QUANTITY	MINIMUM VFD OUTPUT (AMPS)	HEIGHT (IN.)	WIDTH (IN.)	DEPTH (IN.)	WEIGHT (LBS.)							
VFD-SF-1E	1ST FLOOR DUCT SHAFT	SF-1E	208	3	60	1	5	1	16.7	49.7	7.7	14	79.1	WALL	YES	12R	YES	BACNET	H6BND016	

NOTES:
1. VFD SHALL HAVE AT LEAST THE SCHEDULED MINIMUM OUTPUT AMPS. A HIGHER HP/AMPERAGE RATING SHALL BE USED IF REQUIRED TO MEET THE OPERATING MOTOR AMPERAGE. REFER TO APPROVED EQUIPMENT SUBMITTALS FOR FINAL AMPERAGE REQUIREMENT.
2.WHERE A BYPASS IS REQUIRED PER THE SCHEDULE, IT SHALL BE A 2 CONTACTOR TYPE WITH SERVICE SWITCH.
3.DRIVES SHALL INCLUDE ALL OPTIONS AND BE UL LABELED AS A COMPLETE ASSEMBLY,3.DRIVES SHALL INCLUDE ALL OPTIONS AND BE UL LABELED AS A COMPLETE ASSEMBLY,
4. ALL DRIVES SHALL BE THE SAME MANUFACTURER AND MODEL AND SHALL BE PROVIDED BY A SINGLE ENTITY. COORDINATE SHIPPING AND INSTALLATION WITH EQUIPMENT MANUFACTURERS WHERE FACTORY MOUNTING IS REQUIRED.
5. START-UP SHALL BE PROVIDED IN THE FIELD FOR EACH DRIVE BY A MANUFACTURER TRAINED AND AUTHORIZED SERVICE PROVIDER.
6. CIRCUIT BREAKER 100 KAIC

DX COIL SCHEDULE

BASIS OF DESIGN: "DIRECT COIL"

TAG	LOCATION	SERVICE	CFM	FACE VELOCITY (FPM)	COOLING CAPACITY (MBH)	COOLING AIR ENTERING TEMP. DB (°F)	COOLING AIR LEAVING TEMP. (°F)	COOLING AIR PRESSURE DROP (IN)	HEATING CAPACITY (MBH)	HEATING AIR ENTERING TEMP. DB (°F)	HEATING AIR LEAVING TEMP. DB (°F)	HEATING AIR PRESSURE DROP (IN)	CONSTRUCTION			MODEL	REMARKS
													# OF ROWS	FINS PER INCH	FIN MATERIAL		
DX-1E	1ST FLOOR DUCT SHAFT	MUSEUM 1ST FLOOR GALLERY	5500	516	188	64	50	0.37	214	60	96	0.17	4	10	COPPER	3DX-04-32,0-10-48,0-16	

NOTES:
1. PROVIDE CONDENSATE DRAIN TRAP WITH OVERFLOW SHUTOFF SWITCH WIRED TO SHUT DOWN THE SF-1 UPON ACTIVATION AND WIRE HARNESS FOR CONNECTION TO AN ALARM DEVICE.
2. TIE INTO EXISTING DISTECH CONTROLS SYSTEMS.
3. PROVIDE R-454B REFRIGERANT.
4. UNIT SHOULD BE PROVIDED AS A HEAT PUMP.

40% PROPLYENE GYLCOL WATER COOLED HEAT PUMP UNIT SCHEDULE

BASIS OF DESIGN: "COOLBREEZE"

TAG	LOCATION	SERVICE	TOTAL CAPACITY (TONS)	COMPRESSOR			CONDENSER				REFRIGERANT	ELECTRICAL DATA	WEIGHT (LBS)	DIMENSION LXWXH (IN)	MODEL	REMARKS
				QUANTITY	NUMBER OF CIRCUITS	TYPE	QUANTITY	CONDENSING EFT / LFT (°F)	FLOW RATE (GPM)	PRESSURE DROP (PSI)		V/PH/HZ				
HPCU-1E	SUB-CELLAR MECHANICAL ROOM	DX-1E	21	2	2	SCROLL	2	95 / 103	31.5	9.9	R454B	208/3/60	1200	60X30X30	CUSTOM	

NOTES:
1. UNIT SHALL BE PROVIDED WITH SUCTION SERVICE VALVES, LOW AMBIENT DAMPER KIT, AND UNIT NON-FUSED DISCONNECT SWITCH.
2. TIE INTO EXISTING SIEMENS CONTROLS AND JOHNSON CONTROLS SYSTEMS.
3. PROVIDE R-454B REFRIGERANT.

NOT FOR CONSTRUCTION

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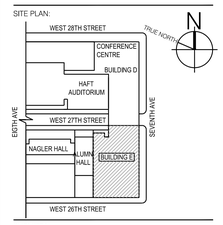

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MECHANICAL SCHEDULES 1

DOB NOW JOB#

SHEET NUMBER:

M-701.00

40% GLYCOL REHEAT COIL SCHEDULE

BASIS OF DESIGN: "COOLBREEZE"

GENERAL			AIRSIDE					WATER SIDE						CONSTRUCTION							REMARKS
TAG	LOCATION	SERVICE	AIRFLOW	VELOCITY	APD	EAT	LAT	EWT	LWT	FLUID FLOW	WPD	FLUID TYPE	TOTAL CAPACITY (MBH)	# OF ROWS	FINS PER INCH	FIN MATERIAL	TUBE MATERIAL	FIN DIMENSIONS (IN)		MODEL	
			CFM	FPM	IN W.C	DB TEMP °F	DB TEMP °F	TEMP °F	TEMP °F	GPM	FT							LENGTH	HEIGHT		
RHC-1	1ST FLOOR DUCT SHAFT	MUSEUM 1ST FLOOR GALLERY	5500	574	0.25	51	69.25	95	80	15.76	6.72	40% PG	109.41	2	14	ALUMINUM	COPPER	46	30	5W-02-30.0-14-46.0-S	

NOTES:

CABINET UNIT HEATER SCHEDULE

BASIS OF DESIGN: "ZEHNDER RITTLING"

TAG	QUANTITY OF UNITS	LOCATION / SERVICE	TYPE	ELECTRICAL DATA	AIRSIDE			WATER SIDE						# OF ROWS	MODEL	REMARKS
				V/PH/HZ	AIRFLOW (CFM)	EAT (°F)	LAT (°F)	EWT (°F)	LWT (°F)	FLUID FLOW (GPM)	WPD (FT)	FLUID TYPE	TOTAL CAPACITY (MBH)			
CH-1E	1	E129	CEILING RECESSED	120/1/60	810	70	113.9	180	160	3.9	0.3	HOT WATER	38.5	1	RC/W-420-08	

NOTES:
1. INSTALL UNITS AS PER MANUFACTURER'S INSTRUCTIONS.
2. PROVIDE SINGLE POLE THERMOSTATS, FUSED DISCONNECT SWITCHES, MOTOR FUSING.

ELECTRIC HUMIDIFER SCHEDULE

BASIS OF DESIGN: "NEPTRONIC"

TAG	LOCATION	SYSTEM	TOTAL AIR FLOW CFM	ENTERING AIR		ROOM CONDITIONS		TUBE QUANTITY	MAX. ABSORPTION DISTANCE IN.	ELECTRICAL DATA			MODEL	REMARKS
				EAT. °F / RH	LAT. °F / RH	DB TEMP. °F	RH %			V/PH/HZ	CAPACITY LBS/HR	POWER (kW)		
H-1E	1ST FLOOR DUCT SHAFT	SF-1E	5500	55 / 60	55 / 82%	70	50	2	30"	208/3/60	90	30	SKE4-N30M-208-3X	

NOTES:
1. CONTINUOUSLY CONTROL OF THE HUMIDITY
2. HI HUMIDITY SENSOR TO BE INSTALLED ON THE DUCT BY THE CONTRACTOR
3. NO FLOW AIR PRESSURE DIFFERENTIAL SENSOR TO BE MOUNTED BY THE CONTRACTOR
4. BACNET MODULE TO CONNECT TO THE BMS FOR CONTROL
5. SEE SPECIFICATIONS

DIFFUSER, GRILLE & REGISTER SCHEDULE

APPLICATION	MFR	MODEL	NECK SIZE	CFM	REMARKS
SUPPLY	TITUS	ROMNI	10" Ø	225	31.5"Ø FACE
SUPPLY	TITUS	ROMNI	14" Ø	400-500	31.5"Ø FACE

NOTES:
1. MECHANICAL CONTRACTOR TO BALANCE DIFFUSERS WITH VOLUME DAMPERS.
2. MECHANICAL CONTRACTOR TO COORDINATE BORDER TYPES WITH CEILING CONSTRUCTION.
3. FOR EXACT LOCATIONS OF CEILING AIR OUTLETS, SEE ARCHITECTURAL REFLECTED CEILING PLANS. COORDINATION IS REQUIRED.
4. PROVIDE CABLE OPERATED DAMPERS ROOM SIDE ACCESS FOR INACCESSIBLE AREAS.
5. COLOR SELECTION: BLACK. COORDINATE WITH ARCHITECT FOR FINISH AND COLOR SELECTION

FIN TUBE RADIATOR SCHEDULE

BASIS OF DESIGN: "ZEHNDER RITTLING"

TAG	QUANTITY	ROWS OF ELEMENT	TOTAL CAPACITY (MBH)	FLUID FLOW (GPM)	ENTERING WATER TEMPERATURE (°F)	LEAVING WATER TEMPERATURE (°F)	TUBE DATA		FIN DATA			ENCLOSURE			LENGTH OF SECTION (FT.)
							DIAMETER (IN.)	MATERIAL	NUMBER OF FINS/LINEAR FEET	FIN SIZE (IN.X IN.)	MATERIAL	MODEL	DEPTH (IN)	HEIGHT (IN)	
FTR-1	3	1	13	1.3	180	160	½"	COPPER	48	3-¼" x 3-¼"	ALUMINUM	BG	3-³/₁₆"	8"	19
FTR-2	1	1	10.9	1.1	180	160	½"	COPPER	48	4-¼" x 4-¼"	ALUMINUM	BG	5-¼"	14"	6

NOTES:
1. SUBJECT TO ENCLOSURE DETAILED BY ARCHITECT. COORDINATE WITH ARCHITECT FOR COLOR AND FINISH SELECTION.
2. CONTRACTOR TO CONTACT MANUFACTURER FOR ACTUAL EXPECTED OUTPUT RATING FOR SELECTION OF ELEMENT LENGTH, BUT IN NO CASE TO BE DERATED BY 20% OF INDICATED BARE ELEMENT RATING.
3. CONTRACTOR TO PROVIDE ELEMENT AND PIPING SUPPORT AND MOUNTING BRACKETS, SUITED TO THE CONDITION
4. PROVIDE CONTROL VALVE FOR EACH FIN TUBE SECTION AND CONNECT TO BMS.
5. PROVIDE BLANK SECTIONS AS INDICATED ON THE MECHANICAL AND ARCHITECTURAL DRAWINGS.

PUMP SCHEDULE

BASIS OF DESIGN: "BELL AND GOSSETT"

TAG	LOCATION	TYPE	CIRCULATING FLUID				ELECTRICAL MOTOR				OPERATING WEIGHT LBS	MODEL	REMARKS
			FLUID	FLOW GPM	HEAD FT	NPSH REQUIRED	BHP	HP	V/PH/HZ	RPM			
P-13E	SUBCELLAR	SMALL CLOSE COUPLED INLINE CENTRIFUGAL PUMP	40% PG	60	85	20.8	2.4	3	208/1/60	3600	65	E-60 1AAB	
P-14E	SUBCELLAR	SMALL CLOSE COUPLED INLINE CENTRIFUGAL PUMP	40% PG	60	85	20.8	2.4	3	208/1/60	3600	65	E-60 1AAB	

NOTES:
1. ALL PUMP MOTORS SHALL BE NON-OVERLOADING DESIGN.
2. INSTALLATION SHALL BE IN STRICT ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS.
3. EACH SYSTEM SHALL OPERATE WITH ONE PUMP AS ACTIVE AND THE OTHER PUMP AS STANDBY.
4. PROVIDE STARTER WITH BACNET FOR EACH PUMP. STARTER BASIS OF DESIGN MANUFACTURER AS "FRANKLIN".

SINGLE DUCT TERMINAL UNIT SCHEDULE

BASIS OF DESIGN: "TITUS"

TAG	LOCATION	SERVING	INLET SIZE INCH	DESIGN AIR FLOW, CFM		HOT WATER REHEAT COILS						MODEL	REMARKS
				MAX	MIN	MBH	GPM	CFM	EWT	APD	WPD		
VAV-1-1E	DUCT SPACE	1ST FLOOR LOBBY	24x16	5600	2800	240	12	5600	180	1.07	3.92	DESV	

NOTES:
1. ELECTRICAL SUPPLY: 115/1/60.
2. PROVIDE CONTROL TRANSFORMERS AND ENCLOSURES.
3. PROVIDE DISCONNECT SWITCHES.
4. ACTUATORS AND DDC CONTROLS TO BE SUPPLIED BY ATC CONTRACTOR, INSTALLED BY MANUFACTURER.
5. PROVIDE STERILOC LINERS.
6. CONTRACTOR TO COORDINATE LEFT OR RIGHT HAND CONTROL LOCATIONS AND COIL CONNECTIONS.
7. PROVIDE MANUFACTURER RECOMMENDED CLEARANCE AROUND CONTROL BOX PER NEC REQUIREMENTS.
8. INLET SIZES ARE NOMINAL. REFERENCE CATALOG FOR EXACT INLET DIMENSIONS.
9. PROVIDE FIVE-YEAR WARRANTY FOR BOTH LABOR AND MATERIALS.
10. PROVIDE AEROCROSS AIR FLOW MEASURING SENSOR

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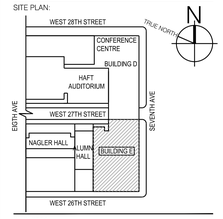

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MECHANICAL SCHEDULES 2

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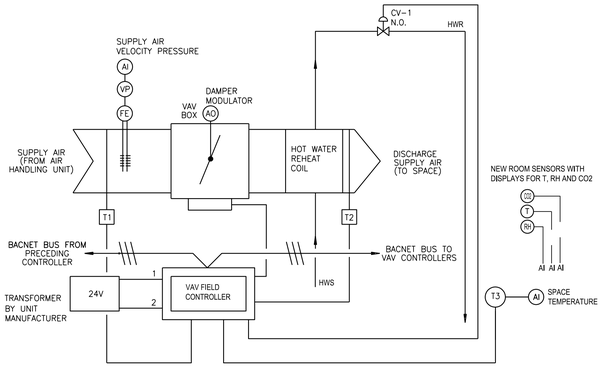
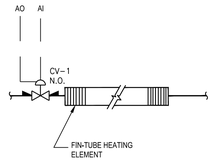
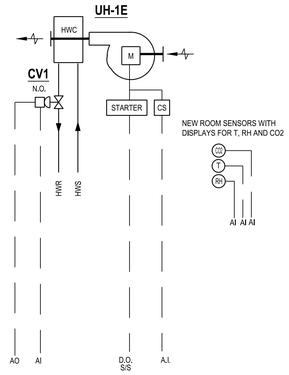


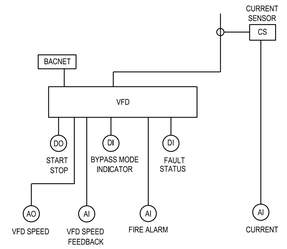
VAV BOX WITH HOT WATER REHEAT COIL
CONTROL DIAGRAM



FIN TUBE CONTROL DIAGRAM



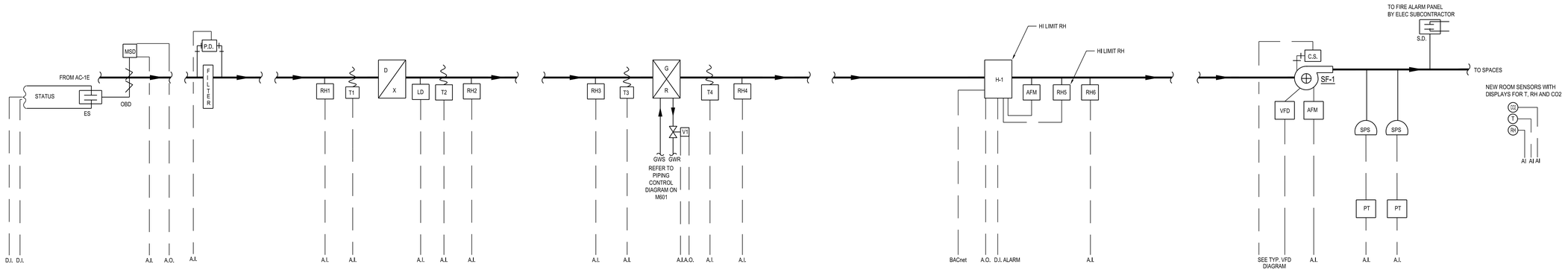
UNIT HEATER CONTROL DIAGRAM



VFD TYPICAL
CONTROL DIAGRAM

VFD MINIMUM REQUIREMENT FOR BMS VARIABLES.

1. PROVIDE THE FOLLOWING VARIABLES FROM THE VFD TO THE BACNET NETWORK:
   - 1.1. PHASE VOLTAGE
   - 1.2. PHASE AMPS
   - 1.3. OUTPUT FREQUENCY
   - 1.4. INPUT POWER KVA
   - 1.5. OUTPUT POWER KVA
   - 1.6. BYPASS STATUS
   - 1.7. ALARM STATUS
   - 1.8. ALARM CODE
   - 1.9. INPUT VOLTAGE
   - 1.10. OUTPUT VOLTAGE



CONTROL DIAGRAM FOR MUSEUM 1ST FLOOR GALLERY SUPPLEMENTAL SYSTEM

LEGEND

- DX COOLING COIL
- GLYCOL REHEAT COIL
- PT — PRESSURE TRANSDUCER
- VFD — VARIABLE FREQUENCY DRIVE
- SPS — STATIC PRESSURE SENSOR
- P.D. — PRESSURE DIFFERENTIAL SENSOR (AIR)
- C.S. — CURRENT SENSOR
- M — MOTOR/ACTUATOR
- AFM — AIR FLOW MEASUREMENT STATION
- T — TEMPERATURE SENSOR
- H — HUMIDITY SENSOR
- CO2 — CARBON DIOXIDE SENSOR
- V — CONTROL VALVE
- S.D. — SMOKE DETECTOR
- E.S. — END SWITCH
- LD — LEAK DETECTOR
- ELECTRIC LINE
- FIRE/SMOKE DAMPER
- FAN

DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
AI	ANALOG INPUT
AO	ANALOG OUTPUT
S/S	START/STOP
OBD	OPPOSED BLADE DAMPER
PBD	PARALLEL BLADE DAMPER
LPS	LOW PRESSURE STEAM
LPC	LOW PRESSURE CONDENSATE
ES	CARBON DIOXIDE SENSOR
AFM	AIR FLOW MEASURING STATION
CC	COOLING COIL
TT	TEMPERATURE TRANSMITTER
SD	SMOKE DETECTOR

H	HUMIDITY TRANSMITTER
CV	CONTROL VALVE
PD	PRESSURE DIFFERENTIAL SENSOR
SP	STATIC PRESSURE SENSOR
VFD	VARIABLE FREQUENCY DRIVE
VP	VELOCITY PRESSURE
GWS	GLYCOL WATER SUPPLY
GWR	GLYCOL WATER RETURN
MSD	MOTORIZED DAMPER

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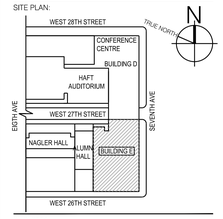

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	REVISED BID SET	04.13.2026
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SCALE: N.T.S

PROJECT#: 8969.110

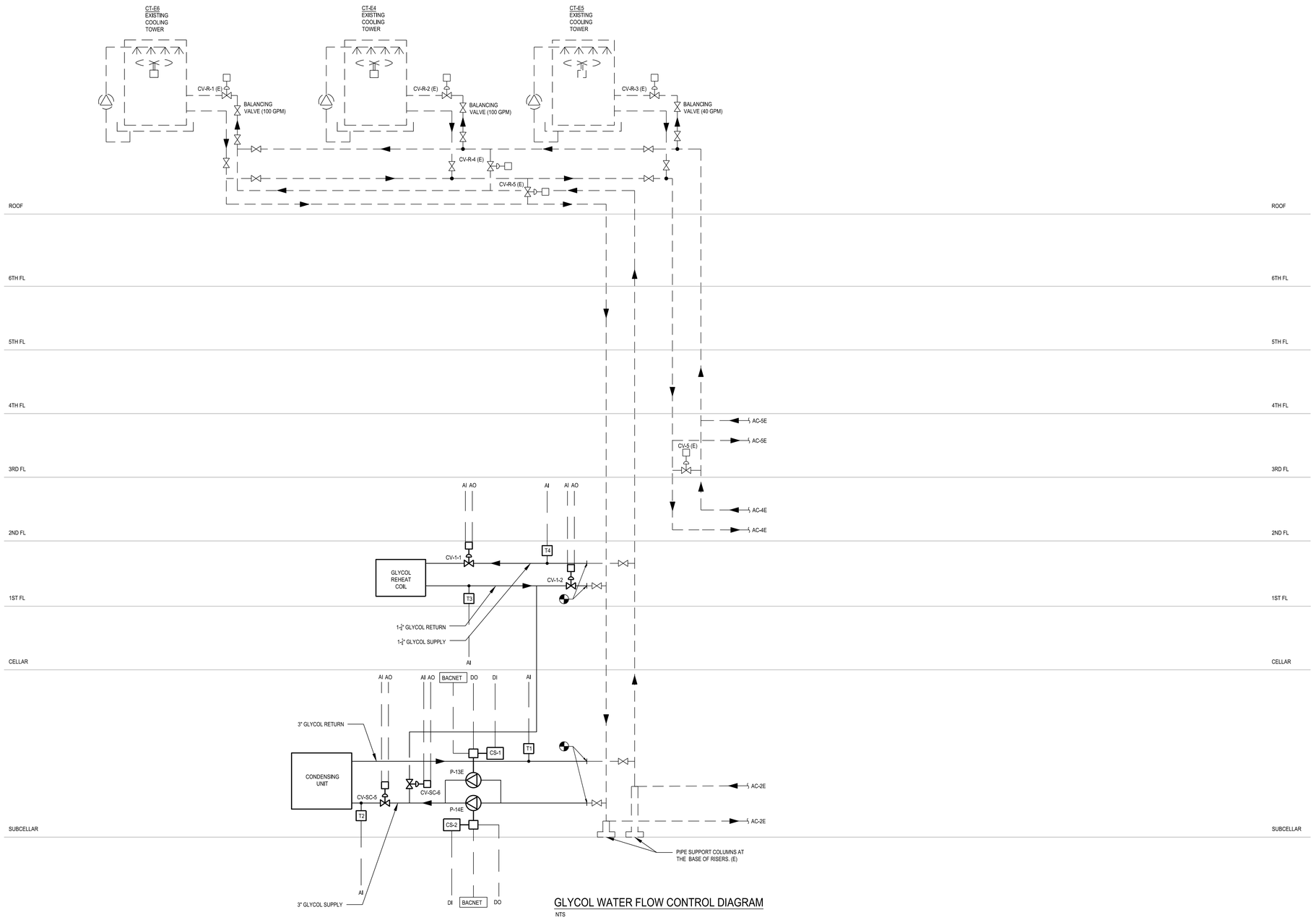
SHEET TITLE:

MECHANICAL
CONTROL
DIAGRAMS

DOB NOW JOB#

SHEET NUMBER:

M-801.00



GLYCOL WATER FLOW CONTROL DIAGRAM

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FIT History Gallery Renovation

Project No. 2448

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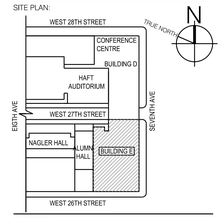
SITE PLAN:



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SCALE: N.T.S

PROJECT #: 8969.110

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DOB NOW JOB#

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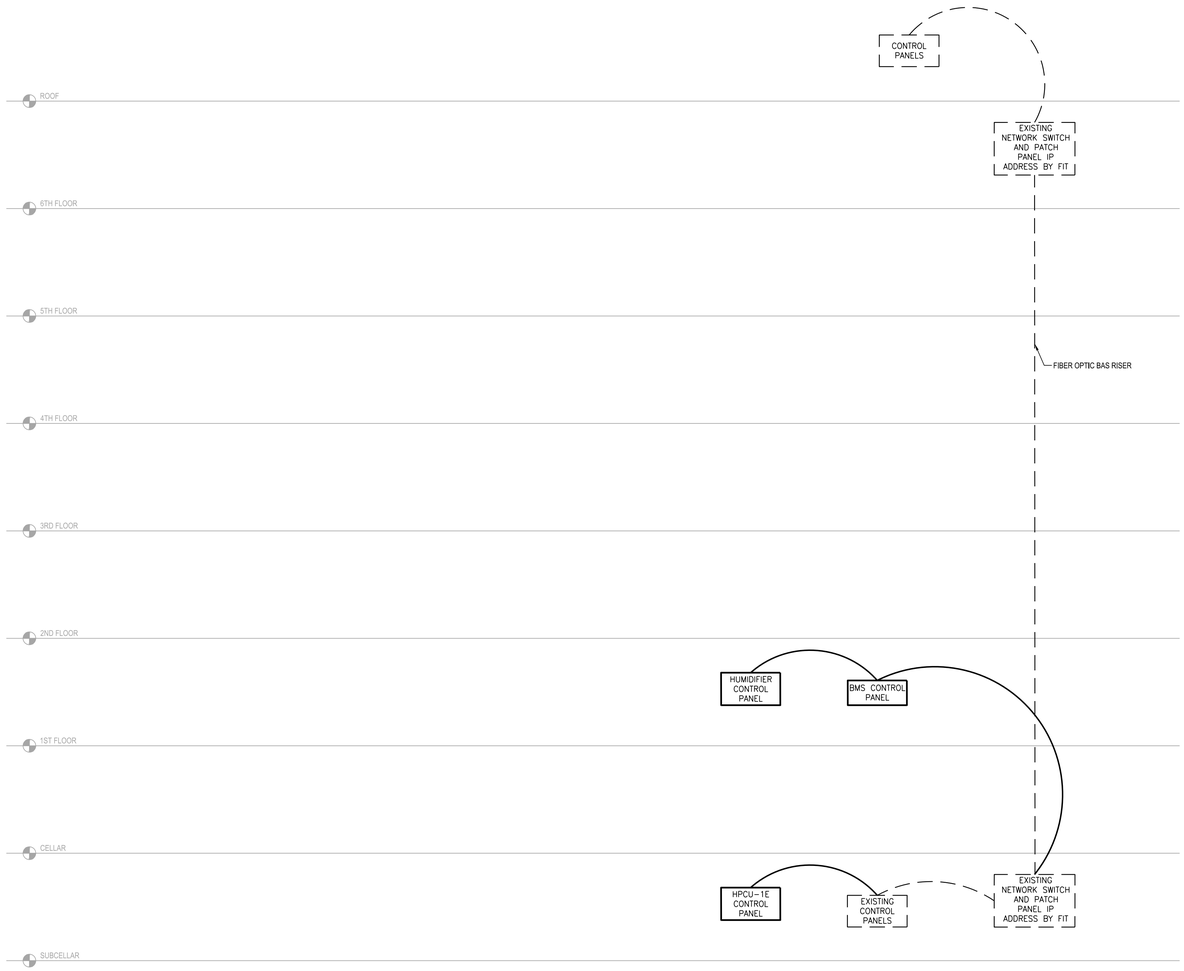

BAS ARCHITECTURE

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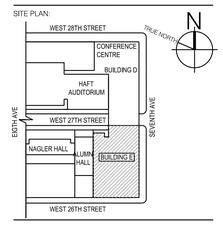

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ELECTRICAL - SYMBOLS

	WALL MOUNTED EXIT LIGHT.
	CEILING MOUNTED EXIT LIGHT WITH SELF CONTAINED BATTERY PACK. SHADED AREA INDICATES ILLUMINATED FACE(S). DIRECTIONAL ARROWS ARE INDICATED.
OR	PANELBOARD
	DISTRIBUTION OR POWER PANELBOARD.
	GROUND BAR
C/T	CT CABINET
M	METER (DIRECT / UTILITY)
SM	SUB-METER
CK#	HOMERUN TO DESIGNATED PANELBOARD - NUMERALS INDICATE CIRCUIT NUMBER.
	GROUND CONNECTION
CK# WP GFI	DUPLEX RECEPTACLE, SUBSCRIPT INDICATES: WP - WEATHERPROOF ENCLOSURE GFI - GROUND-FAULT CIRCUIT-INTERRUPTER RECEPTACLE IG - ISOLATED GROUNDING RECEPTACLE 20A - 20 AMP RECEPTACLE HG - HOSPITAL GRADE RECEPTACLE C - AUTOMATICALLY CONTROLLED RECEPTACLE F - FUTURE SWITCHED RECEPTACLES FOR MOTORIZED SHADES # - IDENTIFIES PANELBOARD CIRCUIT NUMBER (TYPICAL FOR ALL RECEPTACLES) USB - USB RECEPTACLE - NEMA 5-15R USB, PASS & SEYMOUR CAT# TM8-USB-CC6 OR EQUIVALENT
	DOUBLE DUPLEX CONVENIENCE RECEPTACLE WALL MOUNTED IN GANG BOX
	HALF-SWITCHED DUPLEX RECEPTACLE.
	NEMA 5-20R, 20A RECEPTACLE (GFCI)
	RECEPTACLE, NEMA 6-50R 208V, 50A COORDINATE WITH MANUFACTURER
	DOUBLE DUPLEX RECEPTACLE
	STUB UP FACE PLATE TO BE MTD, ON MILLWORK FOR RECEPTACLE
	DUPLEX RECEPTACLE GFI
	FLOOR MOUNTED DUPLEX / DOUBLE DUPLEX / SIMPLEX RECEPTACLE, 15A, 3 WIRE, 125 VOLT, POKE-THRU SERVICE FITTING, UON.
	SPECIAL PURPOSE OUTLET, (COORDINATE REQUIREMENTS WITH VENDOR FOR EACH EQUIPMENT)
	SIMPLEX RECEPTACLE
CH	NEMA 5-15R RECESSED SIMPLEX CLOCK-HANGAR RECEPTACLE
	SINGLE CEILING MOUNTED CONVENIENCE RECEPTACLE
	SPECIAL PURPOSE CEILING MOUNTED RECEPTACLE
$ 3 P	SINGLE POLE SWITCH, LOWER CASE LETTER INDENTIFIES OUTLET(S) CONTROLLED, UPPER CASE LETTER AND OR NUMERAL INDICATES: 2 - DOUBLE POLE 3 - THREE WAY 4 - FOUR WAY P - WITH PILOT LIGHT H - HORSEPOWER RATED WITH HASP FOR LOCK K - KEY OPERATED D - DIMMER SWITCH T - TIMER SWITCH J - DOOR JAM SWITCH L - LOCKING - WITH HASP FOR LOCK MM - MANUAL MOTOR STARTER SWITCH (LOCKING) TS - THERMAL SWITCH OS - OCCUPANCY SENSOR SWITCH VS - VACANCY SENSOR SWITCH SS - SCENE SELECTOR TC - IN-WALL DIGITAL ASTRONOMICAL TIME-CLOCK WITH 7 DAY PROGRAMMING AND HOLIDAY SCHEDULING. SWITCH SHALL INCLUDE INTEGRAL OVERRIDE CAPABILITIES OV - TIME-CLOCK OVER-RIDE SWITCH
OS	CEILING MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR
VS	CEILING MOUNTED DUAL TECHNOLOGY VACANCY SENSOR
PS	CEILING MOUNTED PHOTOSENSOR
WP	3-POLE UNFUSED DISCONNECT (SAFETY) SWITCH. NUMERAL INDICATES AMPACITY. 'WP' DENOTES WEATHERPROOF ENCLOSURE. NO NUMBER INDICATES 30A OR LESS.
WP	3-POLE FUSED DISCONNECT (SAFETY) SWITCH. NUMERAL INDICATES SWITCH AMPACITY/FUSE SIZE. 'WP' DENOTES WEATHERPROOF ENCLOSURE, NO NUMBER INDICATES 30A OR LESS.
WP	3-POLE COMBINATION DISCONNECT & MOTOR STARTER. NUMERAL INDICATES FUSE SIZE. 'WP' DENOTES WEATHERPROOF ENCLOSURE.
WP	3-POLE MOTOR STARTER. NUMERAL INDICATES FUSE SIZE. 'WP' DENOTES WEATHERPROOF ENCLOSURE.
VFD / VFD	VARIABLE FREQUENCY DRIVE

ELECTRICAL - SYMBOLS

T	TRANSFORMER
ELR	EMERGENCY LIGHTING RELAY (ELR), CONTRACTOR TO FURNISH, INSTALL AND WIRE EMERGENCY LIGHTING RELAY, WATTSTOPPER (LEGRAND) CAT# ELCU-200 OR EQUAL APPROVED IN WRITING BY ENGINEER. CONTRACTOR TO PROVIDE TEST BUTTON AND BACK-BOX FLUSH-MOUNTED PREFERRABLY 66" AFF. COORDINATE EXACT LOCATION AND HEIGHT OF TEST BUTTON WITH ARCHITECT. RELAY SHALL BE CONFIGURED SO THAT UNDER NORMAL CONDITIONS, LIGHT FIXTURES ARE CONTROLLED BY DIMMER (OR SWITCH) AND SUPPLIED BY NORMAL POWER FROM LOCAL LIGHTING PANEL. UNDER POWER FAILURE OF CIRCUIT, RELAY SHALL PROVIDE UN-DIMMED (OR UN-SWITCHED) EMERGENCY POWER FROM EMERGENCY LIGHTING PANEL.
RAN	GENERATOR REMOTE ANNUNCIATOR AND ATS REMOTE CONTROL PANEL
RT	REMOTE LIGHTING TRANSFORMER
FCO	FUSE CUT OUT
FDS	FIRE ALARM FUSED DISCONNECT SWITCH
DGP	FIRE ALARM DATA GATHERING PANEL
FACP	FIRE ALARM CONTROL PANEL
FAA	FIRE ALARM REMOTE ANNUNCIATOR
FSD	FIRE SMOKE DAMPER
HT	HEAT TRACE
M	MOTORIZED SHADE
MD	MOTORIZED DAMPER
BG	BREAK GLASS SWITCH
EPO	EMERGENCY POWER OFF
ES	EMERGENCY STOP
T	THERMOSTAT
J	CEILING/WALL/FLOOR MOUNTED JUNCTION BOX
SB	SPLICE BOX
PB	PULLBOX
TC	TIME CLOCK
C / R	CONTACTOR / RELAY
LD	LEAK DETECTOR
CP	CONDENSATE PUMP
SV	SOLENOID VALVE
A	CONNECTOR - LETTER DESIGNATES UNIQUE CONNECTION POINT
	PUSHBUTTON
	DOOR CONTACT. SEE LIGHTING PLANS FOR LOCATIONS.

LEGEND

	NEW WORK
	EXISTING
	DEMO

TELEPHONE, COMMUNICATION, SECURITY & LOW-VOLTAGE SYMBOLS

W	TELEPHONE OUTLET. W - FOR WALL TELEPHONE
	TWO DATA PORT OUTLET
	COMBINATION TELEPHONE/DATA OUTLET.
	TELEPHONE OUTLET FLOOR MOUNTED
	COMBINATION TELEPHONE / DATA FLOOR MOUNTED OUTLET
	FLOOR MOUNTED DATA SYSTEM OUTLET
TV	TV OUTLET
	NID - NETWORK INTERFACE DEVICE PANEL
CCTV	SECURITY CAMERA
SPS	PUBLIC ADDRESS SPEAKER - WALL MOUNTED
PA	PUBLIC ADDRESS SPEAKER - CEILING MOUNTED
WA	WIRELESS ACCESS POINT - CEILING MOUNTED

ELECTRICAL ABBREVIATIONS

A	-AMPS	DIA	- DIAMETER	IN	- INCHES	RMS	- ROOT MEAN SQUARE
AC	- ALTERNATING CURRENT	DISC	- DISCONNECT	INCAN	- INCANDESCENT	SB	- SPLICE BOX
ACC	- ACCENT	DN	- DOWN	INT	- INTERCOM	SN	- SOLID NEUTRAL
ADJ	- ADJUSTABLE	DP	- DISTRIBUTION PANEL	JB	- JUNCTION BOX	SP	- SPARE
AF	- AMP FUSE (FUSES)	DTL	- DETAIL	KP	- KITCHEN PANEL	SPECS	- SPECIFICATIONS
AF	- AMP FRAME (CKT BKRS)	DWG	- DRAWING	KVA	- KILOVOLT AMPERES	SPKR	- SPEAKER
AFCI	- ARC FAULT INTERRUPT	E	- EXISTING	KW	- KILOWATT	SQ	- SQUARE
AFF	- ABOVE FINISHED FLOOR	EC	- EMPTY CONDUIT	KWH	- KILOWATT HOURS	STBY	- STANDBY / LEGALLY-REQUIRED STANDBY (NEC ART. 701)
AFG	- ABOVE FINISHED GRADE	EL	- ELECTRIC	LP	- LIGHTING PANEL	STD	- STANDARD
AC	- AIR CONDITIONING	ELEC	- ELECTRICAL	LTG	- LIGHTING	SURF	- SURFACE
AIC	- AMP INTERRUPTING CAPACITY	ELEV	- ELEVATOR	M	- MAIN	SW	- SWITCH
AG	- ABOVE GRADE	EM	- ON EMERGENCY CIRCUIT / EMERGENCY	MACH	- MACHINE	SWBD	- SWITCHBOARD
AL	- ALUMINUM	EMR	- ELEVATOR MACHINE ROOM	MCC	- MOTOR CONTROL CENTER	SWGR	- SWITCHGEAR
ALM	- ALARM	EMT	- ELECTRICAL METALLIC TUBING	MCM	- THOUSAND CIRCULAT MILS	SYM	- SYMMETRICAL
AM	- AMMETER	ENCL	- ENCLOSURE	MECH	- MECHANICAL	TB	- TERMINAL BLOCK
ARCH	- ARCHITECTURAL	EP	- EXPLOSION PROOF	MFG	- MANUFACTURED	TEL	- TELEPHONE
AP	- AMP PLUG	EQPMT	- EQUIPMENT	MFR	- MANUFACTURER	TELCO	- TELEPHONE COMPANY
APPROX	- APPROXIMATELY	ER	- EXISTING TO REMAIN	MH	- MAN-HOLE	TV	- TELEVISION
AS	- AMP SWITCH	E / R	- EXISTING TO RELOCATE	MIC	- MICROPHONE	TYP	- TYPICAL
AT	- AMP TRIP	EWC	- ELECTRIC WATER COOLER	MISC	- MISCELLANEOUS	U/G, UG	- UNDER-GROUND
ATS	- AUTOMATIC TRANSFER SWITCH	EXIST	- EXISTING	MTD	- MOUNTED	UC	- UNDER COUNTER
AUTO	- AUTOMATIC	EXT	- EXTERIOR, EXTERNAL	MTR	- MOTOR	UF	- UNFUSED
AWG	- AMERICAN WIRE GAUGE	Fⓑⓐⓣ	- FUSED AT	N	- NEUTRAL	UG	- UNDERGROUND
BL	- BLANK	FA	- FIRE ALARM	NEC	- NATIONAL ELECTRIC CODE	U.O.N., UON	- UNLESS OTHERWISE NOTED
BLDG	- BUILDING	FBO	- FURNISHED BY OTHERS	NEMA	- NATIONAL ELECTRICAL MANUFACTURERS	V	- VOLTS
BG	- BELOW GRADE	FCO	- FUSE CUT-OUT	NIC	- NOT IN CONTRACT	VA	- VOLT AMPERE
BPS	- BOLTED PRESSURE SWITCH	FDR	- FEEDER	NM	- NON-METALLIC	VIF	- VERIFY IN FIELD
C	- CONDUIT	FDS	- FUSED DISC. SWITCH (FIRE ALM)	NL	- ON NIGHT LIGHTING CIRCUIT	VM	- VOLTMETER
CAB	- CABINET	FIXT	- FIXTURE	NTS	- NOT TO SCALE	W	- WATTS
CAT	- CATALOGUE	FL	- FLOOR	OCPD	- OVER-CURRENT PROTECTIVE DEVICE	W/	- WITH
CB	- CIRCUIT BREAKER	FLUOR	- FLUORESCENT	OL	- OVERLOAD	W/O	- WITHOUT
CCTV	- CLOSED CIRCUIT TELEVISION	FT	- FEET	O/H, OH	- OVER-HEAD	WP	- WEATHERPROOF
CDT	- CONDUIT	G	- GROUND	OPT-STBY	- OPTIONAL STANDBY (NEC ART. 702)	WT	- WIRING TROUGH
CKT	- CIRCUIT	GA	- GAUGE	P	- POLES	XFMR	- TRANSFORMER
CLG	- CEILING	GALV	- GALVANIZED	PB	- PULL BOX	1/C,2/C,3/C	- QTY OF CONDUCTORS
CM	- CIRCULAR MIL	GEN	- GENERATOR	PF	- POWER FACTOR	C/B, BKR	- CIRCUIT BREAKER
COL	- COLUMN	GFI	- GROUND FAULT INTERRUPT	PH	- PHASE	C/C	- CENTER TO CENTER
CONC	- CONCRETE	GND	- GROUND	PNL	- PANEL	C/L	- CENTER LINE
CONST	- CONSTRUCTION	HC	- HUNG CEILING	PP	- POWER PANEL	CT, C/T	- CURRENT TRANSFORMER
CONT	- CONTINUOUS	HH	- HAND-HOLE	PWR	- POWER	CONV/O	- CONVENIENCE OUTLET
CONV	- CONVENIENCE	HP	- HORSEPOWER	PT	- POTENTIAL TRANSFORMER	N/C	- NORMALLY CLOSED
COORD	- COORDINATE	HT	- HEIGHT	R	- RELOCATED	N/O	- NORMALLY OPEN
CT	- CURRENT TRANSFORMER	HTG	- HEATING	RC	- REMOTE CONTROL	PT, P/T	- POTENTIAL TRANSFORMER
CTRL	- CONTROL	HVAC	- HEATING VENTILATING AND AIR CONDITIONING	RCS	- REMOTE CONTROL SWITCH	Ø	- PHASE
CTRLR	- CONTROLLER	HZ	- HERTZ	REC	- RECEPTACLE		
CU	- COPPER	IC	- INTERRUPTING CAPACITY	RGS	- RIGID GALVANIZED STEEL		
DC	- DIRECT CURRENT	IG	- ISOLATED GROUND	RM	- ROOM		

ELECTRICAL DRAWING LIST

E-001.00	ELECTRICAL SYMBOLS LIST, ABBREVIATIONS AND DRAWING LIST
E-002.00	ELECTRICAL NOTES
E-011.00	1ST FLOOR ELECTRICAL DEMO PLANS
E-101.00	1ST FLOOR ELECTRICAL LIGHTING PLAN
E-200.00	SUB CELLAR ELECTRICAL EQUIPMENT PLAN
E-201.00	1ST FLOOR ELECTRICAL POWER PLAN
E-501.00	ELECTRICAL DETAILS
E-701.00	ELECTRICAL PANEL SCHEDULES

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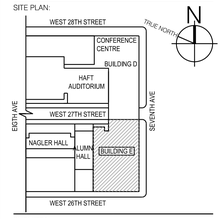

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SCALE: NTS

PROJECT#: 8969.110

SHEET TITLE:

ELECTRICAL SYMBOL ABBREVIATION AND DRAWING LIST

SHEET NUMBER:

E-001.00

GENERAL NOTES

1. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO VISIT AND INSPECT SITE TO BECOME FAMILIAR WITH THE EXISTING CONDITIONS. CONTRACTOR'S INSPECTION SHALL BE CONDUCTED PRIOR TO FINAL BID, AND ANY ADDITIONAL WORK REQUIRED DUE TO FAILURE TO VISIT SITE OR INADEQUATE INSPECTION SHALL NOT BE CONSIDERED FOR COMPENSATION.
2. ELECTRICAL CONTRACTOR TO CAREFULLY STUDY ALL NEW LIGHTING FIXTURES AND COORDINATE WITH LIGHTING MANUFACTURER FOR ANY TRANSFORMERS/DRIVERS (REMOTE/LOCAL), MOUNTING HARDWARE, IN-FEED CONNECTORS, JUNCTION BOXES, JUMPER CABLES, AND WIRING WITHIN MANUFACTURER RECOMMENDED DISTANCE INCLUDING ALL ASSOCIATED CONTROL REQUIREMENTS AND INCLUDE IT IN BID CONTRACT.
3. ELECTRICAL CONTRACTOR SHALL VERIFY ELECTRICAL AND GROUNDING REQUIREMENTS OF ALL NEW AND EXISTING EQUIPMENT TO BE USED. ALL SPECIAL PURPOSE RECEPTACLES INDICATED ON PLAN SHALL BE VERIFIED WITH EQUIPMENT MANUFACTURER TO INSURE PROPER WIRING.
4. CIRCUIT NUMBERS ARE FOR GUIDANCE ONLY, CONTRACTOR SHALL BE RESPONSIBLE TO BALANCE PHASES. REFER TO PANEL SCHEDULES FOR BRANCH CIRCUIT REQUIREMENTS.
5. CIRCUIT WIRE SIZES OTHER THAN 2 #12-3/4"C ARE INDICATED ON PLAN, REFER TO PANEL SCHEDULES FOR BRANCH CIRCUIT BREAKERS OTHER THAN 1 POLE, 20 AMP. ALL CIRCUITS AND FEEDERS SHALL HAVE A FULL SIZE INSULATED GREEN GROUND CONDUCTOR AND BE CONNECTED TO GROUND BUS IN RESPECTIVE PANEL. MINIMUM SIZE CONDUCTOR AND CONDUIT IS #12 THHN CU, 3/4"C (EMT).
6. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING AND PROVIDING THE ACTUAL NUMBER OF CONDUCTORS REQUIRED FOR ALL BRANCH CIRCUIT WIRING TO SERVE THE INTENDED FUNCTION.
7. ALL DEVICE PLATE FINISHES/COLORS SHALL BE AS INDICATED BY ARCHITECT. REFER TO ARCHITECT'S TELECOM AND ELECTRIC PLANS FOR ADDITIONAL ELECTRICAL INFORMATION.
8. FOR EXACT LOCATION AND QUANTITY OF RECEPTACLES, TELEPHONE AND OTHER OUTLETS, REFER TO THE ARCHITECT'S DRAWINGS.
9. MOUNT ALL WALL SWITCHES, DIMMERS, ETC., AT 4'0" A.F.F. TO CENTER LINE OF DEVICES, UON. RECEPTACLES SHALL BE MOUNTED AT 15" A.F.F., UON, REFER TO ARCHITECTURAL PLANS FOR EXACT LOCATION AND MOUNTING HEIGHT.
10. THIS CONTRACTOR IS TO NOTIFY ENGINEER/ARCHITECT OF ANY CONTRADICTIONS FOUND ON THE DESIGN DOCUMENTS AND BASE THE BID ON THE MORE "STRINGENT & EXPENSIVE" CONDITIONS.
11. ELECTRONIC AS-BUILT DRAWINGS, SHOWING CONDUIT RUNS AND CIRCUITING MUST BE GIVEN TO ARCHITECT, ENGINEER AND OWNER AT THE COMPLETION OF THE JOB.
12. THE CONTRACTOR SHALL REMOVE AND/OR RELOCATE ALL EXISTING ELECTRICAL WORK WHICH INTERFERES WITH THE NEW ARCHITECTURAL AND ELECTRICAL LAYOUTS. ALL WORK WHICH IS NO LONGER REQUIRED TO FUNCTION SHALL BE DE-ENERGIZED AND DISCONNECTED AT THE SOURCE OF POWER SUPPLY.
13. PANEL DIRECTORIES SHALL BE MODIFIED AND COMPLETELY FILLED IN AT COMPLETION OF JOB.
14. ANY EXISTING WORK NOT STATED FOR REMOVAL AND DAMAGED AS A RESULT OF PERFORMING THE WORK OF THIS CONTRACT SHALL BE REPAIRED OR REPLACED AS REQUIRED, MATERIAL AND FINISH TO MATCH EXISTING TO THE SATISFACTION OF THE OWNERS REPRESENTATIVE.
15. CONNECT NEW WORK TO EXISTING WORK IN A NEAT AND ACCEPTABLE MANNER.
16. DISPOSE OF REMOVED RACEWAYS, WIRE, PANELS, ETC., AS DIRECTED BY CM & OWNER.
17. ALL ELECTRICAL WORK IN ADJOINING AREAS WHICH IS REQUIRED TO FUNCTION BUT IS AFFECTED BY THIS WORK SHALL BE RECONNECTED AND RESTORED TO ITS PRESENT FUNCTION AS PART OF THE ELECTRICAL SYSTEM OF THE BUILDING(S).
18. ALL RACEWAYS WHICH BECOME EXPOSED BEYOND FINISHED SURFACES BECAUSE OF THE ALTERATION WORK SHALL BE REMOVED AND RE-ROUTED BEHIND THE FINISHED SURFACES.
19. ANY FIRE SAFETY EQUIPMENT AND THIS ASSOCIATED CONDUIT AND WIRING SYSTEM SHALL NOT BE HARMED DURING DEMOLITION AND/OR CONSTRUCTION AND SHALL BE PROTECTED FROM ANY PHYSICAL DAMAGE.
20. ALL NEW VOICE AND DATA WIRING IN CEILING PLENUM SHALL BE TEFLON-COATED OR RUN IN EMT CONDUIT. NEW WALL OUTLETS SHALL RECEIVE 3/4" EMPTY CONDUIT STUB-UP WITH DRAG WIRE AND JUNCTION BOX.
21. EACH COMBINATION DATA/TELEPHONE AND DATA OUTLET SHALL UTILIZE 1" E.M.T. STUBBED UP TO HUNG CEILING FROM JUNCTION BOX.
22. ALL NEW TELEPHONE, ELECTRIC AND DATA OUTLETS TO BE INSTALLED ON AN EXISTING WALL SHOULD BE FLUSH MOUNTED WITH THE FINISHED WALL SURFACE.
23. CONTRACTOR SHALL COORDINATE ALL NEW TELEPHONE CONDUIT RUNS WITH TELECOM COMPANY REPRESENTATIVE BEFORE STARTING WORK.
24. CONTRACTOR TO PROVIDE AN EMPTY CONDUIT SYSTEM AND OUTLET BOXES FOR INSTALLATION OF NEW SECURITY SYSTEM. VERIFY EXACT REQUIREMENTS WITH SECURITY VENDOR.
25. ALL OPEN FLOOR OUTLETS, NOT USED, SHALL BE CAPPED.
26. ALL HOLES IN SLABS OR WALLS SHALL BE FIRE STOPPED VIA LISTED FIRE-STOPPING ASSEMBLIES. SUBMIT TO ENGINEER FOR APPROVAL.
27. PROVIDE A GROUND BUS IN NEW PANELS.
28. CONTRACTOR TO DE-RATE CONDUCTORS IN ACCORDANCE WITH APPLICABLE ELECTRICAL CODES WHEN INSTALLING MORE THAN THREE (3) CIRCUITS IN A 3/4"C HOMERUN AND OTHERWISE REQUIRED.

VOLTAGE DROP REQUIREMENTS

NOTE: FEEDERS ARE SIZED TO MEET 3% MAXIMUM VOLTAGE DROP FROM THE SEB TO THE LAST OCPD. CONTRACTOR MUST PROVIDE FEEDERS AS SIZED HERE AS A MINIMUM. IF CONTRACTOR FEEDER ROUTING INCREASES THEIR LENGTH, OR INCREASES VOLTAGE DROP FOR ANY OTHER REASON, CONTRACTOR SHALL INCREASE FEEDER SIZE AND/OR QUANTITY TO MEET 3% MAXIMUM FEEDER VOLTAGE DROP REQUIREMENTS. THE FEEDER VOLTAGE DROP IS THE SUM OF ALL FEEDER VOLTAGE DROPS FROM THE SERVICE POINT (SEB) TO THE FINAL OVER-CURRENT PROTECTIVE DEVICE OF A CIRCUIT. MAXIMUM BRANCH CIRCUIT VOLTAGE DROP IS 2%, REFER TO ADDITIONAL BRANCH CIRCUIT VOLTAGE DROP REQUIREMENTS IF SHOWN IN DETAIL ON E-500 SERIES DRAWING. ANY CHANGE REQUESTS SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL IN WRITING. CONTRACTOR SHALL MEASURE FEEDER LENGTHS AS FEEDERS ARE INSTALLED AND SUBMIT THIS DATA TO ENGINEER, INCLUDE TABLE OF FEEDER LENGTHS AND TABLE OF CALCULATED BRANCH CIRCUIT VOLTAGE DROPS (AS MAY BE REQUIRED PER E-500 SERIES DETAIL) IN CONTRACTOR'S AS-BUILT DRAWINGS.

DEMOLTION NOTES

1. THE CONTRACTOR SHALL INCLUDE ALL COSTS FOR REMOVALS AND RELOCATIONS IN THE CONTRACT. THESE COSTS SHALL INCLUDE WORK DESCRIBED IN THE SPECIFICATIONS AND SHOWN ON THE ELECTRICAL, ARCHITECTURAL, IT AND MECHANICAL DRAWING WITH ALLOWANCES FOR NORMAL UNFORESEEN DIFFICULTIES WHEN CONCEALED WORK HAS BEEN OPENED. NO CLAIMS FOR ADDITIONAL WORK ASSOCIATED WITH DEMOLITION WILL BE ACCEPTED, EXCEPT IN SPECIFIC CASES CONSIDERED JUSTIFIABLE BY THE ARCHITECT AND ENGINEER.
2. THE CONTRACTOR SHALL REMOVE AND/OR RELOCATE ALL EXISTING ELECTRICAL WORK WHICH INTERFERES WITH THE NEW ARCHITECTURAL AND ELECTRICAL EQUIPMENT LAYOUT, ALL ELECTRICAL CONDUITS, WIRING, OUTLETS, JUNCTION BOXES AND ANY OTHER ELECTRICAL/TELEPHONE WORKS PRESENTLY LOCATED IN THE PARTITIONS SCHEDULED FOR DEMOLITION SHALL BE DISCONNECTED AND REMOVED BACK TO THE SOURCE(S). ALL WORK WHICH IS NO LONGER REQUIRED TO FUNCTION SHALL BE DE-ENERGIZED AND DISCONNECTED AT THE SOURCE OF POWER SUPPLY PRIOR TO REMOVAL.
3. IN AREAS DESIGNATED FOR DEMOLITION BY THE ARCHITECTURAL DRAWINGS, IT IS THE INTENT OF THIS CONTRACT THAT THE CONTRACTOR SHALL DISCONNECT AND REMOVE ALL EXISTING ELECTRICAL, TELECOMMUNICATION, SECURITY AND AUDIO/VISUAL EQUIPMENT INCLUDING: POWER AND LIGHTING PANELBOARDS (WHERE INDICATED) AND ASSOCIATED FEEDERS, TRANSFORMERS, PULLBOXES, LIGHT FIXTURES, FLOOR RECEPTACLES, POWER AND TEL./DATA DOGHOUSE OUTLETS, WALL MOUNTED RECEPTACLES, TELEPHONE/DATA OUTLETS, CONTROL DEVICES AND LIGHT SWITCHES, POWER OUTLETS, BOXES, WIRING, RACEWAYS, CONDUITS AND CABLE TRAYS, AND ALL OTHER EQUIPMENT UNLESS OTHERWISE NOTED, WHICH IS MOUNTED ON WALLS OR PARTITIONS THAT WILL BE TAKEN OUT. REMOVE BRANCH CIRCUITRY BACK TO NEAREST DEVICE SCHEDULED TO REMAIN AND SAFETY TERMINATE ALL CONNECTIONS – MAINTAIN CONTINUITY OF ALL EXISTING FEEDERS AND BRANCH CIRCUITRY TO EXISTING AREAS NOT BEING AFFECTED BY THIS DEMOLITION-ALL WORK TO BE DONE IN AN APPROVED MANNER.
4. ALL ELECTRICAL WORK IN ADJOINING AREAS OR FLOORS WHICH IS REQUIRED TO FUNCTION BUT IS AFFECTED BY DEMOLITION WORK SHALL BE RECONNECTED AND RESTORED TO ITS PRESENT FUNCTION AS PART OF THE ELECTRICAL SYSTEM OF THE BUILDING(S).
5. ALL PRESENT ELECTRICAL MATERIAL AND EQUIPMENT WHICH ARE TO BE REMOVED UNDER THIS CONTRACT SHALL BE REMOVED BY THE ELECTRICAL CONTRACTOR AND SHALL BECOME THE PROPERTY OF BUILDING MANAGEMENT, U.O.N. ALL ELECTRICAL EQUIPMENT TO BE REMOVED SHALL BE DISPOSE BY THE CONTRACTOR, THE BUILDING MANAGEMENT SHALL INSTRUCT THE CONTRACTOR WHICH EQUIPMENT SHALL BE DELIVERED BY THE CONTRACTOR TO THE MANAGEMENT AND STORE AS DIRECTED.
6. ALL RACEWAYS WHICH BECOME EXPOSED BEYOND FINISHED SURFACES BECAUSE OF THE ALTERATION WORK SHALL BE REMOVED AND REROUTED BEHIND THE FINISHED SURFACES, U.O.N. ALL REROUTED FEEDER/BRANCH CIRCUITRY SHALL BE PROVIDED WITH NEW FEEDER/ BRANCH CIRCUITRY EXTENSIONS, PULL BOXES, ETC., WHERE REQUIRED. NEW FEEDER EXTENSIONS SHALL MATCH EXISTING ONES IN ALL RESPECTS, CONDUCTOR CAPACITY, CONDUIT SIZE, ETC
7. PORTIONS OF FEEDER LINES THAT HAVE TO BE REMOVED OR ABANDONED AS A RESULT OF DEMOLITION WORK BUT ARE REQUIRED TO CONTINUE TO FUNCTION SHALL BE CUT AT CONVENIENT LOCATIONS, REROUTED AND RECONNECTED FOR CONTINUATION OF THEIR PRESENT FUNCTION. NEW FEEDER EXTENSIONS SHALL MATCH EXISTING ONES IN ALL RESPECTS, CONDUCTOR CAPACITY, CONDUITS SIZE, ETC.
8. DISPOSE OF REMOVED RACEWAYS, WIRES, PANELS, ETC., AS DIRECTED BY BUILDING MANAGEMENT.
9. ALL UNUSED WIRES SHALL BE REMOVED WHERE DEMOLITION IS TO TAKE PLACE IN THE AREA OF THE BUILDING.
10. ANY DAMAGE TO EXISTING PARTITIONS, FLOORS, CEILINGS OR ANY PART OF THE BUILDING OR EQUIPMENT CAUSED BY THE WORK OF THIS CONTRACT SHALL NOT BE ADDITIONAL EXPENSE TO OWNER.
11. REMOVE ALL ABANDONED ELECTRICAL EQUIPMENT, PANELS, CONDUITS, WIRING, JUNCTION AND PULL BOXES, SUPPORTS, ETC., UNLESS OTHERWISE NOTED.
12. ALL HOLES IN SLABS OR WALLS SHALL BE SEALED WITH APPROVED FIRE RATED MATERIALS, FIRE STOPPED WITH UL LISTED FIRE STOPPING MATERIALS.
13. DISCONNECT LOAD AND LINE END OF CONDUCTORS FEEDING EXISTING EQUIPMENT TO BE RELOCATED OR REMOVED.
14. REMOVE CONDUCTORS FROM EXISTING RACEWAYS TO BE REWIRED.
15. CAP ABANDONED OUTLETS AND RACEWAYS. NO ABANDONED WIRING IS ALLOWED. ALL WIRING INCLUDING LOW TENSION WIRING SHALL BE REMOVED BACK TO SOURCE UNLESS OTHERWISE FIELD DIRECTED BY BUILDING MANAGEMENT.
16. DISCONNECT ALL OBSOLETE FLOOR BOXES AND WIRING BACK TO SOURCE.
17. ALL PORTIONS OF FEEDERS THAT REQUIRE RELOCATION IN THE CORE AREA SHALL BE LOCATED PER BUILDING MANAGEMENT DIRECTIONS. NO RELOCATION SHALL BE DONE WITHOUT PRIOR APPROVAL FROM THE BUILDING MANAGEMENT.
18. ALL EXISTING DEVICES AND COMPONENTS THAT ARE NOT IN ACCORDANCE WITH APPLICABLE CODES SHALL BE REPLACED.
19. COORDINATE WITH MECHANICAL AND PLUMBING CONTRACTORS FOR THE SCOPE OF WORK. REFER TO CORRESPONDING HVAC AND PLUMBING DEMO DRAWINGS.
20. THE DEMOLITION NOTES AND DRAWINGS ARE DIAGRAMMATIC DESCRIPTION OF THE REMOVAL AND RELOCATION SCOPE OF WORK. THE CONTRACTOR, BY SITE INVESTIGATION, SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT SCOPE OF THE WORK INVOLVED, PRIOR TO SUBMITTING HIS BID. COORDINATE WITH ARCHITECT AND BUILDING MANAGEMENT BEFORE ANY WORK.
21. WHERE DEMOLITION IS TO TAKE PLACE IN THE AREA OF THE BUILDING, FIRE SAFETY EQUIPMENT SUCH AS ALARMS, SPEAKERS, SMOKE DETECTORS, FLOOR WARDEN STATIONS, ETC., BUILDING MANAGEMENT MUST BE NOTIFIED FIVE (5) WORKING DAYS PRIOR TO THE START OF DEMOLITION SO THE EQUIPMENT MAY BE PROTECTED OR REMOVED. PROTECTION OF DEVICES AND EQUIPMENT IS THE RESPONSIBILITY OF CONTRACTOR, U.O.N.
22. THIS FLOOR MUST REMAIN IN A STATE OF SAFE CONDITIONS WITH REGARD TO FIRE SAFETY FOR PERSONNEL WORKING ON THE FLOOR, ALL FIRE STAIRS, ALARMS, SPEAKERS, ETC., MUST REMAIN ACCESSIBLE AND OPERABLE AT ALL TIMES
23. REFER TO ARCHITECTURAL DEMOLITION NOTES FOR ADDITIONAL INFORMATION.
24. ALL ELECTRIC POWER MUST BE DISCONNECTED BEFORE STARTING DEMOLITION. TEMPORARY LIGHTING FOR ALL TRADES MUST BE INSTALLED.
25. ELECTRICAL CONTRACTOR SHALL COORDINATE HIS WORK WITH OTHER TRADES AND CONFER WITH THE ARCHITECT.
26. WHEN REMOVING WALL MOUNTED RECEPTACLES WITH CONDUIT IN FLOORS OR WALLS, ALL CONDUITS IS TO BE REMOVED (CHOPPING AND PATCHING OF CONCRETE FLOOR INCLUDED) AND WIRE IS TO BE PULLED BACK TO THE TRENCH HEADER DUCT AND CAPPED. IF SEPARATE CIRCUIT WIRE IS TO BE PULLED BACK TO PANEL BOX AND REMOVE FROM BREAKER.
27. THE BUILDING FIRE ALARM SYSTEM INTEGRITY SHALL BE MAINTAINED AT ALL TIMES (BEFORE, DURING AND AFTER DEMOLITION AND/OR CONSTRUCTION). ALL FIRE ALARM DEVICES SHALL REMAIN IN PLACE DURING ALL PHASES OF DEMOLITION AND CONSTRUCTION. TEMPORARILY, SUPPORT ALL DEVICES LOCATED ON WALLS OR CEILINGS TO BE DEMOLISHED. IF THE EXISTING SYSTEM IS FOUND TO BE INOPERABLE, PROVIDE A TEMPORARY SYSTEM DURING CONSTRUCTION IF REQUIRED, PROVIDE A FIRE WATCH IF REQUIRED BY LOCAL OFFICIALS.
28. PROVIDE TEMPORARY LIGHTING AND POWER FOR ALL TRADES DURING DEMOLITION AND CONSTRUCTION – WHEN USING TEMPORARY LIGHTING, THE CONTRACTOR SHALL CLEARLY LABEL PANELS AND BREAKERS USED FOR LIGHTING. LOCATION OF PANELS TO BE SHOWN ON FLOOR PLAN POSTED AT ENTRANCE TO WORK AREA. PROPER TEMPORARY LIGHTING AND POWER MUST BE INSTALLED AND MAINTAINED IN ALL WORK AREAS. TEMPORARY LIGHT AND POWER STRINGERS SHALL UTILIZE C-TAP TERMINATIONS, LAMPHOLDERS SHALL HAVE LEFT HANDED SCREW SHELL LAMP HOLDERS AND NONMETALLIC LAMP GUARDS, CONNECTIONS TO EXISTING STAIRWELL AND EXIT LIGHT SYSTEMS ARE NOT PERMITTED.
29. ELECTRIC PANELS' COVERS ARE NOT TO BE LEFT OFF AT ANY TIME, UNLESS MEN ARE WORKING ON SAME. COVERS SHALL BE REPLACED EACH NIGHT BEFORE LEAVING JOB SITE,
30. BRANCH CIRCUITRY AND CONTROL WIRING FOR MECHANICAL EQUIPMENT AND DEVICES TO BE REMOVED SHALL BE DISCONNECTED AND REMOVED – COORDINATE WITH MECHANICAL CONTRACTOR THESE REMOVALS. RELOCATE ANY CONTROL DEVICES TO TEMPORARY LOCATIONS IF REQUIRED. FOR EXISTING A/C UNITS TO BE REMOVED, DISCONNECT AND REMOVE STARTERS, DISCONNECT SWITCHES, JUNCTION BOXES, POWER AND CONTROL WIRING BACK TO SOURCE. CONTINUITY SHALL BE MAINTAINED ON ALL ELECTRICAL CIRCUITS FEEDING POWER TO A/C UNITS OR MECHANICAL EQUIPMENT NOT BEING REMOVED.
31. ALL ELECTRICAL DEVICES REMOVED AND TO BE REINSTALLED SHALL BE CLEANED. ALL OTHER DEVICES THAT ARE REMOVED AND MADE SURPLUS SHALL BE REMOVED FROM THE SITE. CONTRACTOR MUST OBTAIN OWNER'S APPROVAL FOR DISPOSITION. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR PROPER DISPOSAL OF ALL ELECTRICAL EQUIPMENT NOT DEEMED SALVAGEABLE BY OWNER.
32. THE CONTRACTOR SHALL MAINTAIN CONTINUITY OF SERVICE ON ALL CIRCUITS AFFECTED BY THIS DEMOLITION, WHENEVER IT IS REQUIRED THAT AN EXISTING CIRCUIT BE REVISED, DISCONNECTED OR REMOVED, IT SHALL BE UNDERSTOOD THAT THE CIRCUIT SHALL BE RECONNECTED AND SERVICE REESTABLISHED IN THE REMAINING PORTION OF THE CIRCUIT AFFECTED BY THIS ALTERATION.
33. IN CONNECTION WITH THE ALTERATIONS TO THE EXISTING BUILDING, THERE WILL BE CERTAIN REMOVALS AND RELOCATIONS OF THE EXISTING ELECTRICAL WORK NECESSARY FOR THE SATISFACTORY PERFORMANCE OF THE GENERAL WORK. THESE CHANGES CANNOT BE COMPLETELY DETAILED ON THE DRAWINGS, BUT SHOULD BE TAKEN INTO CONSIDERATION BY THE CONTRACTOR IN PREPARING THIS PROPOSAL FOR THIS WORK.
34. DURING DEMOLITION PROCEDURES, PROVIDE ALL NECESSARY PROTECTION FOR EXISTING ELECTRICAL WORK REQUIRED FOR REUSE.
35. ALL POWER WIRING IN AREAS TO BE DEMOLISHED SHALL BE THOROUGHLY TRACED OUT TO DETERMINE THE DEVICES BEING FED FROM IT. ALL OBSOLETE WIRING AND CONDUIT SHALL BE REMOVED BACK TO THEIR RESPECTIVE PANELS UPON COMPLETION OF DEMOLITION, AN ACCURATE COUNT OF ALL SPARE CIRCUITS IN ALL PANELS SHALL BE MADE BY THE CONTRACTOR AND FURNISHED TO THE ARCHITECT AND ELECTRICAL ENGINEER. INFORMATION SHALL INCLUDE PANEL NAME, PANEL LOCATION, NUMBER OF SPARE CIRCUIT BREAKERS OF EACH SIZE AND TYPE. NUMBER OF EMPTY SPACES FOR FUTURE BREAKERS IN EACH PANEL.
36. ALL DEMOLISHING WORK, WHICH CREATES DISTURBING NOISE, SHALL BE PERFORM AS PER OWNER'S INSTRUCTIONS. THE REMOVAL OF DEBRIS AND EQUIPMENT MUST BE ARRANGED TO AVOID ANY INCONVENIENCE TO OWNER.
37. ALL FLOOR CELLS MUST BE COMPLETELY CLEANED OUT AS A PART OF DEMOLITION. ALL FLOOR MONUMENTS SHALL BE REMOVED AND ALL UNUSED OPENING SHALL BE SEALED WITH MANUFACTURED BLANK OFF PLATES. PENETRATIONS SHALL BE PATCHED AND FLASHED WITH CONCRETE SO THAT THEY ARE FLUSH WITH SURROUNDING FLOOR AREAS.

LIGHTING & DRIVER NOTES

SEE LIGHTING FIXTURE SCHEDULES AND DETAILS ON DRAWINGS E-000 AND E-500 SERIES DRAWINGS.

1. FOR EXACT LOCATION AND MOUNTING HEIGHTS OF ALL LIGHTING FIXTURES, SWITCHES AND JUNCTION BOXES SEE ARCHITECTURAL, FURNITURE AND LIGHTING DRAWINGS.
2. CIRCUITS ARE DESIGNATED BY THE NUMBER SHOWN ADJACENT TO EACH LIGHTING FIXTURE OR JUNCTION BOX. WIRING IS SHOWN ONLY UNDER SPECIAL CIRCUMSTANCES. PROVIDE ALL CONDUIT, WIRE AND BOXES AS WELL AS CEILING OUTLETS AND WHIPS REQUIRED TO ENERGIZE LIGHTING FIXTURES AS SHOWN.
3. LIGHTING FIXTURES DESIGNATED AS EMERGENCY, "NIGHT LIGHT" AND EXIT LIGHTS SHALL BE UN-SWITCHED, UON.
4. FOR LIGHTING FIXTURE SPECIFICATIONS REFER TO ARCHITECTURAL & LIGHTING CONSULTANT LIGHTING FIXTURE SCHEDULES, CUT-SHEETS.
5. FOR ADDITIONAL LIGHTING REQUIREMENTS SEE ARCHITECTURAL, LIGHTING, TECHNOLOGY, LIGHTING CONTROLS, AND EQUIPMENT MANUFACTURER'S DOCUMENTATION.
6. DRIVERS SHALL BE USED FOR LED LIGHTING.
7. OCCUPANCY, VACANCY AND DAYLIGHT SENSOR LOCATIONS AND QUANTITIES SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC. CONTRACTOR SHALL PROVIDE SENSORS AS REQUIRED TO MEET ALL CODE REQUIREMENTS AND AS PER THE SEQUENCE OF OPERATIONS IN THE CONTROLS NARRATIVE.

LIGHT FIXTURES AND CONTROLS

IN ADDITION TO THE WORK SHOWN IN THESE ELECTRICAL DRAWINGS, THE ELECTRICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE, FURNISH AND INSTALL ALL WORK, LABOR, MATERIALS, FIXTURES, HARDWARE, CABLING AND OTHER COMPONENTS AS SHOWN ON THE ARCHITECTURAL LIGHTING DRAWINGS, INCLUDING ALL LIGHT FIXTURES, SEE ARCHITECTURAL LIGHTING DRAWINGS FOR THESE REQUIREMENTS AND WORK. ELECTRICAL CONTRACTOR IS ALSO RESPONSIBLE TO PROVIDE, FURNISH AND INSTALL ALL CONDUIT, RACEWAY, BACKBOXES AND ASSOCIATED LABOR, HARDWARE AND MATERIALS NECESSARY FOR THE INSTALLATION OF SAME, AND FOR THE INSTALLATION OF DIMMING & OTHER LIGHTING CONTROLS. REFER TO THE ELECTRICAL SPECIFICATIONS AND DRAWINGS OF OTHER TRADES FOR ADDITIONAL WORK, SUCH AS RELATED TO MECHANICAL, PLUMBING AND FIRE ALARM SYSTEMS, AND NOTES REGARDING SEPARATION OF TRADES. ANY LATER CLAIMS MADE WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS REQUIRED DUE TO LACK OF SHOP DRAWINGS OR COORDINATION WITH LIGHTING MANUFACTURER AND FACTORY AUTHORIZED REPRESENTATIVE.

LIGHT FIXTURES AND CONTROLS

IN ADDITION TO THE WORK SHOWN IN THESE ELECTRICAL DRAWINGS, THE ELECTRICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE, FURNISH AND INSTALL ALL WORK, LABOR, MATERIALS, FIXTURES, HARDWARE, CABLING AND OTHER COMPONENTS AS SHOWN ON THE ARCHITECTURAL LIGHTING DRAWINGS, INCLUDING ALL LIGHT FIXTURES, SEE ARCHITECTURAL LIGHTING DRAWINGS FOR THESE REQUIREMENTS AND WORK. ELECTRICAL CONTRACTOR IS ALSO RESPONSIBLE TO PROVIDE, FURNISH AND INSTALL ALL CONDUIT, RACEWAY, BACKBOXES AND ASSOCIATED LABOR, HARDWARE AND MATERIALS NECESSARY FOR THE INSTALLATION OF SAME, AND FOR THE INSTALLATION OF DIMMING & OTHER LIGHTING CONTROLS. REFER TO THE ELECTRICAL SPECIFICATIONS AND DRAWINGS OF OTHER TRADES FOR ADDITIONAL WORK, SUCH AS RELATED TO MECHANICAL, PLUMBING AND FIRE ALARM SYSTEMS, AND NOTES REGARDING SEPARATION OF TRADES, ANY LATER CLAIMS MADE WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS REQUIRED DUE TO LACK OF SHOP DRAWINGS OR COORDINATION WITH LIGHTING MANUFACTURER AND FACTORY AUTHORIZED REPRESENTATIVE.

IF GC INSTALLS ANY UNDIMENSIONED DEVICES WITHOUT ARCHITECT'S APPROVAL, THEY WILL BEAR COST OF RELOCATING THOSE DEVICES.

USE OF MC CABLES IS NOT ALLOWED IN ELECTRICAL AND MECHANICAL ROOMS. ALL BRANCH CIRCUIT WIRING SHALL BE ROUTED IN EMT CONDUIT FROM PANELBOARDS TO A PULLBOX OUTSIDE OF THE ELECTRICAL ROOM AND FROM ELECTRICAL CLOSET TO THE MECHANICAL ROOM

LIGHTING CONTROL SUBMISSION NOTE

1. AS A PART OF THE WORK OF THIS CONTRACT, THE ELECTRICAL CONTRACTOR, IN CONSENT WITH THE SELECTED LIGHTING CONTROL VENDOR, SHALL PREPARE A DETAILED PLAN AND APPLICABLE DETAILS SHOWING ALL CONTROL DEVICES, SWITCHES, RELAY AND RELATED EQUIPMENT TO SATISFY THE LIGHTING CONTROL REQUIREMENTS OF THE PROJECT MATRIX SHOWN ON THE 'COMCHECK' PLAN.
2. OCCUPANCY, VACANCY AND DAYLIGHT SENSOR LOCATIONS AND QUANTITIES SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC. CONTRACTOR SHALL PROVIDE SENSORS AS REQUIRED TO MEET ALL CODE REQUIREMENTS AND AS PER THE SEQUENCE OF OPERATIONS IN THE CONTROLS NARRATIVE.
3. THIS SHALL BE SUBMITTED AS A PROJECT SHOP DRAWING FOR REVIEW BY THIS ENGINEER.
4. IN AREAS OF HUNG CEILLINGS, THE LOW VOLTAGE CONTROL WIRING MAY BE RUN WITHOUT A RACEWAY, HOWEVER, PLENUM RATED CABLE IS REQUIRED FOR THIS APPLICATION.
5. PROVIDE ALL DAYLIGHT CONTROL FUNCTIONALITY AND INSTALLATION AS REQUIRED BY 2020 NYCECC.
6. PROVIDE ALL LIGHTING CONTROL FUNCTIONALITY AND INSTALLATION AS REQUIRED BY 2020 NYCECC. FOR LEGEND OF LIGHTING CONTROL DEVICES REFER TO LIGHTING CONTROL NARRATIVE ON EN DRAWINGS.

POWER NOTES

1. FOR EXACT LOCATION AND MOUNTING HEIGHT OF ALL POWER, TEL/DATA OUTLETS AND MECHANICAL EQUIPMENTS COORDINATE WITH ALL TRADES AND ARCHITECTURAL DRAWINGS.
2. ALL BRANCH CIRCUIT WIRING SHALL BE RUN CONCEALED IN WALLS AND ABOVE HUNG CEILING, UNLESS OTHERWISE NOTED.
3. No. 12 AWG (THHN) SHALL BE THE MINIMUM SIZE AND SHALL BE USED FOR ALL 15A & 20A BRANCH CIRCUIT WIRING, UNLESS OTHERWISE NOTED. CONTRACTOR SHALL ADJUST SIZE FOR VOLTAGE DROP AND OTHER DE-RATING FACTORS AS PER CODE REQUIREMENTS.
4. 3/4" CONDUIT SHALL BE THE MINIMUM TRADE SIZE OF CONDUIT.
5. CIRCUITS ARE DESIGNATED BY THE NUMBER SHOWN ADJACENT TO EACH RECEPTACLE, ETC. WIRING IS SHOWN ONLY FOR UNDER SPECIAL CIRCUMSTANCES. PROVIDE CONDUITS. WIRES, ARMORED CABLES AND BOXES REQUIRED TO ENERGIZE THE EQUIPMENT AS SHOWN.
6. ALL COMMUNICATIONS, SECURITY WORKS ARE A SEPARATE CONTRACT, UON. EC TO PROVIDE ALL CONDUIT, RACEWAY, BACK-BOXES.
7. FOR ADDITIONAL NOTES REFER TO ARCHITECTURAL DRAWINGS.
8. CONDUIT RUNS THAT ARE SHOWN ARE DIAGRAMMATICAL AND SHOW POTENTIAL ROUTING OF CONDUITS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE RUNS WITH ALL TRADES.

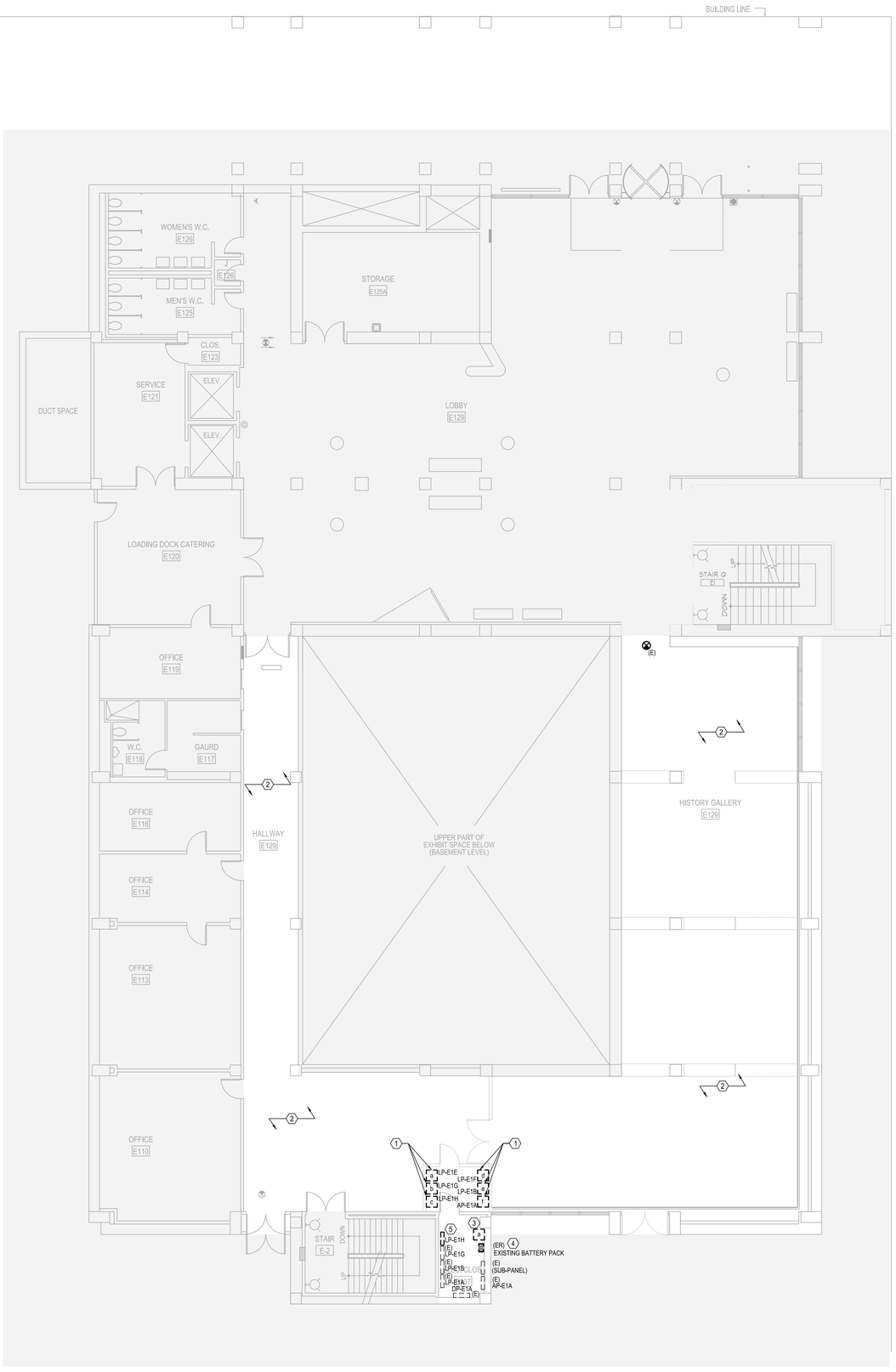
MECH./PLUMBING EQUIP. NOTES

1. INTENT OF DRAWING IS TO SHOW LAYOUT OF MECHANICAL/PLUMBING EQUIPMENT AND RESPECTIVE ELECTRICAL CONNECTIONS WITH ASSOCIATED DEVICES. FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF ALL MECHANICAL/PLUMBING EQUIPMENT AND RESPECTIVE CONTROLS REFER TO MECHANICAL/PLUMBING DRAWINGS. USE THIS DRAWING FOR CIRCUITING PURPOSES ONLY.
2. CONSTRUCTION MANAGER (CM) SHALL DETERMINE WHICH CONTRACTOR'S SCOPE IT IS TO PROVIDE DISCONNECT SWITCHES AND/OR CONTROL PANELS FOR MECHANICAL/PLUMBING EQUIPMENT, COORDINATE WITH CM PRIOR TO INCLUDING COSTS FOR SAME IN BID. DISCONNECT SWITCHES AND CONTROL PANELS SHALL BE INSTALLED INSTALLED/WIRED BY ELECTRICAL CONTRACTOR U.O.N. COORDINATE WITH MECHANICAL/PLUMBING CONTRACTORS FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR TO INSTALL & WIRE THERMOSTATS AND ASSOCIATED BACKBOXES FOR ALL EQUIPMENT INCLUDING INDIVIDUAL HEATPUMPS. THERMOSTATS PROVIDED BY MECHANICAL CONTRACTOR. REFER TO MECHANICAL SCHEDULES & SPECS FOR A LIST OF EQUIPMENT AND ASSOCIATED THERMOSTATS. COORDINATE LOCATION OF ALL THERMOSTATS WITH ARCHITECT.

ELECTRICAL CONTRACTOR NOTE: IT, SECURITY, AND AV

AS PART OF THE WORK OF THIS CONTRACT, THE ELECTRICAL CONTRACTOR SHALL INCLUDE THE COST OF ALL JUNCTION BOXES, CONDUIT RUNS, PULL CORDS, POWER SUPPLIES, RACEWAYS, BACKBOXES AND EMPTY CONDUIT SYSTEMS SHOWN ON THE IT/AV CONSULTANTS DOCUMENTS FOR IT, SECURITY AND A/V AND OTHER CONSULTANTS DRAWINGS TO FACILITATE THE LOW VOLTAGE SYSTEMS INSTALLATION AND BE INCLUDED IN THE ELECTRICAL CONTRACTORS BID FORM FOR THIS WORK.

ALL EQUIPMENT AND RELATED INSTALLATION OF THOSE SYSTEMS ARE NOT



DEMOLITION KEY NOTES:

1	EXISTING DIMMING CONTROL PANELS, PANELS LABELED WITH "a" AND "f" HAVE LIGHTING CONTROL MODULES WHICH SERVE THE LOBBY AREA OUTSIDE OF THE AREA OF WORK. DIMMING CONTROL PANELS LABELED WITH "b", "c", "d", AND "e" SHALL BE REMOVED ENTIRELY (INCLUDING WIRING AND CONDUIT BACK TO SOURCE) SINCE THEY FEED LIGHTING WITHIN THE AREA OF WORK FOR FIXTURES BEING DEMOLISHED. CONTRACTOR SHALL CIRCUIT TRACE TO CONFIRM THIS DESIGN INTENT. CONTRACTOR SHALL REFEED THE ONE MODULE IN "f" FROM DIMMING CONTROL PANEL "a" AND REMOVE CONTROL PANEL "f" IN ITS ENTIRETY (INCLUDING WIRING AND CONDUIT BACK TO SOURCE)
2	EXISTING LIGHTING FIXTURES, RECEPTACLES IN THIS AREA SHALL BE REMOVED, INCLUDING WIRING AND CONDUIT, BACK TO SOURCE. PROTECT AND PRESERVE EXISTING PUBLIC ADDRESS SPEAKERS, WIRELESS ACCESS POINT FOR NEW WORK.
3	RELOCATED EXISTING DIMMING CONTROL PANEL "a". SPLICE AND EXTEND EXISTING WIRING AND CONDUIT / CABLING ACCORDINGLY.
4	REMOVE EXISTING BATTERY PACK INCLUDING ITS ASSOCIATED FEEDERS AND CONDUITS BACK TO SOURCE. RECONNECT EMERGENCY LIGHTS LOBBY E129 CIRCUITS TO NEW EMERGENCY INVERTER.
5	REPLACE IN PLACE EXISTING PANEL LP-EH1 WITH NEW PANEL LP-EH1 120/208V, 100A, 42 POLE. PROVIDE FEEDERS EXTENSION AS REQUIRED.

NOT FOR CONSTRUCTION

NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT History Gallery Renovation

Project No. 2448

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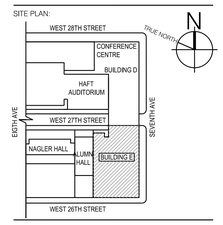
SITE PLAN:



SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
	DESIGN DEVELOPMENT	11.24.2025
	CD PROGRESS	03.10.2026
	BID SET	03.27.2026
	REVISED BID SET	04.13.2026
	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: IAN CHECKED BY: CTD

SCALE: 1/8" = 1'-0"

PROJECT#: 8969.110

SHEET TITLE:

1ST FLOOR ELECTRICAL DEMO PLANS

SHEET NUMBER:

E-011.00

1 **1ST FLOOR PLAN**
1/8"=1'-0"

LIGHTING KEY NOTES:

1	PROVIDE EMERGENCY LIGHTING INVERTER TO FEED ALL LIGHTING FIXTURES DESIGNATED WITH "EM" - BASIS-OF-DESIGN SHALL BE MYERS MODEL #3-IE-5-S-BA208-C-M-2YW.

LIGHTING GENERAL NOTES

1. REFER TO ARCHITECTURAL DRAWINGS FOR LIGHTING FIXTURE SCHEDULE.

LIGHTING CONTROL NOTES

1. ALL TRACK LIGHTS IN HISTORY GALLERY E129 AND VESTIBULE SHALL BE AUTOMATICALLY CONTROLLED BY INTEGRAL DIMMER AND ASTRONOMICAL TIMECLOCK (7-DAY PROGRAMMABLE W/ HOLIDAY SCHEDULING). AUTOMATIC TIME ON/OFF SHALL BE DEFINED BY OWNER.
2. ALL DOWNLIGHTS IN HISTORY GALLERY E129 SHALL BE CONTROLLED BY MANUAL OVERRIDE AND SHALL BE VIA DIMMER SWITCHES.
3. ALL DOWNLIGHTS IN HALWAY AND VESTIBULE SHALL BE AUTOMATICALLY CONTROLLED VIA OCCUPANCY SENSORS AND MANUAL OVERRIDE SHALL BE VIA DIMMER SWITCHES. OCCUPANCY SENSORS SHALL DIM LIGHTS TO 50% OFF AFTER 15 MINUTES OF INACTIVITY.
4. ALL LIGHTING FIXTURES DESIGNATED "EM/NL" SHALL BE UN-SWITCHED.

LIGHTING CONTROL LEGEND AND NOTES

OS	nCM 9 (COLOR OPTION) - CEILING MOUNTED SWITCH OCCUPANCY SENSOR LOW VOLTAGE a - LIGHTING CONTROL ZONE
^{a}D	nPODM-D (COLOR OPTION) - ON-OFF + DIMMING OVERRIDE LOW VOLTAGE WALL MOUNTED SWITCH a - LIGHTING CONTROL ZONE
$	nPODM (COLOR OPTION) - ON-OFF/ OVERRIDE LOW VOLTAGE WALL MOUNTED SWITCH a - LIGHTING CONTROL ZONE
^{a}TC	nDTC (COLOR OPTION) - LOW VOLTAGE TOUCH SCREEN DIGITAL TIME CLOCK WALL MOUNTED. REQUIRED PS 150 POWER SUPPLY a - LIGHTING CONTROL ZONE
D	nSP5 D - RELAY PACK/DIMMING WITH NLIGHT-ENABLED, 120/277 VAC
P	nPP16 - POWER/ RELAY PACK WITH NLIGHT-ENABLED, 120/277 VAC

SENSOR NOTES:

1. ALL DEVICES SHALL BE BY NLIGHT OR APPROVED EQUAL.
2. ONE POWER PACK IS NEEDED PER CIRCUIT /ZONE TO BE CONTROLLED BY LOW VOLTAGE SENSORS. PLEASE RECHECK COUNTS TO VERIFY THE NUMBER OF POWER PACKS NEEDED TO MAKE A COMPLETE SYSTEM. NLIGHT-ENABLED, HAS THE ABILITY TO COMMUNICATE OVER AN NLIGHT NETWORK.
3. WALL MOUNTED DEVICES: COLOR GRAY WITH SATIN NICKEL FACEPLATES
4. CEILING MOUNTED DEVICES: COLOR MATTE BLACK

NOT FOR CONSTRUCTION

NEW YORK CITY ENERGY CONSERVATION CODE

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FIT History Gallery Renovation

Project No. 2448

282 7TH AVE
NEW YORK, NY 10001
212.217.7999

ARCHITECT
SAMUEL ANDERSON ARCHITECTS
307 WEST 38TH ST, SUITE 1901
NEW YORK NY 10018
212.564.7002
SAMUELANDERSON.COM

MEP ENGINEER
MG ENGINEERING D.P.C
116 WEST 32ND STREET
NEW YORK, NY 10001
212.643.9055

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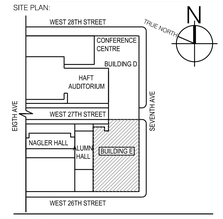
116 West 32nd Street, 12th Floor | New York, N.Y. 10001
P 212.643.9055 | info@mgedpc.net | www.mgedpc.net

LIGHTING DESIGNER
JEFFREY NASH LIGHTING DESIGN
150 WEST 28TH STREET, SUITE 1603
NEW YORK, NY 10001
212.206.8356

SITE PLAN:



SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
	DESIGN DEVELOPMENT	11.24.2025
	CD PROGRESS	03.10.2026
	BID SET	03.27.2026
	REVISED BID SET	04.13.2026
	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: EGV CHECKED BY: EGV

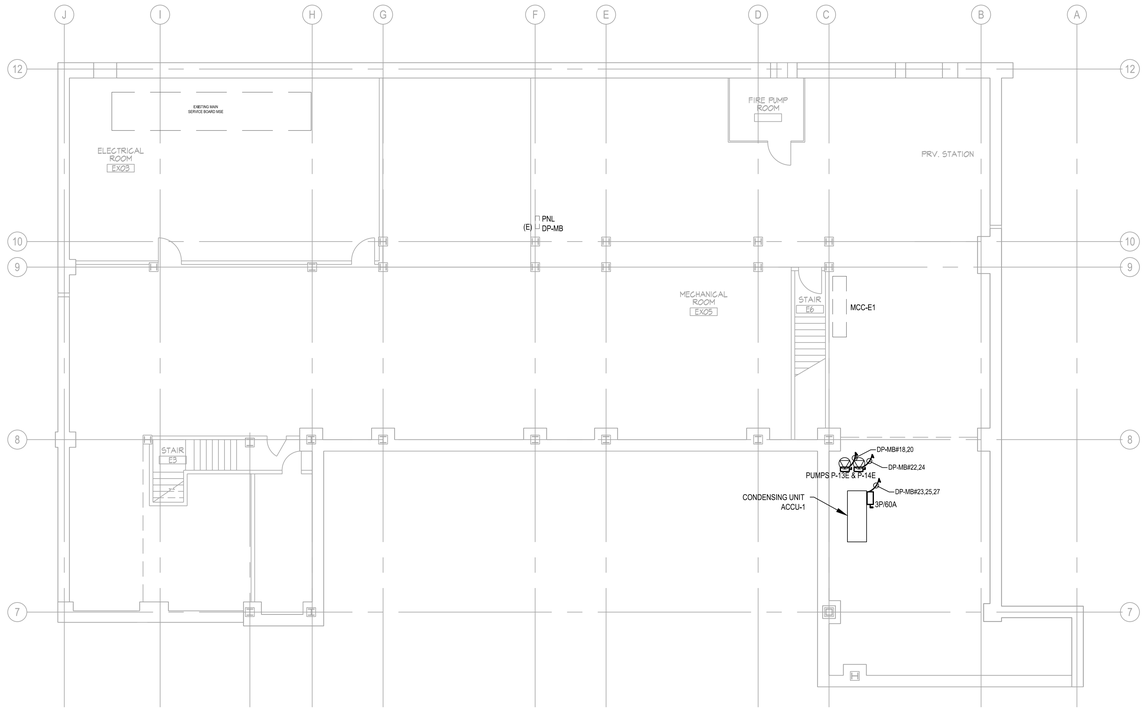
SCALE: 1/8"=1'-0" PROJECT#: 8969.110

SHEET TITLE:

1ST FLOOR ELECTRICAL LIGHTING PLAN

SHEET NUMBER:

E-101.00



1 SUBCELLAR PLAN

1/8"=1'-0"

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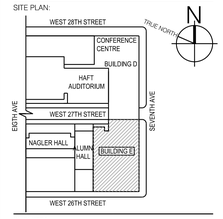

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SEAL & SIGNATURE:

DRAWN BY: AN CHECKED BY: EGV

SCALE: PROJECT#: 8969.110

1/8"=1'-0"

SHEET TITLE:

SUBCELLAR ELECTRICAL EQUIPMENT PLAN

SHEET NUMBER:

E-200.00

1 1ST FLOOR PLAN
1/8"=1'-0"

DEMOLITION KEY NOTES:

1	RELOCATED EXISTING DIMMING CONTROL PANEL, REFER TO E-011 AND E-100 SERIES FOR ADDITIONAL INFORMATION.
2	WALL MOUNTED DEVICES IN GALLERY: COLOR GRAY RECEPTACLES AND DATA WITH SATIN NICKEL FACEPLATES INSTALLED HORIZONTALLY
3	2P-30A FUSE DISCONNECT SWITCH (LOCKABLE TYPE) WITH ISOLATED SOLID NEUTRAL BAR 120/208V, TAP AHEAD OF THE DISCONNECTING MEANS OF PANEL SERVING THE AREA (MAX 5' LENGTH) AND CONNECT SPS VIA 3#10, 1#10-3/4"C.

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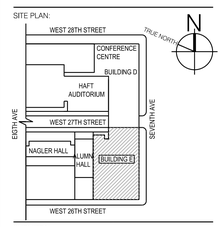

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SEAL & SIGNATURE:

DRAWN BY: AN CHECKED BY: EGV

SCALE: 1/8"=1'-0"

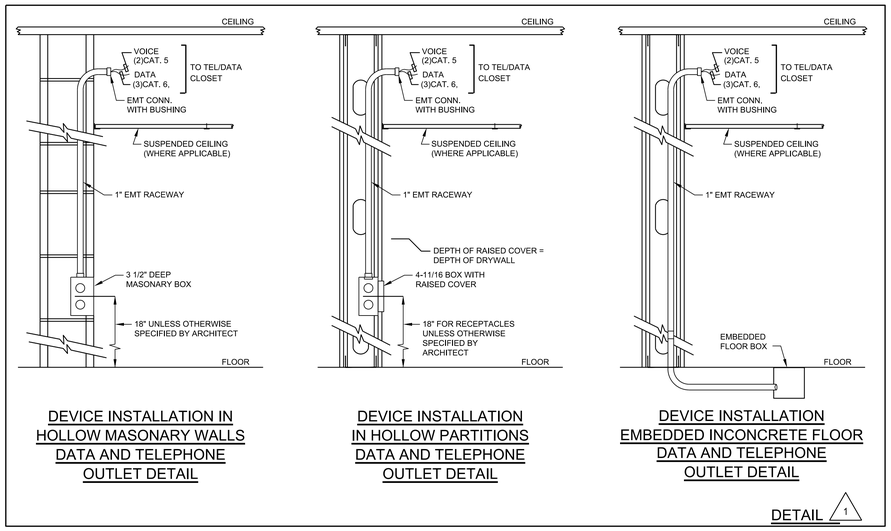
PROJECT #: 8969.110

SHEET TITLE:

1ST FLOOR ELECTRICAL POWER PLAN

SHEET NUMBER:

E-201.00

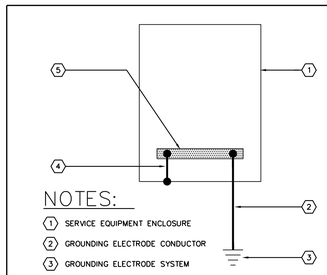


DEVICE INSTALLATION IN HOLLOW MASONARY WALLS DATA AND TELEPHONE OUTLET DETAIL

DEVICE INSTALLATION IN HOLLOW PARTITIONS DATA AND TELEPHONE OUTLET DETAIL

DEVICE INSTALLATION EMBEDDED INCONCRETE FLOOR DATA AND TELEPHONE OUTLET DETAIL

DETAIL 1

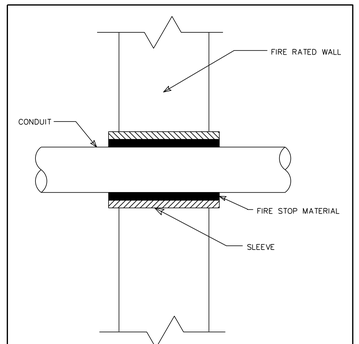


NOTES:

1. SERVICE EQUIPMENT ENCLOSURE
2. GROUNDING ELECTRODE CONDUCTOR
3. GROUNDING ELECTRODE SYSTEM
4. BOND TO ENCLOSURE
5. NEUTRAL BUS

BASIC SYSTEM GROUNDING

DETAIL 7



CONDUIT PENETRATION THRU FIRE RATED WALL

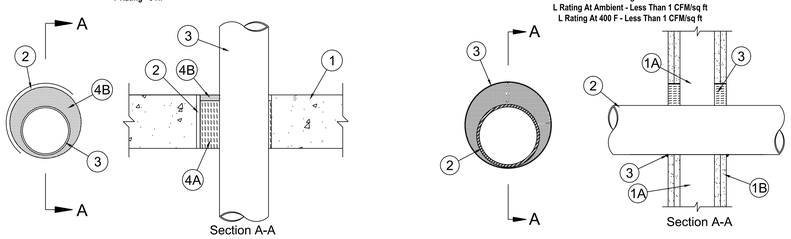
NOT TO SCALE

DETAIL 8

System No. C-AJ-1319
F-Rating - 3 Hr
T-Rating - 0 Hr

Guide XHEZ
Through-Penetration Firestop Systems

System No. W-L-1079
F Rating - 2 Hr
T Rating - 0 Hr
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft



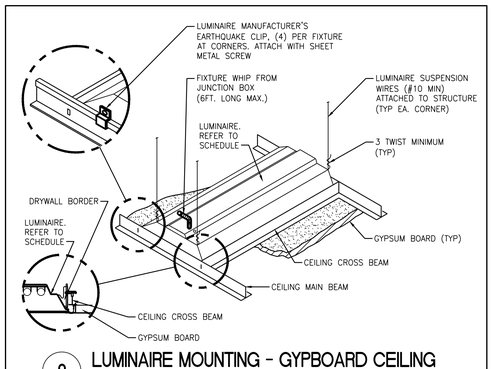
1. Floor or wall assembly -- min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. floor may also be constructed of any ul classified hollow core precast concrete units*. wall may also be constructed of any ul classified concrete blocks*. max diam of opening is 6 in.
see concrete blocks (cazt) and precast concrete units (clty) categories in the fire resistance directory for names of manufacturers.
2. Nonmetallic sleeve -- (optional) -- nom 6 in. diam (or smaller) schedule 40 polyvinyl chloride pipe sleeve cast or grouted into concrete flush with both surfaces of floor or wall.
3. Through penetrant -- one metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. the annular space between the pipe, conduit or tubing and the periphery of the opening shall be min 1/4 in. to max 1-3/4 in. pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. the following types and sizes of metallic pipes, conduits or tubing may be used:
A. Steel pipe -- nom 4 in. diam (or smaller) schedule 10 (or heavier) steel pipe.
B. Iron pipe -- nom 4 in. diam (or smaller) cast or ductile iron pipe.
C. Conduit -- nom 4 in. diam (or smaller) rigid steel conduit, nom 4 in. diam (or smaller) steel electrical metallic tubing or nom 1 in. diam (or smaller) flexible steel conduit.
D. Copper tubing -- nom 4 in. diam (or smaller) type l (or heavier) copper tubing.
E. Copper pipe -- nom 4 in. diam (or smaller) regular (or heavier) copper pipe.
4. Firestop system -- the firestop system shall consist of the following:
A. Packing material -- min 4 in. thickness of 4 pcf mineral wool batt insulation compressed and firmly packed into opening as permanent form. packing material to be recessed from top surface of floor or from both surfaces of wall as required to accommodate the required thickness of fill material. in floors constructed of hollow-core precast concrete units, mineral wool packing material to extend below exposed cores in precast concrete units.
B. Fill, void or cavity material*--sealant -- min 1/2 in. thickness of fill material applied within the annulus flush with top surface of floor or with both surfaces of wall. Specified technologies inc -- specseal series sss sealant or specseal lci sealant
*Bearing the ul classification mark

1. Wall assembly -- the 1 or 2 hr fire-rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual u300 or u400 series wall or partition design in the ul fire resistance directory and shall include the following construction features:
A. Studs -- wall framing may consist of either wood studs or steel channel studs. wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. oc. steel studs to be min 3-5/8 3-1/2 in. wide and spaced max 24 in. oc. when steel studs are used and the diam of opening exceeds the width of stud cavity, the opening shall be framed on all sides using lengths of steel stud installed between the vertical studs and screw-attached to the steel studs at each end. the framed opening in the wall shall be 4 to 6 in. wider and 4 to 6 in. higher than the diam of the penetrating item such that, when the penetrating item is installed in the opening, a 2 to 3 in. clearance is present between the penetrating item and the framing on all four sides.
B. Gypsum board* -- 5/8 in. thick, 4 ft wide with square or tapered edges. the gypsum board type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual u300 or u400 series design in the ul fire resistance directory. max diam of opening is 26 in. for steel stud walls. max diam of opening is 14-1/2 in. for wood stud walls.
the hourly f rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
2. Through penetrant -- one metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. pipe, conduit or tubing may be installed at an angle not greater than 45 degrees from perpendicular. the annular space between pipe, conduit or tubing and periphery of opening shall be min 0 in. (point contact) to max 2 in. pipe, conduit or tubing to be rigidly supported on both sides of wall assembly. the following types and sizes of metallic pipes, conduits or tubing may be used:
A. Steel pipe -- nom 24 in. diam (or smaller) schedule 10 (or heavier) steel pipe.
B. Iron pipe -- nom 24 in. diam (or smaller) cast or ductile iron pipe.
C. Conduit -- nom 4 in. diam (or smaller) steel electrical metallic tubing, nom 6 in. diam (or smaller) steel conduit or nom 1 in. diam (or smaller) flexible steel conduit.
D. Copper tubing -- nom 6 in. diam (or smaller) type l (or heavier) copper tubing.
E. Copper pipe -- nom 6 in. diam (or smaller) regular (or heavier) copper pipe.
3. Fill, void or cavity material* -- sealant -- min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall. at the point contact location between through penetrant and gypsum board, a min 3/8 in. diam bead of fill material shall be applied at the gypsum board/through penetrant interface on both surfaces of wall.
Specified technologies inc -- specseal series sss sealant or specseal lci sealant
*Bearing the ul classification mark

TYPICAL FIRE STOPPING FOR ALL FLOOR PENETRATIONS AND FIRE RATED GYPSUM WALLS

NO SCALE

DETAIL 9



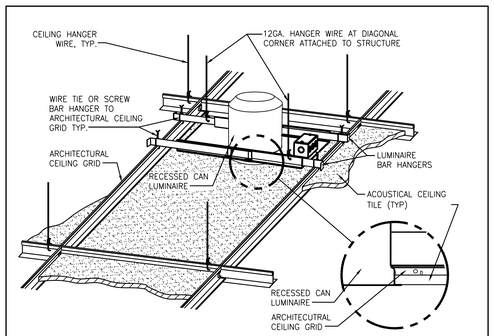
2 LUMINAIRE MOUNTING - GYPBOARD CEILING

NTS

TYPICAL FIRE STOPPING FOR ALL FIRE RATED GYPSUM WALLS

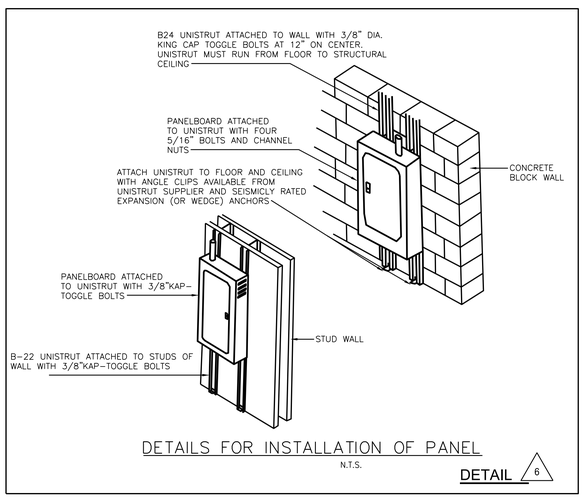
NO SCALE

DETAIL 10



3 DOWNLIGHT MOUNTING - LAY-IN CEILING

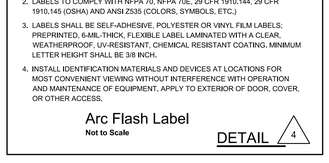
NTS



DETAILS FOR INSTALLATION OF PANEL

N.T.S.

DETAIL 6



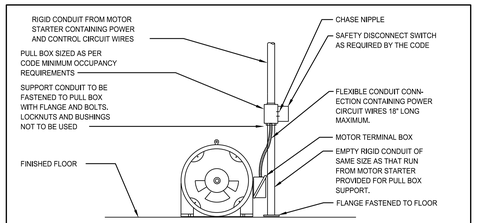
NOTES:

1. PROVIDE GENERIC ARC-FLASH LABELS AS SHOWN ON ALL ELECTRIC LOAD CENTERS, PANELBOARDS, SWITCHBOARDS, SWITCHGEAR, MOTOR CONTROLLERS, VFDS, ATS, ENCLOSED SWITCHES AND CIRCUIT BREAKERS, CONTROL PANELS, SPLICE BOXES AND ALL OTHER ELECTRICAL SERVICE & DISTRIBUTION EQUIPMENT.
2. LABELS TO COMPLY WITH NFPA 70, NFPA 70E, 29 CFR 1910.144, 29 CFR 1910.145 (OSHA) AND ANSI Z535 (COLORS, SYMBOLS, ETC.)
3. LABELS SHALL BE SELF-ADHESIVE, POLYESTER OR VINYL FILM LABELS; PREPRINTED, 6-MIL-THICK, FLEXIBLE LABEL LAMINATED WITH A CLEAR, WEATHERPROOF, UV-RESISTANT, CHEMICAL RESISTANT COATING, MINIMUM LETTER HEIGHT SHALL BE 3/8 INCH.
4. INSTALL IDENTIFICATION MATERIALS AND DEVICES AT LOCATIONS FOR MOST CONVENIENT VIEWING WITHOUT INTERFERENCE WITH OPERATION AND MAINTENANCE OF EQUIPMENT, APPLY TO EXTERIOR OF DOOR, COVER, OR OTHER ACCESS.

Arc Flash Label

Not to Scale

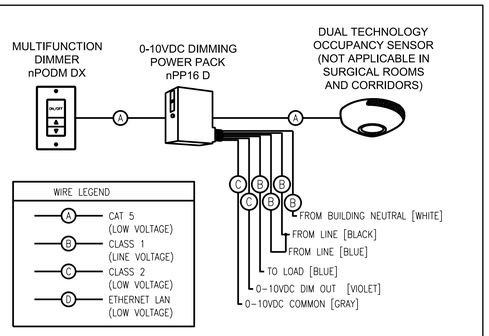
DETAIL 4



DETAIL SHOWING METHOD OF CONNECTION TO FLOOR MOUNTED MOTORS (INCLUDING MOUNTING OF CONTROL DEVICES IF REQUIRED)

NO SCALE

DETAIL 5



nLIGHT TYPICAL LIGHTING CONTROL WIRING DIAGRAM

DETAIL 11

NOT FOR CONSTRUCTION

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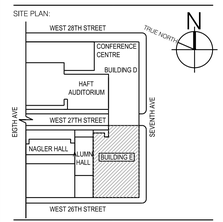
SITE PLAN:



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SEAL & SIGNATURE:

DRAWN BY: IAN CHECKED BY: CTD

SCALE: NTS

PROJECT#: 8969.110

SHEET TITLE:

ELECTRICAL DETAILS

SHEET NUMBER:

E-501.00

PANEL DESIGNATION: AP-E1A (EXISTING)

LOCATION:

VOLTAGE:	208Y/120	VOLTS	3 PHASE	4 WIRE	BUS TYPE				
MAIN:	225A	MCB		MLO		SHUNT TRIP MCB			
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE	1		
LUGS:	FEEDTHRU			SUBFEED	X	STAINLESS STEEL			
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL			
AIC RATING:	TBD	KA	NO. OF POLES:		42	LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
OFFICE E-111		20/1	1	0			2	20/1		OFFICE E-112
SECRETARY E-110, OFFICE E-111, OFFICE E-112		20/1	3		0		4	15/1		CONFERENCE E-113, OFFICE E-114
GUARD E-117		20/1	5			0	6	20/1		OFFICE E-114
LOCKER ROOM E-116 TOILET E-118		15/1	7	0			8	15/1		EXHIBIT E-130
GUARD E-117, RECEIVING E-120, SERVICE E-121		20/1	9		0		10	20/1		"
OFFICE E-114		20/1	11			0	12	20/1		MEN'S TOILET E-125 COAT ROOM E-128
EXHIBIT E-130		20/1	13	0			14	20/1		TEL. CL. E-104 LOBBY E-129
ELECTRIC CLOSET E-107		15/1	15		0		16	15/1		CH-1E
EXHIBIT E-130		20/1	17			0	18	15/1		CH-2E LOADING DOCK
TRACK		15/1	19	0			20	15/1		WIREMOLD REC.
TRACK		15/1	21		0		22	15/1		"
CORRIDOR E-129		20/1	23			0	24	20/1		CORRIDOR E-129
CORRIDOR E-129		20/1	25	0			26	20/1		CORRIDOR E-129
LOBBY E-129		20/1	27		0		28	20/1		EXHIBIT E-139
HEATER ELEC. CLOSET		15/1	29			0	30	20/1		"
WIREMOLD OUTLETS IN LONG HALLWAY		20/1	31	0			32	15/1		CAMERA - SECURITY
			33		0		34	20/1		CORRIDOR E-129
ROLL UP DOOR		20/3	35			0	36	30/1		TRACK
			37	0			38			DIMMING PANEL "AP-E1A" (FUTURE SPARE)
TRACK EMERGENCY LIGHTS		20/1	39		0		40	100/3		
TRACK EMERGENCY LIGHTS		20/1	41			0	42			
SUB-TOTALS				0	0	0				SUB-TOTALS

TOTAL CONNECTED LOAD (kVA):	0.0	TOTAL DEMAND LOAD (kVA):	0.0
TOTAL CONNECTED LOAD (AMPS):	0	TOTAL DEMAND LOAD (AMPS):	0
		PERCENT SPARE :	0%
		TOTAL MIN. AMPACITY (AMPS):	0

PANEL DESIGNATION: LP-E1G (EXISTING)

LOCATION:

VOLTAGE:	208Y/120	VOLTS	3 PHASE	4 WIRE	BUS TYPE				
MAIN:	100A	MCB		MLO		SHUNT TRIP MCB			
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE	1		
LUGS:	FEEDTHRU			SUBFEED	X	STAINLESS STEEL			
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL			
AIC RATING:	TBD	KA	NO. OF POLES:		42	LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
TRACK LIGHTS		20/1	1	0			2	20/1		HALLWAY RECEP.
TRACK LIGHTS		20/1	3		0		4	20/1		HALLWAY RECEP.
TRACK LIGHTS		20/1	5			0	6	20/1		HISTORY GALLERY RECEP.
TRACK LIGHTS		20/1	7	0			8	20/1		HISTORY GALLERY RECEP.
TRACK LIGHTS		20/1	9		0		10	20/1		HISTORY GALLERY RECEP.
TRACK LIGHTS		20/1	11			0	12	15/1		HISTORY GALLERY RECEP.
TRACK LIGHTS		20/1	13	0			14	15/1		HISTORY GALLERY RECEP.
TRACK LIGHTS		20/1	15		0		16	15/1		HISTORY GALLERY RECEP.
TRACK LIGHTS		20/1	17			0	18	15/1		HISTORY GALLERY RECEP.
TRACK LIGHTS		20/1	19	0			20	15/1		HISTORY GALLERY RECEP.
SPARE		15/1	21		0		22	15/1		SPARE
SPARE		15/1	23			0	24	15/1		SPARE
SPARE		15/1	25	0			26	15/1		SPARE
SPARE		15/1	27		0		28	15/1		SPARE
SPARE		15/1	29			0	30	15/1		SPARE
SPARE		15/1	31	0			32	15/1		SPARE
SPARE		15/1	33		0		34	15/1		SPARE
SPARE		15/1	35			0	36	15/1		SPARE
SPARE		15/1	37	0			38	15/1		SPARE
SPARE		15/1	39		0		40	15/1		SPARE
SPARE		15/1	41			0	42	15/1		SPARE
SUB-TOTALS				0	0	0				SUB-TOTALS

TOTAL CONNECTED LOAD (kVA):	0.0	TOTAL DEMAND LOAD (kVA):	0.0
TOTAL CONNECTED LOAD (AMPS):	0	TOTAL DEMAND LOAD (AMPS):	0
		PERCENT SPARE :	0%
		TOTAL MIN. AMPACITY (AMPS):	0

PANEL DESIGNATION: LP-E1A (EXISTING)

LOCATION:

VOLTAGE:	208Y/120	VOLTS	3 PHASE	4 WIRE	BUS TYPE				
MAIN:	225A	MCB		MLO		SHUNT TRIP MCB			
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE	1		
LUGS:	FEEDTHRU			SUBFEED	X	STAINLESS STEEL			
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL			
AIC RATING:	TBD	KA	NO. OF POLES:		42	LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
OFFICE E111		15/1	1	0			2	15/1		CONFERENCE E113
SECRETARY E110		15/1	3		0		4	15/1		OFFICE E114
OFFICE E112		15/1	5			0	6	15/1		LOCKER ROOM E116
GUARD E117 TOILET E118		15/1	7	0			8	15/1		CORRIDOR E129
OFFICE E119		15/1	9		0		10	15/1		"
RECEIVING E120		15/1	11			0	12	15/1		"
EXHIBIT E130		15/1	13	0			14	15/1		CORRIDOR E129
"		15/1	15		0		16	15/1		"
"		15/1	17			0	18	15/1		"
LOBBY E129		15/1	19	0			20	15/1		LOBBY E129
"		15/1	21		0		22	15/1		"
"		15/1	23			0	24	15/1		SERVICE E121
"		15/1	25	0			26	15/1		MEN'S E125 WOMEN'S E127
LOBBY E129		15/1	27		0		28	15/1		COAT ROOM E128
"		15/1	29			0	30	15/1		COAT ROOM
STAIR E-1		15/1	31	0			32	15/1		STAIR E-1
"		15/1	33		0		34	15/1		STAIR E-2
STAIR E-2		15/1	35			0	36	15/1		"
"		15/1	37	0			38	15/1		CORRIDOR E129
EXISTING LOAD		15/1	39		0		40	15/1		"
EXISTING LOAD		15/1	41			0	42	15/1		EXISTING LOAD
SUB-TOTALS				0	0	0				SUB-TOTALS

TOTAL CONNECTED LOAD (kVA):	0.0	TOTAL DEMAND LOAD (kVA):	0.0
TOTAL CONNECTED LOAD (AMPS):	0	TOTAL DEMAND LOAD (AMPS):	0
		PERCENT SPARE :	0%
		TOTAL MIN. AMPACITY (AMPS):	0

PANEL DESIGNATION: DP-E1A (EXISTING)

LOCATION:

VOLTAGE:	208Y/120	VOLTS	3 PHASE	4 WIRE	BUS TYPE				
MAIN:	600A	MCB	X	MLO		SHUNT TRIP MCB			
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE	1		
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL			
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL			
AIC RATING:	TBD	KA	NO. OF POLES:		24	LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
AP-E1A		125/3	1	0			2	150/3		LP-E1A
			3		0		4			
			5			0	6			
LP-E1G		125/3	7	0			8	200/3		DIMMING PANEL "LP-E1F", "LP-E1B" (FUTURE SPARE)
			9		0		10			
			11			0	12			
LP-E1H		100/3	13	0			14	90/3		LP-E1B
			15		0		16			
			17			0	18			
EXISTING LOAD		90/3	19	0			20	70/3		EXISTING LOAD
			21		0		22			
			23			0	24			
SUB-TOTALS				0	0	0				SUB-TOTALS

TOTAL CONNECTED LOAD (kVA):	0.0	TOTAL DEMAND LOAD (kVA):	0.0
TOTAL CONNECTED LOAD (AMPS):	0	TOTAL DEMAND LOAD (AMPS):	0
		PERCENT SPARE :	0%
		TOTAL MIN. AMPACITY (AMPS):	0

PANEL DESIGNATION: LP-E1B (EXISTING)

LOCATION:

VOLTAGE:	208Y/120	VOLTS	3 PHASE	4 WIRE	BUS TYPE				
MAIN:	100A	MCB		MLO		SHUNT TRIP MCB			
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE	1		
LUGS:	FEEDTHRU			SUBFEED	X	STAINLESS STEEL			
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL			
AIC RATING:	TBD	KA	NO. OF POLES:		24	LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
EXISTING LOAD		15/1	1	0			2	15/1		EXISTING LOAD
EXISTING LOAD		20/1	3		0		4	20/1		EXISTING LOAD
SPARE		15/1	5			0	6	15/1		EXISTING LOAD
HIGH CEILING		15/1	7	0			8	15/1		EXISTING LOAD
HIGH CEILING		15/1	9		0		10	15/1		EXISTING LOAD
HIGH CEILING		15/1	11			0	12	15/1		BY SECURITY DESK
MUSEUM WALL		15/1	13	0			14	20/1		TRACK LIGHTS/HI-HATS
BY WINDOW		15/1	15		0		16	15/1		EXISTING LOAD
BY WINDOW		15/1	17			0	18	20/1		TRACK LIGHTS/HI-HATS
TRACK LIGHTS/HI-HATS		20/1	19	0			20	100/3		DIMMING PANEL "LP-E1E"
TRACK LIGHTS/HI-HATS		20/1	21		0		22			
LOWER LOBBY		15/1	23			0	24			
SUB-TOTALS				0	0	0				SUB-TOTALS

TOTAL CONNECTED LOAD (kVA):	0.0	TOTAL DEMAND LOAD (kVA):	0.0
TOTAL CONNECTED LOAD (AMPS):	0	TOTAL DEMAND LOAD (AMPS):	0
		PERCENT SPARE :	0%
		TOTAL MIN. AMPACITY (AMPS):	0

PANEL DESIGNATION: LP-E1H (NEW)

LOCATION:

VOLTAGE:	208Y/120	VOLTS	3 PHASE	4 WIRE	BUS TYPE				
MAIN:	100A	MCB		MLO		SHUNT TRIP MCB			
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE	1		
LUGS:	FEEDTHRU			SUBFEED	X	STAINLESS STEEL			
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL			
AIC RATING:	TBD	KA	NO. OF POLES:		30	LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
HUMIDIFIER 3#6+1#10G IN 1"C	7,196.80	60/3	1	10,795			2	30/3	3,598.40	INLINE FAN 3#10+1#10G IN 3/4"C
	7,196.80		3		10,795		4		3,598.40	
	7,196.80		5			10,795	6		3,598.40	
LIGHTING INVERTER 3#10+1#10G IN 3/4"C	3,598.40	30/3	7	3,598			8	20/1		ELECTRONIC TRAP PRIMER
	3,598.40		9		3,598		10	20/1		CABINET HEATER CH-1E
	3,598.40		11			3,598	12	20/1		SPARE
CONTROL PANEL		20/1	13	0			14	20/1		SPARE
VAV W/ REHEAT		20/1	15		0		16	20/1		SPARE
SPARE		20/1	17			0	18	20/1		SPARE
SPARE		20/1	19	0			20	20/1		SPARE
SPARE		20/1	21		0		22	20/1		SPARE
SPARE		20/1	23			0	24	20/1		SPARE
SPARE		20/1	25	0			26	20/1		SPARE
SPARE		20/1	27		0		28	20/1		SPARE
SPARE		20/1	29			0	30	20/1		SPARE
SPARE		20/1	31	0			32	20/1		SPARE
SPARE		20/1	33		0		34	20/1		SPARE
SPARE		20/1	35			0	36	20/1		SPARE
SPARE		20/1	37	0			38	20/1		SPARE
SPARE		20/1	39		0		40	20/1		SPARE
SPARE		20/1	41			0	42	20/1		SPARE
SUB-TOTALS				14,394	14,394	14,394				SUB-TOTALS

TOTAL CONNECTED LOAD (kVA):	43.2	TOTAL DEMAND LOAD (kVA):	43.2
TOTAL CONNECTED LOAD (AMPS):	120	TOTAL DEMAND LOAD (AMPS):	120
		PERCENT SPARE :	0%
		TOTAL MIN. AMPACITY (AMPS):	120

PANEL DESIGNATION: LIGHTING (EXISTING)

LOCATION:

VOLTAGE:	208Y/120	VOLTS	3 PHASE	4 WIRE	BUS TYPE				
MAIN:	125A	MCB		MLO	X	SHUNT TRIP MCB			
MOUNTING:	SURFACE		X	FLUSH		NEMA ENCLOSURE	1		
LUGS:	FEEDTHRU			SUBFEED		STAINLESS STEEL			
GND BUS:	NORMAL		X	ISOL.		200% NEUTRAL			
AIC RATING:	TBD	KA	NO. OF POLES:		18	LOCKING BREAKERS			

REMARKS:

LOAD:	VA	TRIP	NO.	A	B	C	NO.	TRIP	VA	LOAD:
SPACE			1	0			2			SPACE
SPACE			3		0		4			SPACE
SPACE			5			0	6			SPACE
EXISTING LOAD		15/1	7	0			8	20/1		EXISTING LOAD
EXISTING LOAD		15/1	9		0		10	15/1		EXISTING LOAD
EXISTING LOAD		15/1	11			0	12	15/1		EXISTING LOAD
EXISTING LOAD		15/1	13	0			14	20/1		EXISTING LOAD
EXISTING LOAD		15/1	15		0		16	15/1		EXISTING LOAD
EXISTING LOAD		15/1	17			0	18	15/1		EXISTING LOAD
SUB-TOTALS				0	0	0				SUB-TOTALS

TOTAL CONNECTED LOAD (kVA):	0.0	TOTAL DEMAND LOAD (kVA):	0.0
TOTAL CONNECTED LOAD (AMPS):	0	TOTAL DEMAND LOAD (AMPS):	0
		PERCENT SPARE :	0%
		TOTAL MIN. AMPACITY (AMPS):	0

PANELBOARD NOTES

1. CONTRACTOR SHALL REMOVE CIRCUITRY AFFECTED BY THE DEMOLITION SCOPE AS INDICATED ON THE ELECTRICAL DEMOLITION DRAWING.
2. CONTRACTOR SHALL CIRCUIT TRACE TO DETERMINE IF AFFECTED CIRCUITS FEED AREAS OUTSIDE THE SCOPE WORK AREA AND MAINTAIN THOSE CIRCUITS ACCORDINGLY.
3. CIRCUITS WHICH SOLELY FEED THE SCOPE OF WORK AREA SHALL BE REMOVED IN THEIR ENTIRETY (WIRING AND CONDUIT / CABLING) BACK TO SOURCE
4. REMOVED CIRCUITS SHALL MAINTAIN THEIR EXISTING CIRCUIT BREAKERS WHICH SHALL BE PLACED IN THE "OFF" POSITION AND LABELED "SPARE" IN THE UPDATED PANEL DIRECTORY.

NOT FOR CONSTRUCTION

NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT History Gallery Renovation

Project No. 2448

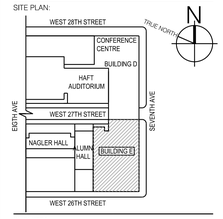
282 7TH AVE
NEW YORK, NY 10001
212.217.7999

ARCHITECT
SAMUEL ANDERSON ARCHITECTS
307 WEST 38TH ST, SUITE 1901
NEW YORK NY 10018
212.564.7002
SAMUELANDERSON.COM

MEP ENGINEER
MG ENGINEERING D.P.C
116 WEST 32ND STREET
NEW YORK, NY 10001
212.643.9055
MG Engineering D.P.C. / we engineer success
116 West 32nd Street, 12th Floor | New York, N.Y. 10001
P 212.643.9055 | info@mgedpc.net | www.mgedpc.net

LIGHTING DESIGNER
JEFFREY NASH LIGHTING DESIGN
150 WEST 28TH STREET, SUITE 1603
NEW YORK, NY 10001
212.206.8356

SITE PLAN:



SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
	DESIGN DEVELOPMENT	11.24.2025
	CD PROGRESS	03.10.2026
	BID SET	03.27.2026
	REVISED BID SET	04.13.2026
	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: IAN CHECKED BY: EGV

SCALE: NTS PROJECT#: 8969.110

SHEET TITLE:

ELECTRICAL PANEL SCHEDULES

SHEET NUMBER:

E-701.00

PLUMBING SYMBOLS

	DOMESTIC COLD WATER PIPING
	VENT PIPING
	SOIL, WASTE OR SANITARY PIPING
	BURIED PIPING
L	LEADER PIPING OR STORM (ST)
L(OF)	LEADER OVERFLOW
IW	INDIRECT WASTE PIPING
	CLEAN OUT/PLUGGED OUTLET
	CAPPED OUTLET
	CLEAN-OUT DECK PLATE (FLOOR PLAN)
	P-TRAP (FLOOR PLAN)
	HOSE BIB (W/VB)
	VALVE ON VERTICAL
FAI	FRESH AIR INLET (FAI)
	ELBOW TURNED UP
	ELBOW TURNED DOWN
	BOTTOM PIPE CONNECTION
	TOP PIPE CONNECTION
	SLOPE CHANGE IN PIPE ELEVATION (ROLL DOWN)
OPEN CLOSED	GATE VALVE
	GLOBE VALVE
	CHECK VALVE
	PRESSURE RELIEF VALVE
	ANGLE PRESSURE RELIEF VALVE
	ANGLE PRESSURE REDUCING VALVE (PRV)
	FIXTURE STOP VALVE
OPEN CLOSED	OUTSIDE SCREW & YOKE (OS & Y) VALVE
OPEN CLOSED	BALL VALVE
	ARROW INDICATES DIRECTION OF FLOW
	PITCH PIPE DOWN IN DIRECTION OF ARROW
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	PIPE SLEEVE
	UNION
	CAPPED PIPE WITH SHUT-OFF VALVE
	'Y' TYPE STRAINER WITH BLOW-OFF VALVE
	TRAP (RISER DIAGRAM)
JL	VENT THRU ROOF (RISER DIAGRAM)
PD/FD R.D. P.D.	FLOOR/AREA/ROOF OR PLENUM DRAIN (PLAN VIEW)
PD/FD R.D. P.D.	FLOOR, AREA ROOF DRAIN (RISER DIAGRAM)
RPZ	REDUCED PRESSURE ZONE BACKFLOW
P # — PLUMBING (CW, HW, S, V) RISER	RISER SERVICE / RISER NUMBER
G # — GAS RISER DESIGNATION	RISER SERVICE / RISER NUMBER
L # — LEADER RISER DESIGNATION	RISER SERVICE / RISER NUMBER
# P-### — DETAIL	DETAIL / DRAWING LOCATION
# P-## — SECTION	DETAIL / DRAWING LOCATION
#	REVISION NUMBER
	CONNECT NEW WORK TO EXISTING
	DISCONNECT EXISTING WORK & CAP

PLUMBING ABBREVIATIONS

AC	AIR CONDITIONING	FF	FINISH FLOOR	PERF	PERFORATED
AD	ACCESS DOOR	FIN	FINISH(ED)	PL	PLATE
ADJ	ADJUSTABLE	FIN FL	FINISH(ED) FLOOR	PLBG	PLUMBING
AFF	ABOVE FINISHED FLOOR	FIN GR	FINISH(ED) GRADE	PO	PLUGGED OUTLET
AFWH	ANTI-FREEZE WALL HYDRANT	FL	FLOOR	PRV	PRESSURE REDUCING VALVE
AP	ACCESS PANEL	FT	FEET	PSIG	POUNDS PER SQUARE INCH (GAUGE)
BFP	BACKFLOW PREVENTER	FTG	FITTING	PTN	PARTITION
BLDG	BUILDING	FXT	FIXTURE	RCV	RISER CONTROL VALVE
BLKHD	BULKHEAD	G	GAS	RD	ROOF DRAIN
BOP	BOTTOM OF PIPE	GA	GAUGE	REFR	REFRIGERATOR
BOT	BOTTOM	GC/CM	GENERAL CONTRACTOR/CONST. MANAGER	REINF	REINFORCED
BR	BRANCH	GAL	GALLONS	REQT'S	REQUIREMENTS
BSMT	BASEMENT	GALV	GALVANIZED	REV	REVISED
BT	BATHTUB	GD	GARAGE DRAIN	RM	ROOM
CAB	CABINET	GPM	GALLONS PER MINUTE	RPM	REVOLUTIONS PER MINUTE
CB	CATCH BASIN	GR	GRADE	RPZ	REDUCED PRESSURE ZONE BACKFLOW PREVENTER
CF	CUBIC FEET	GV	GAS VENT	RV	RELIEF VALVE
CI	CAST IRON	GW	GREASE WASTE	S	SANITARY/SOIL
CLG	CEILING	GWR	GREY WATER REUSE	SA	SHOCK ABSORBER
CLOS	CLOSET	HB	HOSE BIBB	SCHED	SCHEDULE
CM	COFFEE MAKER	HGT	HEIGHT	SD	SUMP DISCHARGE
CO	CAPPED OUTLET	HORIZ	HORIZONTAL	SECT	SECTION
CODP	CLEANOUT DECK PLATE	HP	HORSEPOWER/HIGH POINT	SH	SHOWER
COL	COLUMN	HR	HOUR	SHT	SHEET
COMP'T	COMPARTMENT	HTG	HEAT(ING)	SK	SINK
CONC	CONCRETE	HTR	HEATER	SLV	SLEEVE
CONN	CONNECTION	HVAC	HEATING, VENTILATION, & AIR CONDITIONING	SIM	SIMILAR (TO)
CONST	CONSTRUCTION	HW	HOT WATER	SPO	SOIL PLUGGED OUTLET
CONT	CONTINUATION	HWC	HOT WATER CIRCULATION	SS	STAINLESS STEEL
CORR	CORRIDOR	HWH	HOT WATER HEATER	SQ	SQUARE
COWP	CLEANOUT WALL PLATE	HZ	HIGH ZONE	SQ.FT.	SQUARE FOOT (+/')
CT	COOLING TOWER	ID	INSIDE DIAMETER	SP	STREET PRESSURE
CV	CHECK VALVE	IE	INVERT ELEVATION	STD	STANDARD
CW	COLD WATER	INSUL	INSULATION	STL	STEEL
CWPD	COLD WATER PUMP DISCHARGE	IRR	IRRIGATION	STOR	STORAGE
CWVO	COLD WATER VALVED OUTLET	IW	INDIRECT WASTE	STRUCT	STRUCTURAL
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY	JC	JANITOR'S CLOSET	SUSP	SUSPENDED
DET	DETAIL	L	LEADER	TD	TERRACE DRAIN
DF	DRINKING FOUNTAIN	LAB	LABORATORY	TDH	TOTAL DYNAMIC HEAD
DIA	DIAMETER	LAV	LAVATORY	TEMP	TEMPORARY
DIAG	DIAGONAL	LP	LOW POINT	TER	TERRACE
DIAM	DIAMETER	LZ	LOW ZONE	THRU	THROUGH
DIP	DUCTILE IRON PIPE	MAX	MAXIMUM	TOS	TOP OF SLAB
DIM	DIMENSION	MECH	MECHANICAL	TP	TRAP PRIMER
DN	DOWN	MEMB	MEMBRANE	TTB	TIGHT TO BEAM
DR	DRAIN	MER	MECHANICAL EQUIPMENT ROOM	TYP.	TYPICAL
DW	DISHWASHER	MEZZ	MEZZANINE	UON	UNLESS OTHERWISE NOTED
DWG	DRAWING	MFR	MANUFACTURER	UR	URINAL
EA	EACH	MH	MANHOLE	V	VENT
ED	EJECTOR DISCHARGE	MIN	MINIMUM	VB	VACUUM BREAKER
EL	ELEVATION	MISC	MISCELLANEOUS	VCO	VALVED & CAPPED OUTLET
ELEC	ELECTRICAL	MTD	MOUNTED	VERT	VERTICAL
ELEV	ELEVATOR	MTL	METAL	VEST	VESTIBULE
EMER	EMERGENCY	NC	NORMALLY CLOSED	VO	VALVED OUTLET
EMR	ELEVATOR MACHINE ROOM	NIC	NOT IN CONTRACT	VPO	VENT PLUGGED OUTLET
ENCL	ENCLOSURE	No	NUMBER	VTR	VENT THROUGH ROOF
ENG	ENGINEER	NO	NORMALLY OPEN	W	WASTE
ENTR	ENTRANCE	NOM	NOMINAL	W/	WITH
EOS	END/EDGE OF SLAB	NTS	NOT TO SCALE	WC	WATER CLOSET
EQUIP	EQUIPMENT	NFWH	NON FREEZE WALL HYDRANT	WPO	WASTE PLUGGED OUTLET
EWC	ELECTRIC WATER COOLER	NFGH	NON FREEZE GROUND HYDRANT	WH	WALL HYDRANT
EWH	ELECTRIC WATER HEATER	OC	ON CENTER	WP	WATER PROOFING / WATER PROOFED
EXH	EXHAUST	OD	OVERFLOW DRAIN		
EXIST	EXISTING	OF	OVERFLOW		
EXP	EXPRESS	OFF	OFFICE		
EXT	EXTERIOR	OPNG	OPENING		
FAI	FRESH AIR INTAKE	OVHD	OVERHEAD		
FD	FLOOR DRAIN	PAN	PANEL		
FDN	FOUNDATION	PD	PLAZA DRAIN		

2022 NYC PLUMBING NOTES

THE PLUMBING SYSTEMS (SANITARY, WASTE, STORM, VENT, GAS, WATER DISTRIBUTION) AND ALL ASSOCIATED EQUIPMENT WILL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE FULL REQUIREMENTS OF THE 2022 BUILDING CODE OF THE CITY OF NEW YORK AS CITED IN CHAPTER 29, THE 2022 NEW YORK CITY PLUMBING CODE AND THE 2022 FUEL GAS CODE.

1. THE SANITARY SYSTEM SHALL BE PROVIDED IN FULL ACCORDANCE WITH THE GENERAL PROVISIONS OF CHAPTER 7.
2. THE MATERIALS USED IN THE PLUMBING SYSTEM SHALL BE PROVIDED IN FULL ACCORDANCE WITH CHAPTER 3.
3. EQUIPMENT HOOK-UP AND THE JOINING OF PIPING SHALL BE IN FULL COMPLIANCE WITH CHAPTER 4.
4. THE INSTALLATION OF FIXTURES SHALL BE IN FULL ACCORDANCE WITH SECTION PC CHAPTER 4.
5. TRAPS FOR FIXTURES AND DRAIN LINES SHALL BE PROVIDED AND CLEANOUTS INSTALLED IN FULL COMPLIANCE WITH CHAPTER 10 AND CLEANOUTS INSTALLED IN FULL COMPLIANCE WITH CHAPTER 7.
6. VERTICAL AND HORIZONTAL PIPING SHALL BE HUNG AND SUPPORTED AS DIRECTED IN SPECIFICATIONS AND WITH THE FULL COMPLIANCE WITH SECTION CHAPTER 3.
7. THE WATER SUPPLY SYSTEMS SHALL BE INSTALLED AND MAINTAINED IN FULL COMPLIANCE WITH CHAPTER 6.
8. THE SANITARY DRAINAGE SYSTEM SHALL BE SIZED AND INSTALLED IN FULL COMPLIANCE WITH SECTIONS CHAPTER 7.
9. THE VENT PIPING FOR THE SANITARY DRAINAGE SYSTEM SHALL BE INSTALLED IN FULL COMPLIANCE WITH CHAPTER 9.
10. THE STORM DRAINAGE SYSTEM AND PIPING SHALL BE INSTALLED IN FULL COMPLIANCE WITH CHAPTER 11.
11. RODENT PROOFING SHALL BE IN ACCORDANCE WITH SECTION PC 304.
12. TEMPORARY TOILET FACILITIES SHALL BE PROVIDED FOR WORKMAN AS PER SECTION PC 311.
13. ALL TRENCHING SHALL BE DONE IN ACCORDANCE WITH SECTION PC 306.

GENERAL PLUMBING NOTES

1. EACH BIDDER SHALL VISIT THE SITE AND BECOME INFORMED AS TO THE CONDITION OF THE PREMISES AND THE EXTENT AND CHARACTER OF WORK REQUIRED. NO ADDITIONAL COMPENSATION WILL BE APPROVED DUE TO THE FIELD CONDITIONS.
2. ALL EXISTING SYSTEMS SHALL BE LEFT IN PERFECT WORKING ORDER UPON COMPLETION OF ALL NEW WORK.
3. EXACT SIZES AND LOCATIONS OF ALL EXISTING PIPING SHALL BE VERIFIED ON THE SITE.
4. NO EXISTING OR REMOVED PIPING SHALL BE REUSED UNLESS OTHERWISE INDICATED.
5. THIS CONTRACTOR SHALL NOT INTERRUPT ANY OF THE SERVICES OF THE EXISTING BUILDING NOR INTERFERE WITH THE SERVICES IN ANY WAY WITHOUT THE EXPRESSED PERMISSION OF THE OWNER. SUCH INTERRUPTIONS AND INTERFERENCES SHALL BE MADE AS BRIEF AS POSSIBLE.
6. UNDER NO CIRCUMSTANCES WILL THIS CONTRACTOR OR HIS WORKMEN BE PERMITTED TO USE ANY PART OF THE BUILDING AS A SHOP, EXCEPT PART DESIGNATED BY THE OWNER FOR SUCH PURPOSES.
7. UNNECESSARY NOISE SHALL BE AVOIDED AT ALL TIMES AND NECESSARY NOISE SHALL BE REDUCED TO A MINIMUM.
8. WHERE THE WORK MAKES TEMPORARY SHUT DOWN OF SERVICES UNAVOIDABLE, THEY SHALL BE MADE AT NIGHT OR AT SUCH TIMES THAT WILL CAUSE THE LEAST INTERFERENCE WITH THE ESTABLISHED OPERATING ROUTINE OF THE BUILDING.
9. THIS CONTRACTOR SHALL ARRANGE ALL WORK CONTINUOUSLY, INCLUDING OVERTIME AS REQUIRED, TO ASSURE THAT SERVICES WILL BE SHUT DOWN AND CUT-INS ONLY DURING THE TIME ACTUALLY REQUIRED TO MAKE THE NECESSARY CONNECTION TO EXISTING WORK.
10. THIS CONTRACTOR SHALL GIVE AMPLE WRITTEN NOTICE IN ADVANCE TO THE OWNER OF ANY REQUIRED SHUT DOWNS.
11. ANY AND ALL REQUIRED DEMOLITION WORK TO BE PERFORMED ABOVE EXISTING SUSPENDED CEILINGS AND FURRED OUT WALLS SHALL BE DONE AT THE TIME WHEN THE EXISTING CEILINGS AND FURRED OUT WALLS ARE REMOVED BY THE GENERAL CONTRACTOR.
12. TO ENSURE CONTINUOUS OPERATION, MAKE ALL NECESSARY TEMPORARY CONNECTIONS BETWEEN NEW AND EXISTING WORK. ALL COST RESULTING FROM TEMPORARY SHUTDOWNS SHALL BE BORNE BY THIS CONTRACTOR.
13. ALL VENT, HOT WATER CIRCULATION, HOT AND COLD WATER PIPING ARE AT CEILING OR IN HUNG CEILING: EXCEPT IN PIPE CHASES OR OTHERWISE NOTED.
14. CONTRACTOR SHALL CHECK AND VERIFY THE EXACT LOCATION OF ALL PIPE PENETRATIONS, PIPE ELEVATIONS, DRAINS, ETC.
15. ACCESS DOORS SHALL BE PROVIDED FOR ALL CLEANOUTS, VALVES, FLUSH VALVES, AND ANY OTHER EQUIPMENT AND ACCESSORIES THAT MAY REQUIRE ACCESS FOR MAINTENANCE OR OPERATION WHICH ARE LOCATED BEHIND WALLS AND PARTITIONS OR CONCEALED IN HUNG CEILINGS. COORDINATE INSTALLATION WITH GENERAL CONTRACTOR.
16. THIS CONTRACTOR SHALL OBTAIN A COPY OF THE BUILDING RULES AND REGULATIONS AND PROVIDE ALL WORK AS REQUIRED TO CONFORM TO ALL REQUIREMENTS.
17. COORDINATE EXACT ROUTING OF PIPING IN THE FIELD WITH EXISTING CONDITIONS AND WORK OF OTHER TRADES. ALL WORK SHALL BE SCHEDULED AND COORDINATED TO ACCOMMODATE BUILDING.
18. THIS CONTRACTOR SHALL PROVIDE CUTTING AND PATCHING OF ALL WORK AS REQUIRED INCLUDING WORK OUTSIDE OF THE GENERAL PROJECT LIMIT LINES (I.E. CEILING OF THE FLOOR BELOW).
19. THIS CONTRACTOR SHALL PROVIDE CAPPED/VALVED OUTLETS FOR FUTURE CONNECTIONS WHENEVER CONNECTING INTO AN EXISTING CAPPED/ VALVED OUTLET. SIZE OF NEW CAPPED/VALVED OUTLET SHALL MATCH EXISTING.

PLUMBING DRAWING LIST

P-001	PLUMBING NOTES, SYMBOLS, ABBREVIATIONS & DRAWING LIST
P-100	SUB CELLAR & CELLAR PLUMBING PART PLANS
P-101	1ST FLOOR PLUMBING PLAN
P-801	PLUMBING DETAILS

NYC DOB SPECIAL INSPECTION NOTES

1. AN INDEPENDENT SPECIAL INSPECTOR SHALL BE RETAINED TO PERFORM SPECIAL INSPECTIONS AS WELL AS FILE FORM TR-1 FOR PLUMBING SYSTEM DESIGN AS DOCUMENTED ON THESE PLANS IN ACCORDANCE WITH THE NYC BUILDING CODE.
2. SPECIAL INSPECTION REQUIRED FOR FIRE-RESISTANT PENETRATIONS AND JOINTS PER 2022 NYCBC 1705.17.
3. SPECIAL INSPECTION REQUIRED FOR POST-INSTALLED ANCHORS PER 2022 NYCBC 1705.37.

NYC DOB FILING NOTE

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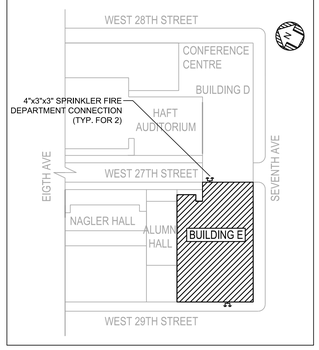
NYC FLOOD HAZARD AREA NOTES

- FEMA FLOOD MAPS OBTAINED FROM FEMA FLOOD MAP SERVICE CENTER WEBSITE. DESIGN APPLICANT MAKES NO CLAIM AS TO THEIR ACCURACY.
- PROPERTY IS NOT IN SPECIAL FLOOD HAZARD AREA PER EFFECTIVE 2007 FIRM.

PLOT PLAN AND ZONING DATA

PROJECT ADDRESS: 282 7TH AVENUE NY, NY 10001
TAX BLOCK: 776
TAX LOT: 40



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NEW YORK CITY ENERGY CONSERVATION CODE

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 NEW YORK CITY ENERGY CONSERVATION CODE.

FIT History Gallery Renovation

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LIGHTING DESIGNER
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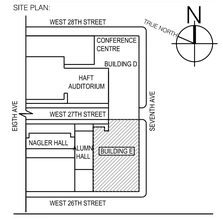
212.206.8356

SITE PLAN:



SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
	DESIGN DEVELOPMENT	11.24.2025
	CD PROGRESS	03.10.2026
	BID SET	03.27.2026
	REVISED BID SET	04.13.2026
	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: --
CHECKED BY: --
SCALE: N.T.S
PROJECT#: 8969.110

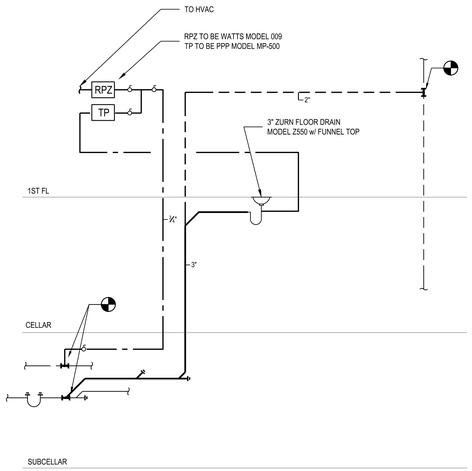
SHEET TITLE:

PLUMBING NOTES SYMBOLS, & DRAWING LIST

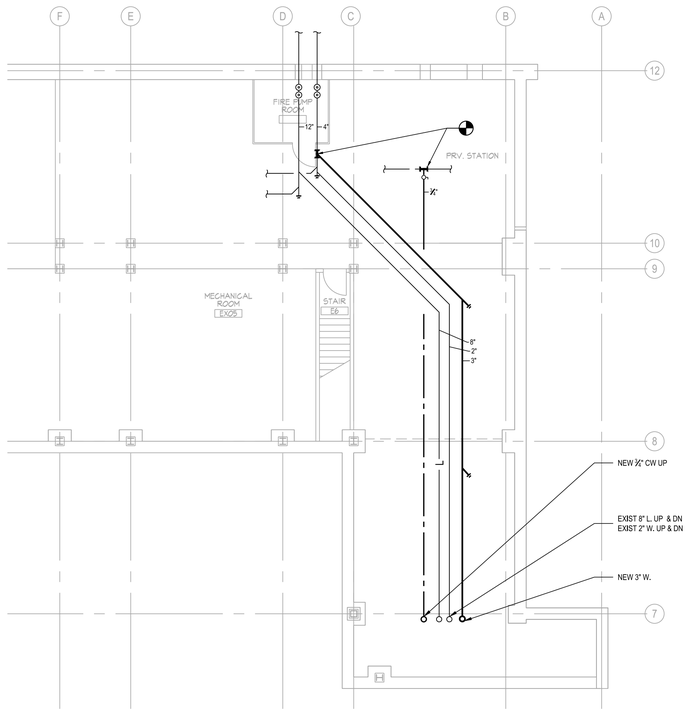
DOB NOW JOB#

SHEET NUMBER:

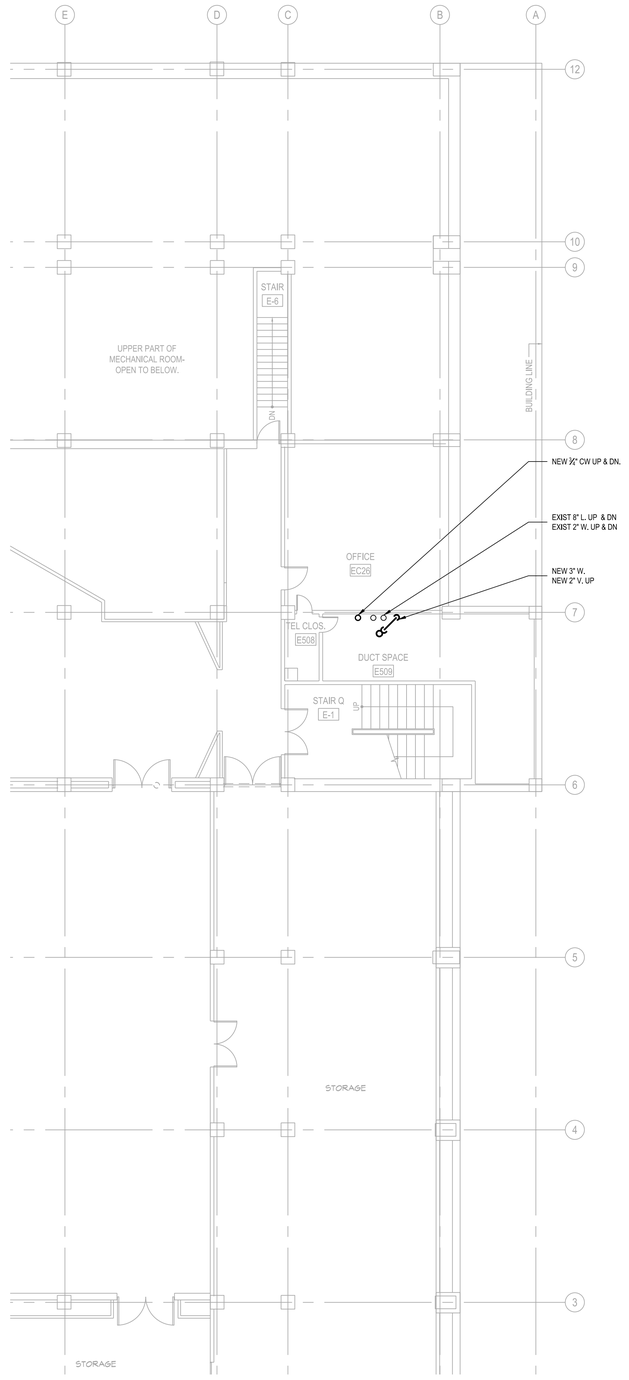
P-001.00



PART RISER DIAGRAM



SUB-CELLAR PART PLAN - 1'-0" = ⅛"



CELLAR PART PLAN - 1'-0" = ⅛"

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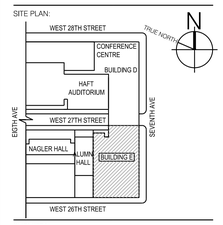

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CHECKED BY: --

SCALE:
1/8"=1'-0"

PROJECT #: 8969.110

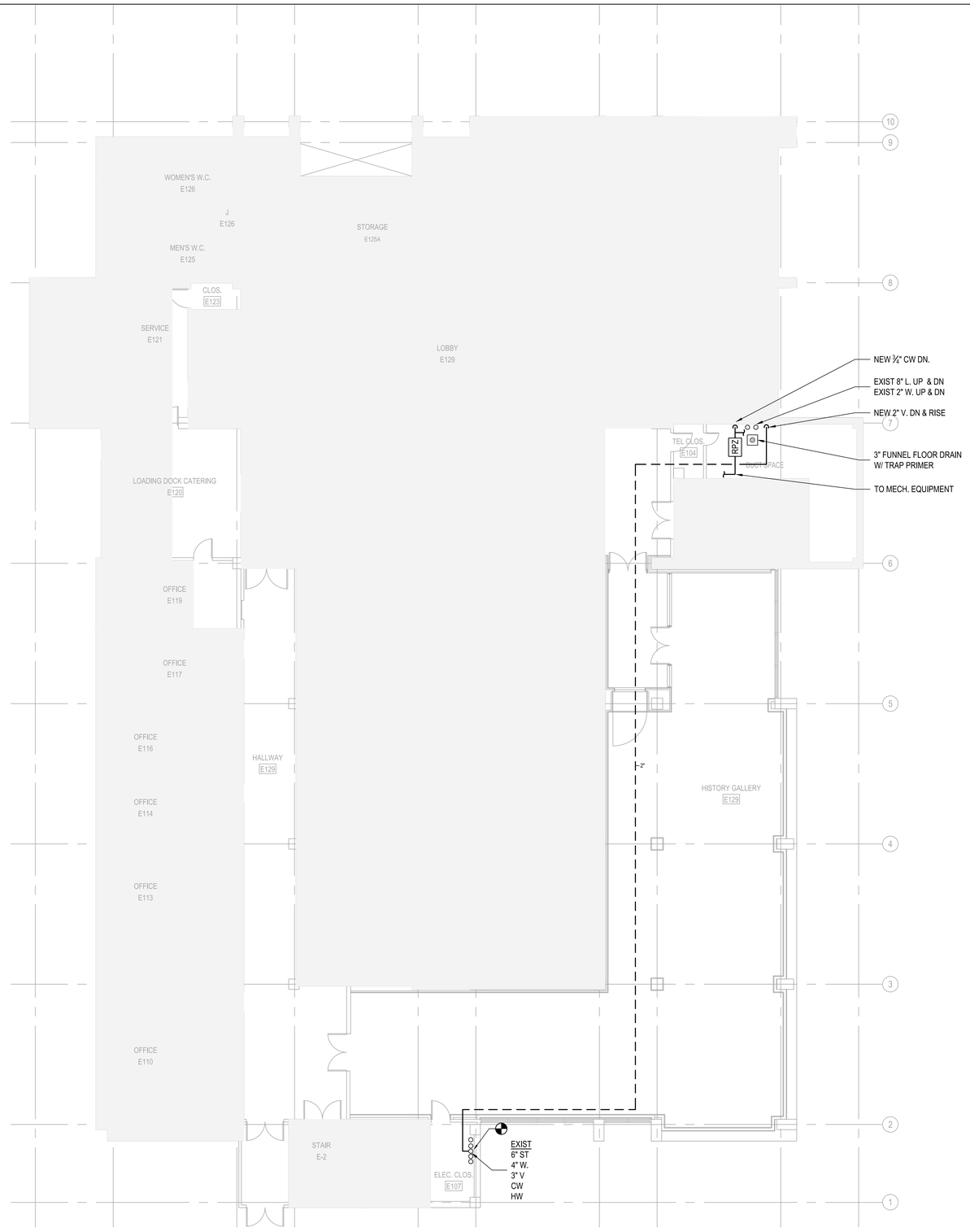
SHEET TITLE:

SUB CELLAR & CELLAR PLUMBING PART PLANS

DOB NOW JOB#

SHEET NUMBER:

P-100.00



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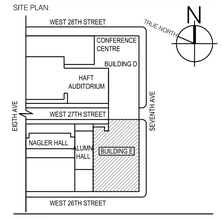

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SCALE:
1/8"=1'-0"

PROJECT#: 8969.110

SHEET TITLE:

1ST FLOOR PLUMBING PLAN

DOB NOW JOB#

SHEET NUMBER:

P-101.00

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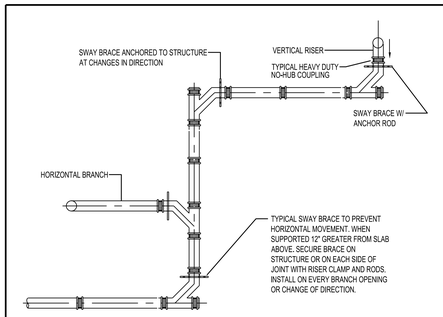
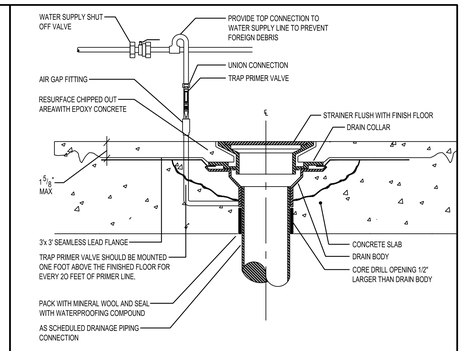


#	**Sway Bracing for Horizontal Drainage Piping** **Not to Scale**



	Typical Floor Drain Installation **Not to Scale**

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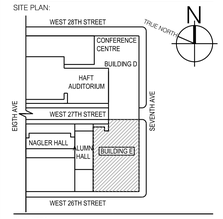

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CHECKED BY: --

SCALE: N.T.S

PROJECT#: 8969.110

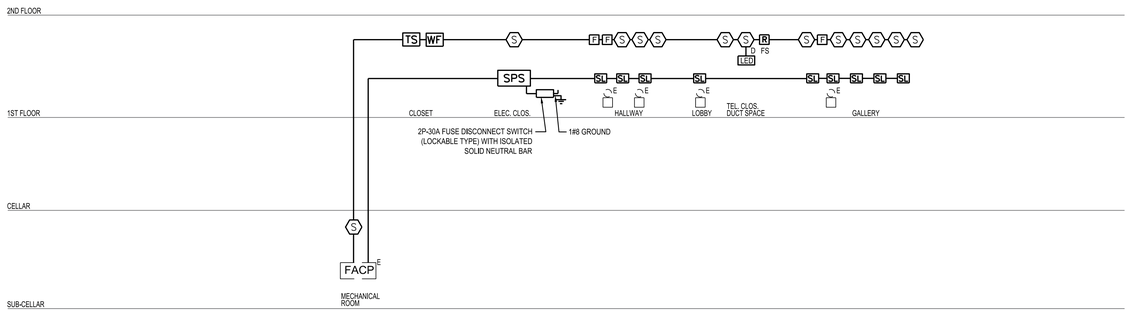
SHEET TITLE:

PLUMBING DETAILS

DOB NOW JOB#

SHEET NUMBER:

P-801.00



PARTIAL FIRE ALARM RISER DIAGRAM
N.T.S

ALL DEVICES SHOWN ARE NEW, U.O.N.	THERE IS NO DEDICATED LINE VOLTAGE FIRE ALARM POWER RISER AVAILABLE IN THIS BUILDING	THERE ARE NO CO PRODUCING EQUIPMENT ON THIS FLOOR, THE FLOOR BELOW, OR THE FLOOR ABOVE.

EXISTING FIRE ALARM DEVICES NOTES:

THE FOLLOWING SHALL APPLY FOR ALL DEVICES IDENTIFIED AS EXISTING TO REMAIN.

1. EXISTING WIRING SHALL BE PROTECTED DURING DEMOLITION AND CONSTRUCTION SO THAT IT CAN BE REUSED AND RECONNECTED TO MAKE EXISTING DEVICES FULLY OPERATIONAL. EXISTING WIRING THAT HAS BEEN DAMAGED DURING DEMOLITION OR CONSTRUCTION SHALL BE REPLACED AT NO ADDITIONAL COST TO THE OWNER.

2. EXISTING MANUAL PULL STATIONS AND FIRE WARDEN STATIONS AFFECTED BY THE SCOPE OF WORK AND INDICATED TO BE LOWERED/RELOCATED OR REPLACED SHALL BE LOWERED SO THAT THE HIGHEST OPERABLE PART IS NOT MORE THAN 48" AND SHALL NOT BE LESS THAN 42" ABOVE FINISH FLOOR. EXISTING WIRING MAY BE REUSED ONLY IF IT CAN BE EXTENDED TO THE NEW MOUNTING POSITION WITHOUT SPLICES. IF EXISTING WIRING IS TOO SHORT, FURNISH AND INSTALL NEW WIRING BACK TO THE FIRE ALARM COMMAND STATION, "DGP" OR TERMINAL CABINET.

3. THE ABOVE DESCRIBED WORK SHALL BE INCLUDED IN THE CONTRACT PRICE.

4. EXISTING BASE BUILDING FIRE ALARM EQUIPMENT AND DEVICES MUST REMAIN IN SERVICE AT ALL TIMES DURING DEMOLITION AND CONSTRUCTION.

RISER NOTES:

1. ALL FIRE ALARM CABLING SHALL BE SUPPORTED FROM BUILDING STRUCTURE AND NOT DEPEND ON CEILING MEDIA, PIPES, DUCTS, CONDUITS OR EQUIPMENT FOR SUPPORT. CABLING SHALL BE SECURED IN PLACE AT INTERVALS NOT EXCEEDING 5 FEET ON CENTERS AND WITHIN 12" EVERY ASSOCIATED CABINET BOX OR FITTING.

2. MODIFY STROBE POWER SUPPLY AS REQUIRED BY FIRE ALARM VENDOR. SUPPLY ALL MODULES, HARDWARE AND SOFTWARE AS NECESSARY.

3. STROBES SHALL BE SYNCHRONIZED WHEN FLASHING SO THAT NO TWO OR MORE STROBES IN ANY FIELD OF VIEW SHALL FLASH AT DIFFERENT TIMES OR RATES.

SYMBOL LEGEND

FACP	FIRE ALARM CONTROL PANEL
SPS	STROBE POWER SUPPLY
F	MANUAL PULL STATION, MOUNTED NOT LESS THAN 42" AND NOT MORE THAN 48" ABOVE FINISH FLOOR.
S	AREA SMOKE DETECTOR EL – DENOTES ELEVATOR RELATED DEVICE D – DUCT SMOKE DETECTOR
TS	TAMPER SWITCH
WF	WATER FLOW SWITCH
XX SL	WALL MOUNTED, STROBE ONLY APPLIANCE XX – DENOTES CANDELA RATINGS (TYP.)
XX H	WALL MOUNTED, COMBINATION HORN/STROBE APPLIANCE XX – DENOTES CANDELA RATINGS (TYP.)
	FIRE ALARM BELL
R FS	RELAY EL – DENOTES ELEVATOR RELATED DR – DENOTES DOOR RELEASE FS – DENOTES FAN SHUTDOWN FSD – DENOTES FIRE SMOKE DAMPER P – DENOTES PURGE ESV – DENOTES ELEVATOR SHAFT VENT SV – DENOTES STAIR SHAFT VENT DAMPER
	ABBREVIATIONS
E	EXISTING
R	RELOCATED
ER	EXISTING TO REMAIN
E/R	EXISTING TO RELOCATE
	LINE–TYPES
——	NEW
— —	EXISTING

SEQUENCE OF OPERATION

	SYSTEM INPUTS	SYSTEM OUTPUTS: FIRE COMMAND STATION ANNUNCIATION — A: ACTUATE COMMON ALARM SIGNAL INDICATOR & LOCAL AUDIBLE ALARM SIGNAL AT THE FIRE COMMAND STATION AND REMOTE ANNUNCIATOR WHERE APPLICABLE	B: VISUALLY ANNUNCIATE THE DEVICE IN ALARM AT THE FIRE COMMAND STATION AND REMOTE ANNUNCIATOR WHERE APPLICABLE	C: ACTUATE COMMON TROUBLE SIGNAL INDICATOR & LOCAL AUDIBLE TROUBLE SIGNAL AT THE FIRE COMMAND STATION AND REMOTE ANNUNCIATOR WHERE APPLICABLE	D: VISUALLY ANNUNCIATE THE DEVICE OR CIRCUIT IN TROUBLE AT THE FIRE COMMAND STATION AND REMOTE ANNUNCIATOR WHERE APPLICABLE	NOTIFICATION — E: ACTUATE STROBE APPLIANCES ON FL. OF ALARM & FL. ABOVE	F: ACTUATE SPEAKER APPLIANCES TO SOUND EVAC. TONE ON ALARM FL. & ABOVE & FL. ABOVE	G: ACTUATE SPEAKER APPLIANCES TO SOUND INQUIRY TONE ON ALL FLOORS	H: TRANSMIT ALARM SIGNAL TO CENTRAL STATION	I: TRANSMIT SUPERVISORY SIGNAL TO CENTRAL STATION	J: ACTUATE FLASHING FIRE SIGN AT THE FIRE COMMAND STATION	K: PRINT EVENTS AT THE FIRE COMMAND STATION	FIRE SAFETY CONTROL — L: RECALL ELEVATORS TO THE DESIGNATED LEVEL	M: SHUTDOWN ALL AIR HANDLING UNITS 2000 CFM AND LARGER SERVING THE FLOOR IN ALARM	N: CLOSE ALL REQUIRED FIRE/SMOKE DAMPERS	O: OPERATE ALL DOOR STRIKE RELEASE RELAYS TO OPEN LOCKED DOORS	P: OPERATE ALL DOOR HOLDER RELEASE RELAYS TO ALLOW DOORS TO CLOSE
1	MANUAL PULL STATION	●	●			●	●	●	●		●	●				
2	AREA SMOKE DETECTOR	●	●			●	●	●	●		●	●		●	●	●
3	ELEVATOR RELATED SMOKE DETECTOR	●	●			●	●	●	●		●	●	●	●	●	●
4	IN-DUCT SMOKE DETECTOR	●	●			●	●	●	●		●	●		●	●	●
5	HEAT DETECTOR	●	●			●	●	●	●		●	●		●	●	●
6	WATERFLOW SWITCH	●	●			●	●	●	●		●	●	●	●	●	●
7	TAMPER SWITCH			●	●					●						
8	TROUBLE CONDITIONS			●	●					●						

DESIGN NOTES:

1. AUDIBLE DEVICES SHALL PROVIDE ALARM SIGNALS THAT ARE EQUAL TO 15 DECIBELS ABOVE AMBIENT SOUND PRESSURE LEVEL FOR THE OCCUPANCY. BUSINESS OCCUPENCY HAS AMBIENT SOUND PRESSURE LEVEL 55 DECIBELS PER NFPA 72. THEREFORE, AUDIBLE DEVICES SHALL BE 70 DECIBELS OR MORE SOUND PRESSURE LEVEL. MECHANICAL SPACES SHALL PROVIDE MINIMUM SOUND PRESSURE LEVEL OF 90 DECIBELS.

2. ADDRESSABLE DEVICES SHALL BE WIRED CLASS B CIRCUIT & LEVEL 1 SURVIVIABILITY.
AUDIBLE AND VISUAL DEVICES SHALL BE WIRED CLASS B CIRCUIT & LEVEL 1 SURVIVIABILITY.

NOT FOR CONSTRUCTION

NEW YORK CITY ENERGY CONSERVATION CODE
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FIT History Gallery Renovation

Project No. 2448

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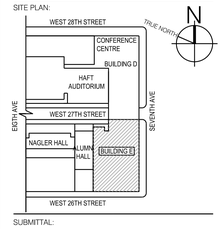
SITE PLAN:



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No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
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SEAL & SIGNATURE:

DRAWN BY: IAN CHECKED BY: EGV

SCALE: NTS

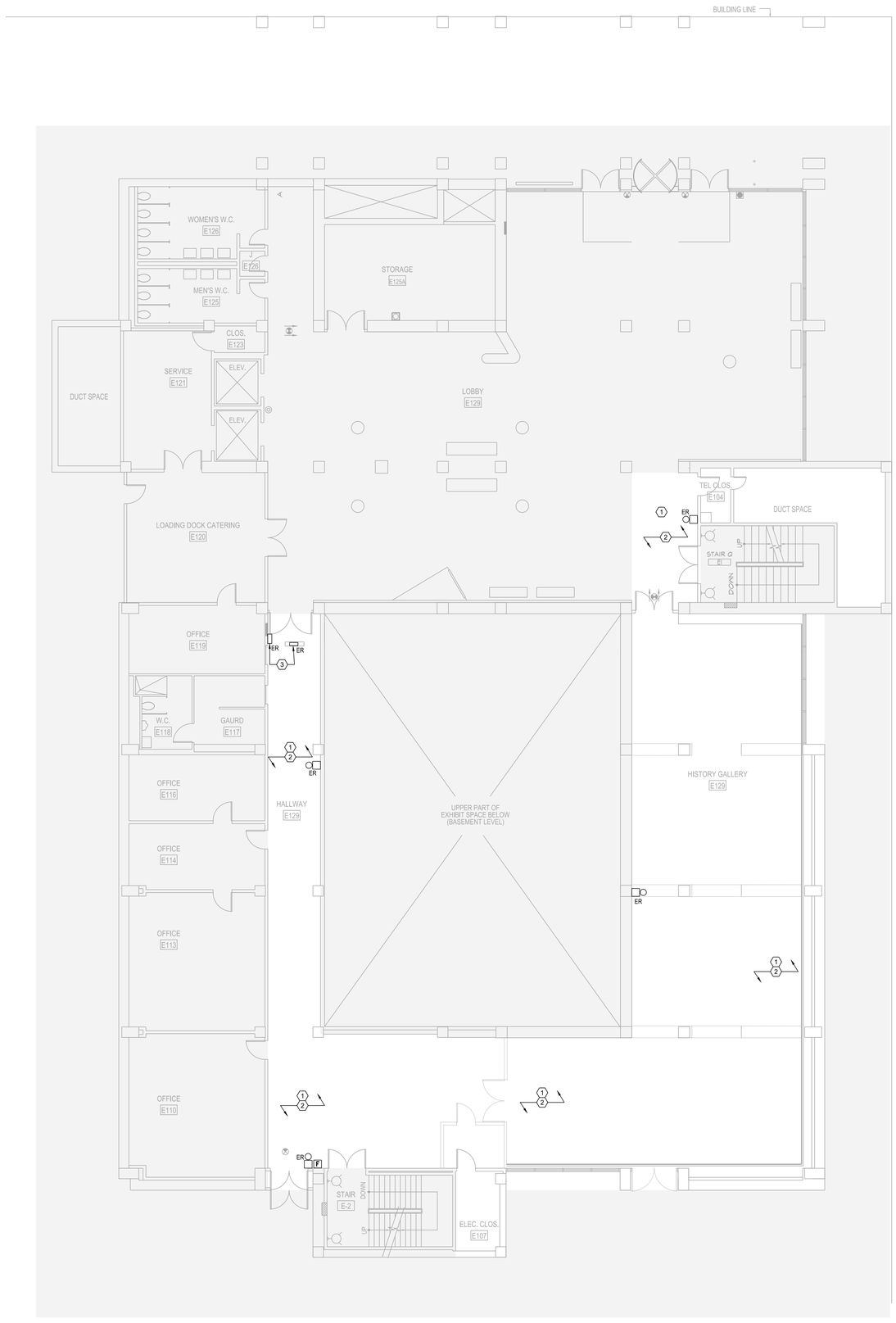
PROJECT #: 8969.110

SHEET TITLE:

FIRE ALARM NOTES, SYMBOLS LIST, AND RISER DIAGRAM

SHEET NUMBER:

FA-001.00



1 1ST FLOOR PLAN
SCALE: 1/8"=1'-0"

FIRE ALARM KEY NOTES:

1	EXISTING FIRE ALARM DEVICES SHALL REMAIN IN SERVICE AND OPERATIONAL UNTIL ALL NEW FIRE ALARM DEVICES HAVE BEEN INSTALLED, TESTED, AND VERIFIED TO BE FULLY FUNCTIONAL DO NOT REMOVE EXISTING FIRE ALARM BELLS AND SHALL REMAIN IN SERVICE AND OPERATIONAL.
2	AT NO TIME THROUGHOUT THE DURATION OF WORK SHALL AREAS OF THE SPACE BE LEFT WITHOUT ACTIVE FIRE ALARM COVERAGE.
3	EXISTING FDNY/NYPD COMMUNICATION STATION AND NOTIFICATION SIGN TO REMAIN (INCLUDING WIRING/CABLING/CONDUIT), THIS DEVICE SHALL BE PROTECTED THROUGHOUT THE DURATION OF CONSTRUCTION.

FIRE ALARM GENERAL NOTES:

1. IF AT ANY POINT EXISTING FIRE ALARM COVERAGE CANNOT BE MAINTAINED, A FIRE WATCH SHALL BE IMPLEMENTED IN ACCORDANCE WITH FIRE CODE REQUIREMENTS UNTIL FULL COVERAGE IS RESTORED.

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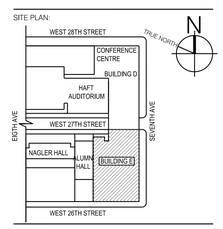

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SEAL & SIGNATURE:

DRAWN BY: IAN
CHECKED BY: CTD

SCALE: 1/8"=1'-0"

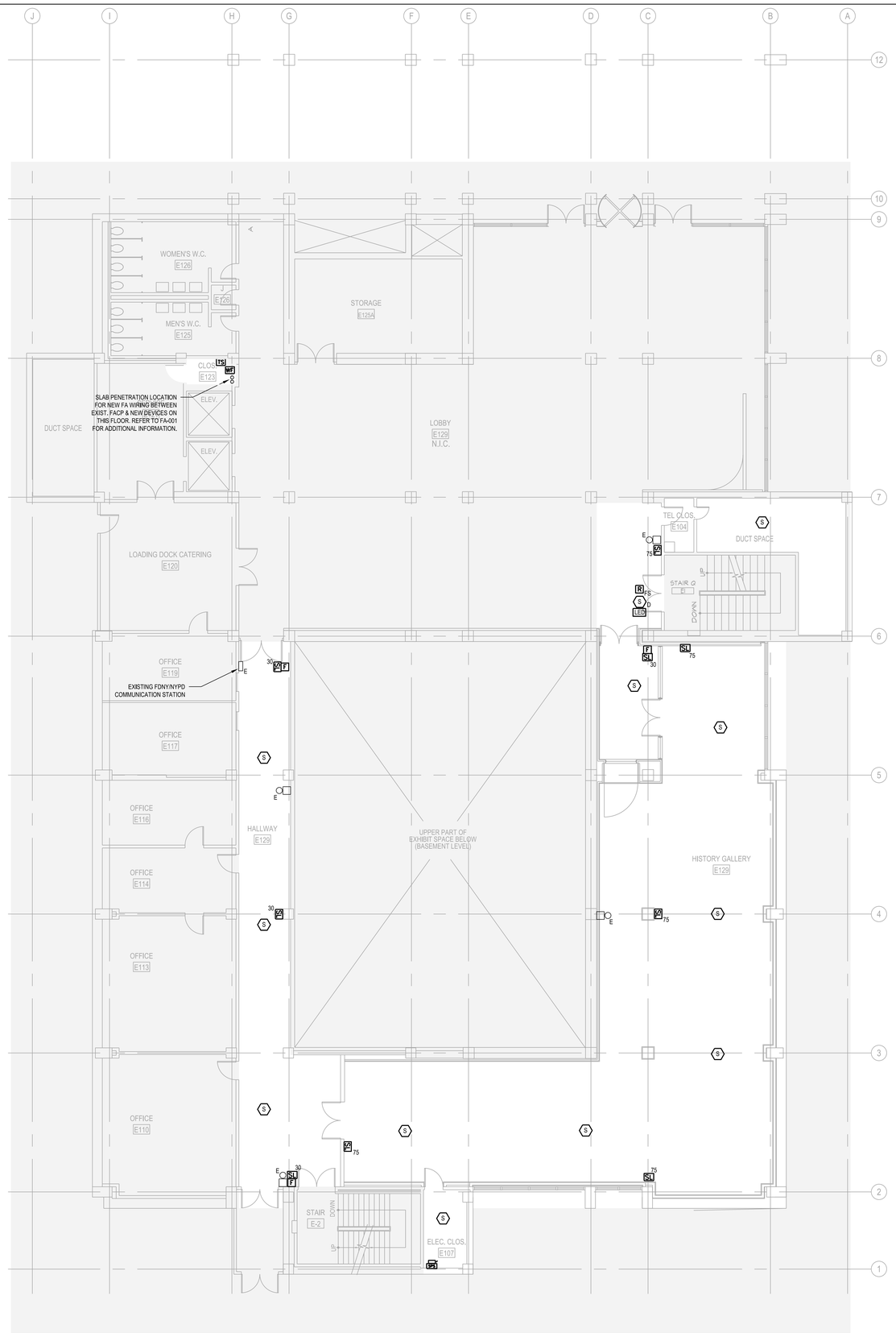
PROJECT#: 8969.110

SHEET TITLE:

1ST FLOOR FIRE ALARM DEMOLITION PLAN

SHEET NUMBER:

FA-011.00



1 1ST FLOOR PLAN
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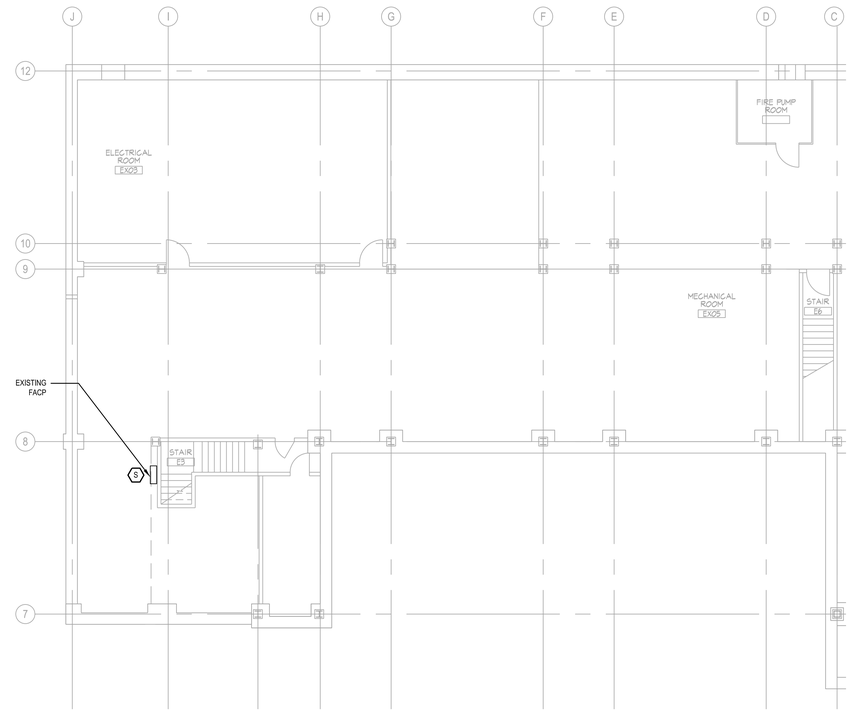

2 SUB-CELLAR PART PLAN
SCALE: 1/8"=1'-0"

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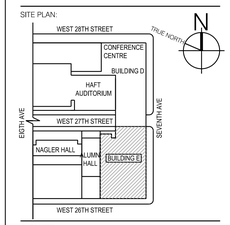

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SEAL & SIGNATURE:

DRAWN BY: IAN CHECKED BY: EGV

SCALE: PROJECT#: 8969.110

1/8"=1'-0"

SHEET TITLE:

1ST FLOOR AND SUB-CELLAR FIRE ALARM PART PLANS

SHEET NUMBER:

FA-101.00

FIRE PROTECTION SYMBOLS

F(S)	FIRE PROTECTION INCOMING SERVICE/STREET PRESSURE PIPING
F	FIRE STANDPIPE PIPING
SP	SPRINKLER MAIN PIPING
	SPRINKLER BRANCH PIPING
	SPRINKLER PIPING UNDER OBSTRUCTION
DR	SPRINKLER DRAIN PIPING
	EXISTING PIPING (REFER TO LETTER DESIGNATION ABOVE)
	UPRIGHT/ PENDANT SPRINKLER HEAD
	CONCEALED SPRINKLER HEAD
	SIDEWALL SPRINKLER HEAD
	EXTENDED COVERAGE SIDEWALL SPRINKLER HEAD
	SPRINKLER UNDER OBSTRUCTION
	DRY UPRIGHT/ PENDANT SPRINKLER
	DRY SIDEWALL SPRINKLER HEAD
	ELBOW TURNED UP
	ELBOW TURNED DOWN
	BOTTOM PIPE CONNECTION
	TOP PIPE CONNECTION
	SLOPE CHANGE IN PIPE ELEVATION (ROLL DOWN)
	ARROW INDICATES DIRECTION OF FLOW
	PITCH PIPE DOWN IN DIRECTION OF ARROW
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	PIPE SLEEVE
	CAPPED OUTLET
	VALVE ON VERTICAL
	AUTOMATIC AIR VENT VALVE
	PRESSURE GAUGE AND COCK
OPEN CLOSED	GATE VALVE
	CHECK VALVE
	CHECK VALVE W/ BALL DRIP
	DOUBLE CHECK VALVE
OPEN CLOSED	OUTSIDE SCREW & YOKE (OS & Y) VALVE
OPEN CLOSED	BALL VALVE
	FIRE DEPT. CONNECTION (WALL MOUNTED)
	FLOOR CONTROL VALVE ASSEMBLY (FCVA)
SP # — SPRINKLER RISER DESIGNATION	RISER SERVICE / RISER NUMBER
# (FP-101) — DETAIL	DETAIL / DRAWING LOCATION
A (FP-1) — SECTION	DETAIL / DRAWING LOCATION
#	REVISION NUMBER
	CONNECT NEW WORK TO EXISTING
	DISCONNECT EXISTING WORK & CAP

FIRE PROTECTION ABBREVIATIONS

ABD	AUTOMATIC BALL DRIP	LZ	LOW ZONE
AFF	ABOVE FINISHED FLOOR	MAX	MAXIMUM
AFP	AUTOMATIC FIRE PUMP	MECH	MECHANICAL
ARCH	ARCHITECTURAL	MER	MECHANICAL EQUIPMENT ROOM
BFP	BACKFLOW PREVENTER	MEZZ	MEZZANINE
BLDG	BUILDING	MFR	MANUFACTURER
BOP	BOTTOM OF PIPE	MIN	MINIMUM
CFM	CUBIC FEET PER MINUTE	MISC	MISCELLANEOUS
CLG	CEILING	MTD	MOUNTED
COL	COLUMN	NC	NORMALLY CLOSED
CONN	CONNECTION	NIC	NOT IN CONTRACT
CONST	CONSTRUCTION	No.	NUMBER
CONT	CONTINUATION	NO	NORMALLY OPEN
CV	CHECK VALVE	NTS	NOT TO SCALE
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY	OC	ON CENTER
DIA	DIAMETER	OS&Y	OUTSIDE SCREW AND YOKE GATE VALVE
DIM	DIMENSION	PAV	PREACTION VALVE
DN	DOWN (THRU FLOOR SLAB)	PAP	PREACTION PANEL
DPV	DRY PIPE VALVE	PO	PLUGGED OUTLET
DR	DRAIN	PRV	PRESSURE REDUCING VALVE
DWG	DRAWING	PSIG	POUNDS PER SQUARE INCH (GAUGE)
EA	EACH	RCV	RISER CONTROL VALVE
EL	ELEVATION	REINF	REINFORCED
ELEC	ELECTRICAL	REV	REVISED / REVISION
ELEV	ELEVATOR	RPM	REVOLUTIONS PER MINUTE
EMER	EMERGENCY	RPZ	REDUCED PRESSURE ZONE BACKFLOW PREVENTER
EMR	ELEVATOR MACHINE ROOM	RV	RELIEF VALVE
ENCL	ENCLOSURE	SCHED	SCHEDULE
EQUIP	EQUIPMENT	SD	SMOKE DETECTOR
EXIST	EXISTING	SECT	SECTION
FCVA	FLOOR CONTROL VALVE ASSEMBLY	SLV	SLEEVE
FD	FLOOR DRAIN	SP	SPRINKLER
FDC	FIRE DEPARTMENT CONNECTION	SS	STAINLESS STEEL
FE	FIRE EXTINGUISHER	SSFP	SPECIAL SERVICE FIRE PUMP
FH	FIRE HYDRANT	SQ.FT.	SQUARE FOOT (ft^2)
FHC	FIRE HOSE CABINET	STD	STANDARD
FHR	FIRE HOSE RACK	STL	STEEL
FHV	FIRE HOSE VALVE	TCSP	TEMPORARY CORE SPRINKLER PROTECTION
FHVC	FIRE HOSE VALVE CABINET	TDH	TOTAL DYNAMIC HEAD
FF	FINISH(ED) FLOOR	TEMP	TEMPORARY
FL	FLOOR	THRU	THROUGH
FS	FIRE SERVICE PIPING	TOP	TOP OF PIPE
FSP	FIRE STANDPIPE	TOS	TOP OF SLAB
FT	FEET	TYP	TYPICAL
GC	GENERAL CONTRACTOR	UON	UNLESS OTHERWISE NOTED
GAL	GALLONS	UP	UP (THRU FLOOR SLAB)
GPM	GALLONS PER MINUTE	VCO	VALVED & CAPPED OUTLET
GV	GATE VALVE	VERT	VERTICAL
HD	HEAT DETECTOR	VEST	VESTIBULE
HP	HORSEPOWER/HIGH POINT	VIF	VERIFY IN FIELD
HR	HOUR	VLV	VALVE
HZ	HIGH ZONE	VO	VALVED OUTLET
ID	INSIDE DIAMETER	W/	WITH
IE	INVERT ELEVATION	WF	WIDE FLANGE
IN	INCH	WFS	WATER FLOW SWITCH
JP	JOCKEY PUMP	WP	WATER PROOFING / WATER PROOFED
LP	LOW POINT	Z	ZONE

FIRE PROTECTION GENERAL NOTES

1. ALL SPRINKLER LOCATIONS SHOWN ON SPRINKLER DRAWING ARE DIAGRAMMATIC. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR EXACT SPRINKLER LOCATION AND ALIGNMENT.
2. SPRINKLER CONTRACTOR IS RESPONSIBLE FOR PROVIDING COMPLETE SHOP DRAWINGS INCLUDING HEAD LOCATIONS, PIPE SIZING AND HYDRAULIC CALCULATIONS.
3. THE SPRINKLER CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS, INSPECTIONS & SIGN-OFF REQUIRED BY THE BUILDING DEPT. OFFICIALS.
4. SPRINKLER HEADS IN GYPSUM BOARD CEILING AREAS TO BE ALIGNED WITH OR CENTERED BETWEEN ADJACENT LIGHT FIXTURES.
5. PROVIDE 'SWING ARM' CONNECTION TO ALL SPRINKLER HEADS TO ASSURE PRIOR ALIGNMENT.
6. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWING FOR EXACT SIZE & LOCATION OF SLAB PENETRATIONS, THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS WITH ALL PENETRATIONS FOR APPROVAL TO STRUCTURAL & MEP ENGINEER PRIOR INSTALLATION OF SPRINKLER WORK.
7. PROVIDE SPRINKLER COVERAGE UNDER OBSTRUCTIONS 48" IN WIDTH OR GREATER.
8. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.
9. EXISTING PIPING WHERE SHOWN FOR VARIOUS SYSTEMS IS DIAGRAMMATIC ONLY.
10. BECOME THOROUGHLY FAMILIAR WITH ACTUAL EXISTING CONDITIONS AT THE BUILDING OF THE PRESENT INSTALLATIONS, INCLUDING LOCATIONS, SIZES, AND ELEVATIONS OF PIPING, TO WHICH CONNECTIONS MUST BE MADE OR WHICH MUST BE CHANGED OR ALTERED. THE INTENT OF THE WORK IS SHOWN ON THE DRAWINGS AND DESCRIBED HEREINAFTER, AND NO CONSIDERATION WILL BE GRANTED BY REASON OF LACK OF FAMILIARITY ON THE PART OF THE CONTRACTOR WITH ACTUAL PHYSICAL CONDITIONS AT THE SITE.
11. INSTALL ALL WORK IN FULL ACCORDANCE WITH THE REQUIREMENTS OF ALL LOCAL AND GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION OVER THESE MATTERS, AS WELL AS WITH ANY REQUIREMENTS OF THE NFPA, UL, AND OTHER APPLICABLE CODES. SECURE AND PAY FOR NECESSARY APPROVALS, PERMITS, INSPECTIONS, ETC., AND DELIVER THE OFFICIAL RECORDS OF THE GRANTING OF PERMITS TO THE ARCHITECT WITHOUT ADDITIONAL COST TO THE OWNER.
12. PREPARE AND SUBMIT FOR APPROVAL MANUFACTURER'S SHOP DRAWINGS AND DATA FOR EQUIPMENT, AND DETAILED DRAWINGS OF ALL SPRINKLER PIPING WORK.
13. KEEP AN ACCURATE RECORD ON ALL DEVIATIONS BETWEEN WORK SHOWN ON DRAWINGS AND THAT WHICH IS ACTUALLY PERFORMED.
14. ALL FIRE PROTECTION VALVES SHALL HAVE TAMPER SWITCHES.
15. ALL FIRE PROTECTION OS&Y VALVES SIZE 4" & LARGER & PRESSURE DIFFERENTIAL OF 200 PSI & GREATER SHALL BE PROVIDED WITH A VALVED BYPASS.
16. ALL FIRESTOPPING MUST BE APPROVED PRODUCTS THAT ARE UL RATED.
17. ALL SPRINKLER HEADS TO BE INSTALLED SHALL BE NEW.

SPRINKLER DESIGN CRITERIA

EACH SPRINKLER SYSTEM SHALL BE HYDRAULICALLY CALCULATED IN ACCORDANCE WITH NFPA-13-2016 TO MEET FOLLOWING CRITERIA:

SPRINKLER SYSTEM

1. LIGHT HAZARD OCCUPANCY: DENSITY .10 GPM PER SQ. FT. OVER MOST HYDRAULICALLY REMOTE 1500 SQ. FT., MAXIMUM COVERAGE PER SPRINKLER HEAD 225 SQ. FT.
2. EXACT LOCATION OF SPRINKLER HEADS IN FINISHED AREAS WITH SUSPENDED CEILINGS SHALL BE AS INDICATED ON ARCHITECTURAL REFLECTED CEILING PLANS.
3. CLOSELY SPACED SPRINKLER HEADS LOCATED 6'-0" O.C. SHALL DISCHARGE A MINIMUM OF 3 GPM PER LINEAR FOOT OF PROTECTED LINE.
4. MINIMUM PRESSURE AT EACH SPRINKLER HEAD SHALL BE 7 PSI & 15 GPM.
5. WHENEVER ROLL GROOVED CONNECTIONS ARE USED, ALLOWANCE FOR ADDITIONAL PRESSURE LOSS AT GROOVES SHALL BE MADE AS FOLLOWS:
   A. FOR EACH COUPLING ON STRAIGHT RUN INCLUDING STRAIGHT FLOW THROUGH TEE OR CROSS; ADD 1 EQUIVALENT FOOT OF PIPE.
   B. FOR EACH COUPLING AT ELBOW, TEE OR CROSS WHERE DIRECTION OF FLOW CHANGES; ADD 2 EQUIVALENT FEET OF PIPE.
7. EQUIVALENT FITTING LENGTHS USED IN HYDRAULIC CALCULATIONS SHALL BE IN ACCORDANCE WITH NFPA 13-2016.
   A. WHEREVER FITTINGS ARE USED IN CONJUNCTION WITH LIGHTWALL PIPE, EQUIVALENT FITTING LENGTHS INDICATED IN NFPA 13 SHALL BE INCREASED BY 30%.
8. DISCHARGE FROM EACH SPRINKLER HEAD SHALL NOT BE LESS THAN REQUIRED FOR AREA COVERED BY THIS HEAD, AREA COVERAGE PER HEAD SHALL BE DETERMINED IN ACCORDANCE WITH NFPA 13-2016.
9. THE RESULT OF HYDRAULIC CALCULATIONS SHALL INDICATE A MINIMUM 5% SAFETY MARGIN FOR PRESSURE.
10. CONTRACTOR SHALL BASE ALL HYDRAULIC CALCULATIONS ON THE REQUIRED HYDRANT FLOW TEST.
    A. TEST DATA SHALL INDICATE STATIC PRESSURE, RESIDUAL PRESSURE AT FLOW AND ELEVATION AT LOCATION TESTED.
    B. FLOW TEST DATA SHALL BE SUBMITTED FOR REVIEW ALONG WITH SHOP DRAWINGS AND HYDRAULIC CALCULATIONS.

2022 NEW YORK CITY SPRINKLER NOTES

1. SPRINKLER SYSTEM CONFORMS TO NEW YORK CITY BUILDING CODE, CHAPTER 9, SECTION BC 903 AND APPENDIX Q, SECTIONS BC Q101 & BC Q102.
2. THE INSTALLATION, COMPONENTS, SIZING, SPACING, CLEARANCES, POSITION & TYPE OF SYSTEMS CONFORMS TO BC 903.3 & BC Q102, CHAPTER 6.
3. ONLY APPROVED DEVICES SHALL BE USED AS PER BC Q102, SECTION 6.1.1
4. SPRINKLERS SHALL BE PROTECTED AGAINST FREEZING & INJURY AS PER BC Q102, CHAPTER 8.
5. INSPECTIONS & TESTS OF SPRINKLER SYSTEMS SHALL BE CONDUCTED AS PER BC 901.5 & BC Q102, CHAPTER 27.
6. THE OCCUPANCY OF THE AREAS TO BE SPRINKLERED SHALL BE IN ACCORDANCE WITH BC 903 & BC Q102, CHAPTER 5.
7. WATER SUPPLY TEST PIPES & GAUGES SHALL BE PROVIDED AS PER BC Q102, CHAPTER 6.
8. SPACING, LOCATION & POSITION OF SPRINKLERS SHALL BE IN ACCORDANCE WITH BC Q102, CHAPTER 8.
9. THERE IS NO HIGH PILED STORAGE AS DEFINED IN BC Q102, CHAPTER 12.
10. ALL PIPES PASSING THOUGH WALLS SHALL BE IN ACCORDANCE WITH BC 714.
11. DISTANCE OF SPRINKLERS FROM HEAT SOURCE SHALL BE AS PER TABLE 8.3.2.5 (A) OF BC Q102.
12. ALL VALVES SHALL BE IDENTIFIED AS PER CHAPTER 6.6.4 OF BC Q102.
13. DRAINAGE SHALL CONFORM TO CHAPTER 8.16.2 OF BC Q102.
14. FITTINGS SHALL BE PROVIDED AS PER CHAPTER 6.4 OF BC Q102.
15. VALVES SHALL BE APPROVED TYPE AS PER CHAPTER 6.6 OF BC Q102.
16. PIPE HANGERS SHALL BE PROVIDED AS PER CHAPTER 9 OF BC Q102.
17. PROVISIONS SHALL BE MADE TO FACILITATE FLUSHING SYSTEM PIPING AS PER CHAPTER 8.16.3 OF BC Q102.
18. SPRINKLERS SHALL BE AN APPROVED TYPE AS PER CHAPTER 6.2 OF BC Q102.
19. TEMPERATURE RATING OF SPRINKLERS SHALL COMPLY WITH CHAPTER 6.2.5 OF BC Q102.
20. MINIMUM CLEARANCE OF 18" BELOW SPRINKLER DEFLECTORS SHALL BE MAINTAINED AS PER CHAPTER 8.5.6.1 OF BC Q102.
21. CONCEALED PIPING SHALL BE INSPECTED PRIOR TO BEING COVERED PER BC BC 901.5 AND NEW YORK CITY FIRE CODE, FC 106.
22. SPRINKLER SYSTEM ALARMS SHALL BE PROVIDED AS PER CHAPTER 6.8 OF BC Q102.
23. SPARE SPRINKLER HEADS AND WRENCH TO BE KEPT ON PREMISES AS PER CHAPTER 6.2.9 OF BC Q102.
24. ENGINEER SHALL BE RESPONSIBLE FOR THE DESIGN TO COMPLY WITH THE REQUIREMENTS OF BC 903 & BC Q102.
25. ALL SPRINKLER BRANCH PIPING SHALL BE A MINIMUM OF 1 INCH AS PER CHAPTER 8 OF BC Q102.
26. SPRINKLER HEADS ON THE SPRINKLER SCHEDULE ARE EITHER FM APPROVED OR UL LISTED, OR BOTH FM APPROVED AND UL LISTED.
27. WATER SUPPLIES TO SPRINKLER SYSTEM SHALL BE IN ACCORDANCE WITH BC Q102, CHAPTER 24.
28. SPRINKLER SYSTEM SPECIAL INSPECTIONS SHALL BE PERFORMED IN ACCORDANCE WITH SECTION BC 1705.29 OF THE NEW YORK CITY BUILDING CODE.
29. QUICK RESPONSE SPRINKLER HEADS SHALL NOT BE PERMITTED FOR USE IN EXTRA HAZARD OCCUPANCIES PER NFPA 13-2016 ITEM 8.4.1.2 & 11.2.3.2.2.2.
30. SPRINKLER HEADS IN LIGHT HAZARD OCCUPANCIES SHALL BE IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS AS APPLICABLE:
    30.1. HEADS SHALL BE QUICK RESPONSE TYPE PER NFPA 13-2016 ITEM 3.6.4.8 HEADS IN RESIDENTIAL OCCUPANCY SHALL MEET NFPA 13-2016 ITEM 8.4.5
    30.2. HEADS FOR MODIFICATION OR ADDITION TO AN EXISTING SYSTEM EQUIPPED WITH STANDARD RESPONSE SPRINKLER HEADS SHALL MEET NFPA 13-2016 ITEM 8.3.3.1
31. QUICK RESPONSE SPRINKLER HEADS & STANDARD RESPONSE SPRINKLER HEADS SHALL NOT BE INTERMIXED WITHIN A COMPARTMENT PER NFPA 13-2016 ITEM 8.3.3.2.
32. WHEN EXISTING LIGHT HAZARD SYSTEMS ARE CONVERTED TO USE QUICK RESPONSE HEADS, ALL SPRINKLERS IN A COMPARTMENT SPACE SHALL BE QUICK RESPONSE PER NFPA 13-2016 ITEM 8.3.3.6.
33. OCCUPANCY OF SPACE IS: LIGHT HAZARD PER BC 903.2 & CHAPTER 5 OF BC Q102.
34. SPRINKLER SYSTEM IS HYDRAULICALLY DESIGNED IN ACCORDANCE WITH CHAPTER 11 OF BC Q102. SPRINKLER SYSTEM IS DESIGNED TO 0.10 GPM/SQ.FT. OVER 1500 SQ. FT.

SPRINKLER SIGNAGE NOTE

CONTRACTOR SHALL PROVIDE PERMANENTLY MARKED RIGID SIGN LOCATED AT EACH FLOOR CONTROL VALVE ASSEMBLY IDENTIFYING THE HYRAULICALLY CALCULATED SPRINKLER SYSTEM. THE SIGN SHALL INCLUDE THE FOLLOWING INFORMATION.

1. LOCATION OF DESIGNED AREA OR AREAS.
2. DISCHARGE DENSITIES OVER THE DESIGN AREA OR AREAS
3. REQUIRED FLOW AND RESIDUAL PRESSURE AT THE BASE OF THE RISER
4. OCCUPANCY CLASSIFICATION
5. HOSE STREAM ALLOWANCE INCLUDED IN ADDITION TO THE SPRINKLER DEMAND
6. THE NAME OF THE CONTRACTOR.

SPRINKLER AND STANDPIPE PAINTING

IN ACCORDANCE WITH 2022 NYCBC CHAPTER 9 SECTION 903.6. ALL STANDPIPE AND SPRINKLER PIPING INCLUDING MAINS, LOOP MAINS AND VALVE HANDLES MUST BE PAINTED, AS OUTLINED IN THE LAW. THIS LAW IS RETROACTIVE AND IS REQUIRED FOR ALL PROJECTS. SPRINKLER BRANCH LINES FROM MAIN TEE'S ARE EXCLUDED FROM THIS REQUIREMENT. SAMPLES OF THE THREE PRIMARY COLORS USED, RED, GREEN AND YELLOW SHALL BE SUBMITTED FOR APPROVAL BY ENGINEER. PAINTING OF ALL PIPING SHALL REQUIRE A SPECIAL INSPECTION AND CERTIFICATION. NO PIPING SHALL BE ENCLOSED PRIOR TO PAINT INSPECTION BY SPECIAL INSPECTOR.

FIRE PROTECTION DRAWING LIST

SP-001	SPRINKLER NOTES, SYMBOLS, ABBREVIATIONS & DRAWING
SP-101	1ST FLOOR SPRINKLER PLAN
SP-601	SPRINKLER EXISTING RISER DIAGRAM & DETAILS

NYC DOB SPECIAL INSPECTION NOTES

1. AN INDEPENDENT SPECIAL INSPECTOR SHALL BE RETAINED TO PERFORM SPECIAL INSPECTIONS AS WELL AS FILE FORM TR-1 FOR FIRE PROTECTION SYSTEMS DESIGN AS DOCUMENTED ON THESE PLANS IN ACCORDANCE WITH THE NYC BUILDING CODE.
2. SPECIAL INSPECTION REQUIRED FOR SPRINKLER SYSTEMS PER 2022 NYCBC 1705.29.
3. SPECIAL INSPECTION REQUIRED FOR FIRE-RESISTANT PENETRATIONS AND JOINTS PER 2022 NYCBC 1705.17.
4. SPECIAL INSPECTION REQUIRED FOR POST-INSTALLED ANCHORS PER 2022 NYCBC 1705.37.
5. OWNER SHALL NOTIFY FDNY OF SPRINKLER SYSTEM DISCONNECTION BY SUBMITTING A LETTER OF NOTIFICATION.

NYC FLOOD HAZARD AREA NOTES

- FEMA FLOOD MAPS OBTAINED FROM FEMA FLOOD MAP SERVICE CENTER WEBSITE. DESIGN APPLICANT MAKES NO CLAIM AS TO THEIR ACCURACY.
- PROPERTY IS NOT IN SPECIAL FLOOD HAZARD AREA PER EFFECTIVE 2007 FIRM.

NYC DOB FILING NOTE

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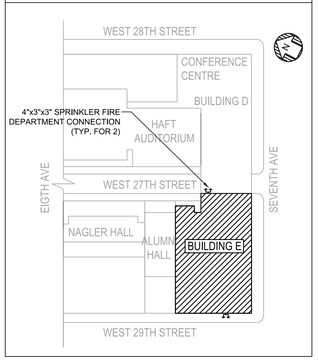
PLOT PLAN AND ZONING DATA

PROJECT ADDRESS: 282 7TH AVENUE NY, NY 10001
TAX BLOCK: 776
TAX LOT: 40



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NEW YORK CITY BUILDING DEPARTMENT APPROVAL NOTE

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FIT History Gallery Renovation

Project No. 2448

282 7TH AVE
NEW YORK, NY 10001
212.217.7909

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LIGHTING DESIGNER
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150 WEST 28TH STREET, SUITE 1603
NEW YORK, NY 10001
212.206.8356

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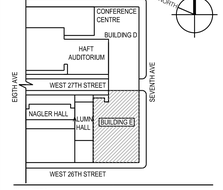


SUBMITTAL:

BID SET

ISSUE / REVISION:

No.	DESCRIPTION	DATE
	ISSUED FOR PROGRESS	11.12.2025
	DESIGN DEVELOPMENT	11.24.2025
	CD PROGRESS	03.10.2026
	BID SET	03.27.2026
	REVISED BID SET	04.13.2026
	ISSUED FOR CONSTRUCTION	TBD

SEAL & SIGNATURE:

DRAWN BY: TQC CHECKED BY: MDJ

SCALE: PROJECT#: 8969.110

N.T.S

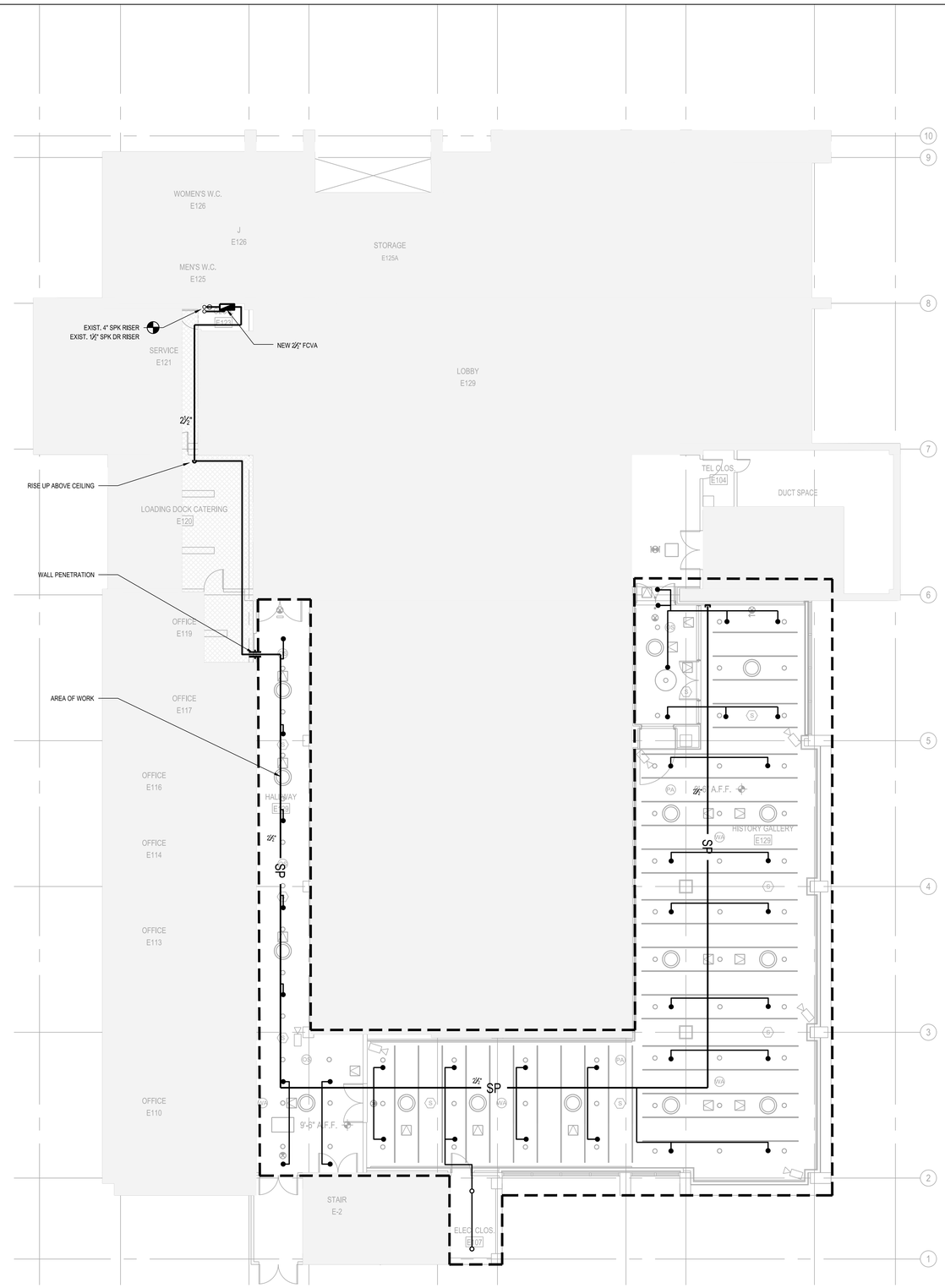
SHEET TITLE:

SPRINKLER NOTES, SYMBOLS, & DRAWING LIST

DOB NOW JOB#

SHEET NUMBER:

SP-001.00



SPRINKLER HEAD COUNT

40 NEW SPRINKLER HEADS

SPRINKLER NOTES

1. REFER TO NOTES & DESIGN CRITERIA ON COVER SHEET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
2. IN AREAS WITHOUT HUNG CEILINGS, COORDINATE THE LOCATION OF ALL DUCTS, PIPING, & CONDUIT BANKS WITH THE RESPECTIVE CONTRACTOR AND PROVIDE ADDITIONAL SPRINKLER HEADS AND PIPING BELOW OBSTRUCTIONS GREATER THAN 48" IN WIDTH.
3. SPRINKLER COVER PLATES TO HAVE BLACK FINISH.

SPRINKLER BRANCH PIPING SCHEDULE

NO. OF SPRINKLERS	BRANCH LINE
1 SPRINKLER	1 IN.
2 SPRINKLER	1 IN.
3 SPRINKLER	1¼" IN.
4 SPRINKLER	1½" IN.
5 SPRINKLER	1½" IN.
10 SPRINKLER	2 IN.
20 SPRINKLER	2½" IN.

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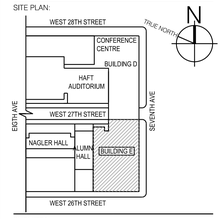

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SEAL & SIGNATURE:

DRAWN BY: --
CHECKED BY: --

SCALE:
1/8"=1'-0"

PROJECT#: 8969.110

SHEET TITLE:

1ST FLOOR SPRINKLER PLAN

DOB NOW JOB#

SHEET NUMBER:

SP-101.00

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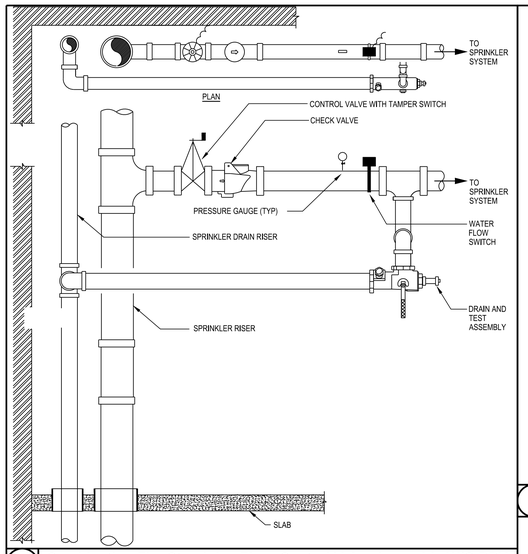
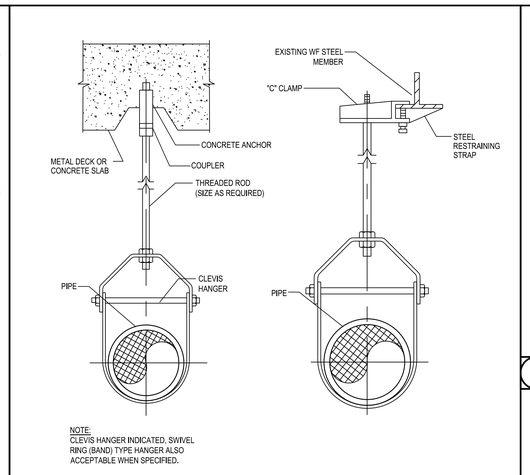
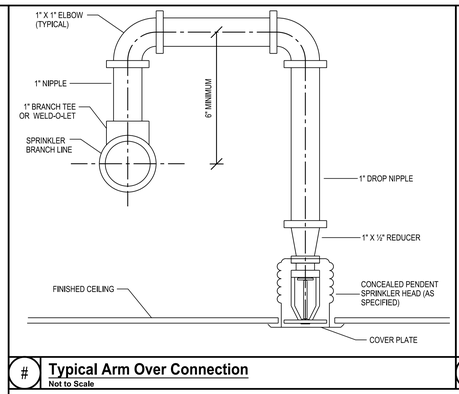


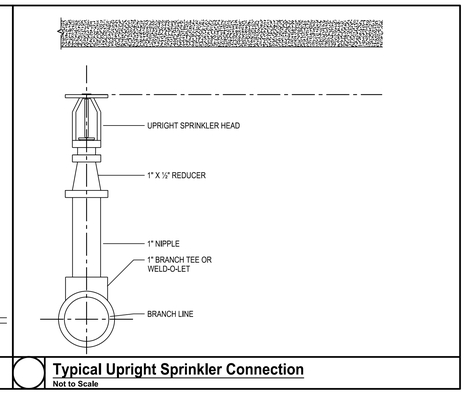
**Combination Fire Standpipe Floor Control Valve Assembly W/O PRV**
Not to Scale



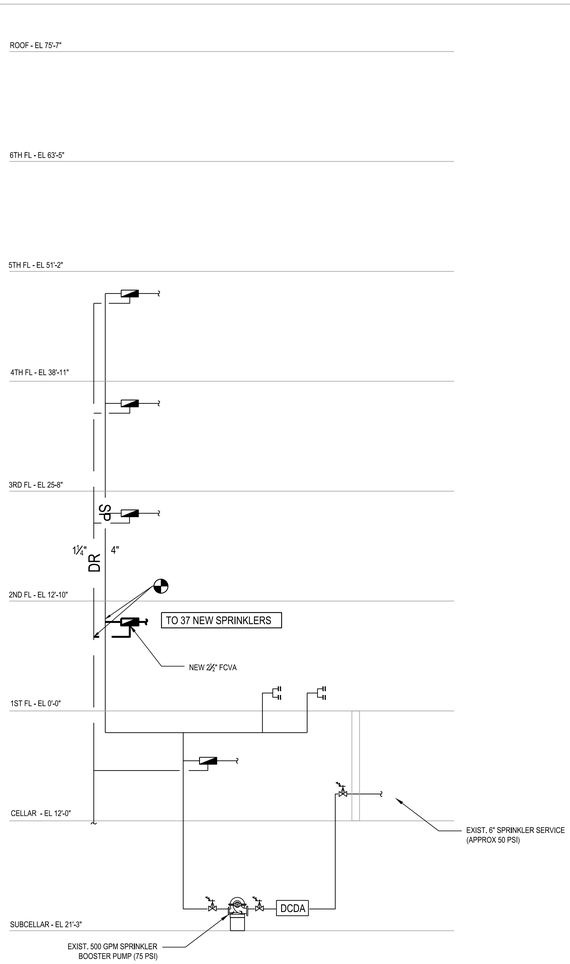
Pipe Hanger Details for Pipe 6" & Smaller
Not to Scale



**Typical Arm Over Connection**
Not to Scale



Typical Upright Sprinkler Connection
Not to Scale



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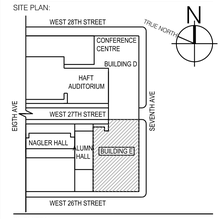

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CHECKED BY: --

SCALE: N.T.S

PROJECT#: 8969.110

SHEET TITLE:
SPRINKLER EXISTING RISER DIAGRAM & DETIALS

DOB NOW JOB#

SHEET NUMBER:
SP-601.00