

PROJECT MANUAL

**JOSEPH G. CAPUTO COMMUNITY
CENTER**

**95 Broadway
Ossining, New York 10562**

Specifications and Contract Documents

Project No. 24012

June, 2026

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**VILLAGE OF OSSINING
WESTCHESTER COUNTY, NEW YORK**

CONTRACT NUMBERS:

REC-26-01G GENERAL CONSTRUCTION
REC-26-01P PLUMBING CONSTRUCTION
REC-26-01M MECHANICAL/HVAC CONSTRUCTION
REC-26-01E ELECTRICAL CONSTRUCTION

**Improvements- Renovation and Remodeling- at Joseph G. Caputo
Community Center**



Prepared by:

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JUNE 2026

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Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

NOTICE TO BIDDERS

NOTICE TO BIDDERS

VILLAGE OF OSSINING

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

WESTCHESTER COUNTY, NEW YORK

NOTICE TO BIDDERS

Notice is hereby given that sealed bids will be received by the Office of the Village Clerk, Municipal Building, 16 Croton Avenue, Ossining, N.Y. 10562 for the following contracts:

- REC-26-01G: Improvements, Renovation, and Remodeling at Joseph G. Caputo Community Center General Construction
- REC-26-01P: Improvements, Renovation, and Remodeling at Joseph G. Caputo Community Center Plumbing Construction
- REC-26-01M: Improvements, Renovation, and Remodeling at Joseph G. Caputo Community Center Mechanical/HVAC Construction
- REC-26-01E: Improvements, Renovation, and Remodeling at Joseph G. Caputo Community Center Electrical Construction

The principal features of the work to be performed are the roof replacement and interior renovations of the Joseph G. Caputo Community Center.

The bids shall be in accordance with the Specifications, Drawings and Terms of the proposed contract. These proposals will be received by Susanne Donnelly, Village Clerk, Village of Ossining, 16 Croton Avenue, Ossining, N.Y. 10562 until 10:00 a.m., Prevailing Time, Thursday, July 16, 2026, at which time they will be publicly opened and read.

OBTAINING DOCUMENTS: The Contract Documents, including Drawings and Specifications, may be obtained beginning on Thursday, June 25, 2026. Documents are available electronically only at no cost to prospective bidders. Interested parties should email sraiskums@villageofossiningny.gov.

BID SECURITY: Each proposal must be accompanied by bid security in the amount of five percent (5%) of the bid, in the form and subject to the conditions stipulated in the bid documents.

PRE-BID MEETING: A mandatory pre-bid job meeting is scheduled for Wednesday, July 1, 2026, at 10:00 AM at the Joseph G. Caputo Community Center, 95 Broadway, Ossining, NY 10562.

MINORITY PARTICIPATION POLICY: It is the policy of the Village of Ossining to include minority and women-owned businesses in our solicitations and to take affirmative steps to ensure that M/WBE's have full participation in our procurement process.

VILLAGE RIGHTS: The Village reserves the right to waive any informalities in any proposals, or to reject any or all proposals, and to advertise for new proposals.

By order of the Village Board of Trustees, Village of Ossining.

Susanne Donnelly, Village Clerk
Village of Ossining

Dated: 06/22/26

SECTION I – INFORMATION FOR BIDDERS

SECTION I INFORMATION FOR BIDDERS

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

A. CONTENTS

Attention of bidders is called to the contents of the Notice to Bidders, a copy of which is annexed hereto and made a part hereof. All the work in this contract is described in detail in the Plans and Specifications, Information for Bidders, Bidder's Proposal and Contract Documents, all of which are attached hereto and made a part hereof.

B. DATE AND TIME FOR FILING BIDS

Sealed bids will be received at the Office of the Village Clerk, Municipal Building, 16 Croton Avenue, Ossining, New York. All bids shall be received by **10:00 A.M., Local Prevailing Time, Thursday, July 16, 2026**, for the work herein mentioned, at which place and after which time they will be publicly opened and read aloud. No bid shall be received or considered after the time stated herein.

All bids shall be enclosed in a sealed envelope and addressed as follows:

Bids for:	Improvements-Renovation and Remodeling-at Joseph G.Caputo Community Center Contract No. REC-26-01. G, P, M, and/or E
Attention:	Susanne Donnelly, Village Clerk Municipal Building 16 Croton Avenue Ossining, N.Y. 10562
Opening:	Thrusday, July 16, 2026 10:00 A.M. Local Prevailing Time

C. BID FORM

All bids must be upon the blank form for the proposal attached hereto, with the proposed bid amount for each item of work set out in words and numbers. In the case of a discrepancy, the bid price in words will be considered the price bid. The bidder's complete name and address shall be provided.

Bidders shall return with the bid proposal the following completed documents:

- Statement and certification of non-collusion – Compliance with section 103-d of the General Municipal Law (Bidder's proposal at pages 25-28)
- Iran Divestment Act of 2021 certification (Bidder's proposal at page 29)
- Bidder's qualifications (Bidder's proposal at pages 30-32)
- Registration for contractors and subcontractors (with current registration certificates) (Bidder's proposal at page 33)
- Minority and women-owned business certification (Bidder's proposal at page 34)
- Bidder's proposal (Bidder's proposal at pages 35-42)
- Bid bond, cashier's check or certified check in the amount of 5% of the bid proposal.

All bids must be submitted to the Village Clerk in a sealed envelope endorsed with the name of the contract, the contract number, and the name of the person making the same.

D. INFORMAL BIDS

The Village Board of Trustees of the Village of Ossining may reject, as informal, bids which are incomplete, conditional, or obscure, or which contain additions not called for, erasures, alterations, or irregularities of any kind, or the Village Board may waive any such informality it deems immaterial or non-prejudicial to the Village and other bidders.

The Village Board reserves the right to select the bid or proposal the acceptance of which will, in its judgment, best secure the sufficient performance of the work or to reject any or all bids.

E. ACCEPTANCE OF BIDS

No bid will be allowed to be withdrawn for any reason whatsoever after it has been deposited with the Village Clerk. No bid will be accepted from, or contract awarded to, any person who is

in arrears with the Village of Ossining, upon debt or contract, nor who is in default, as surety or otherwise, upon any obligation to the Village of Ossining.

F. BID SECURITY

A certified check, cashier's check, or bid bond in the amount of five percent (5%) of the proposal submitted must accompany each bid. Certified or cashier's checks shall be made payable to the Village of Ossining. Bid bonds must be issued by an approved bonding or insurance company, authorized to do business in the State of New York.

All bid deposits, whether check or bond, shall be held by the Village of Ossining, as security that the business organization to whom the contract shall be awarded will enter into a contract therefore and give security for the performance thereof within ten (10) calendar days after notice of such award. Such bid deposit must be enclosed in the sealed envelope containing the bid.

Bid deposits will be returned to all except the three (3) lowest responsive and responsible bidders within ten (10) business days after the formal opening of the bid.

Bid deposits will be returned to the three (3) lowest responsive and responsible bidders within ten (10) business days after the Village and the accepted bidder have executed the contract, or, if no contract has been so executed, within forty-five (45) business days after the opening of the bids, or upon demand of the bidder at any time thereafter so long as the bidder has not been notified of the acceptance of its bid.

If the bidder to whom the contract has been awarded refuses or neglects to execute and deliver the same and furnish the security required within ten (10) calendar days after due notice that the contract has been awarded to it, the amount of the bid deposit made by said bidder shall be retained by the Village of Ossining as liquidated damages for such neglect or refusal, not as a penalty, and shall be paid into the General Fund of the Village of Ossining. But if the bidder to whom the contract is awarded shall execute and deliver the contract and furnish the security within the time specified, the amount of the bid deposit will be returned to the bidder.

The bidder by submission of this bid agrees with the Village of Ossining that the amount of said bid deposit represents the minimum amount of the damages the Village will suffer by reason of any default as aforesaid.

G. ATTENTION DIRECTED

The attention of the bidders is directed to those provisions of the Contract Agreement relative to:

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

Compliance with Laws
Labor Conditions
Wage Rates
Insurance Required
Bonds Required

H. BIDDERS TO INVESTIGATE

Bidders are required to submit their proposals upon the following express conditions, which shall apply to and become part of every bid received:

Bidders must satisfy themselves by personal examination of the location of the proposed work and by such other means as they may desire as to actual conditions and requirements of the work.

I. QUESTIONS REGARDING CONTRACT DOCUMENTS

In general, no answer will be given in reply to an oral question, if the question involves an interpretation of the intent or meaning of the plans or contract documents or the equality of use of products or methods other than those definitely designated or described in the specifications. All information given to bidders other than by means of the plans or contract documents or by Addenda as described below, is given informally and shall not be used as the basis of a claim against the Village of Ossining, the Village Engineer and Engineer.

To receive consideration, such question shall be submitted in writing to the Village Engineer at least fifteen (15) calendar days before the established date for receipt of bids.

The Village Engineer will arrange as Addenda, which shall become a part of the contract, all questions received as above provided, with his decision regarding each. At least three (3) calendar days prior to the receipt of bids, he will send a copy of these Addenda to each of those who has taken out the contract documents.

J. SCOPE OF WORK

The principal features of the work to be performed are the roof replacement and interior renovations of the Joseph G. Caputo Community Center.

K. TIME FOR COMPLETION

It is the purpose of the Village Engineer to build the works under his charge in the shortest period of time consistent with good construction. A complete and well-designed construction plan and effective organization will be insisted upon.

The attention of the prospective bidders is especially directed to the contract requirements as to the time of the beginning work, the rate of progress and the time allowed for construction and completing the work, as set forth herein and elsewhere in this contract.

The work shall be substantially completed on or before three hundred sixty-five (365) calendar days after written Notice to Proceed.

TIME OF THE ESSENCE: The time in which the contract is to be completed is of the essence of this contract. The bidder must include with its bid a detailed construction schedule, a listing of labor and equipment to be assigned to the contract including that of all proposed subcontractors, and the name and experience record of the superintendent to be assigned to the work who must be at the site during the full course of the work. If, in the opinion of the Village, any bidder fails to demonstrate that it has suitable capital, experience, labor and plant to complete the work within the prescribed time of completion, the Village will consider the bid informal and non-responsive and reject any such bid from further consideration.

L. SEQUENCE OF CONSTRUCTION

The work shall be carried out in the order and sequence directed by the Village Engineer or his authorized representative. The order and sequence of work in this Contract is further specified in the construction drawings.

As noted earlier in this section, the bidder must submit a detailed construction plan with the bid proposal demonstrating the ability to complete the work in the time allotted. This plan shall include as a minimum:

1. Name and experience of the superintendent and crew foremen to be assigned to the work. Names and telephone numbers of Contractor's after-hours emergency contact personnel.
2. List of equipment to be assigned to the work including that of any proposed subcontractors. If equipment is not owned by the Contractor or subcontractor(s), the bidder shall submit a letter from the rental supplier stating that, should the bidder be awarded the contract, the equipment would be available for the duration of the work.

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3. Number and classification of employees to be assigned to the work including those of any proposed subcontractors.
4. A detailed work schedule, with identifiable start and finish dates for the various items of work.

Bidders should refer to the project's technical specifications for more detailed requirements.

M. EXISTING CONDITIONS

Bidders must satisfy themselves by a personal examination of the location of the proposed work and/or by such other means as they may prefer, as to the actual conditions and requirements of the work and shall not at any time after submission of a bid assert or claim that there was any misunderstanding in regard to the nature of the work or the conditions affecting the work.

N. ABILITY AND EXPERIENCE OF BIDDER

It is the purpose of the Village of Ossining not to award this contract to any bidder who does not furnish evidence satisfactory to the Village that it has ability and experience in this class of work, that it has sufficient capital and plans to enable it to prosecute the same successfully and to complete it in the time named.

The Village may make such investigations as it deems necessary to determine the ability of the bidders to perform the work. Information regarding experience, financial resources and facilities shall be submitted in the Bidder's Proposal. The Village Board of Trustees reserves the right to reject any proposal if the evidence submitted by or the investigations of such bidder fails to satisfy it that such bidder is properly qualified to carry out the work contemplated under this contract.

O. BONDS REQUIRED

The selected bidder shall provide payment and performance bonds each in the amount of 100% of the contract price. The bonds shall be from a solvent fidelity or surety company authorized to transact business in this state. The Village Corporation Counsel shall approve the bonds for adequacy, form, and correctness.

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The bidder to whom a contract is awarded shall be prepared to attend at the Office of the Village Clerk to execute the contract, to furnish all required bonds, and to furnish the required insurance or acceptable binders or certificates within ten (10) calendar days after written notice from the Village Engineer that the contract has been awarded to it. Should the selected bidder fail to timely execute the contract and furnish the required bonds and insurance the Village may determine that the selected bidder is no longer interested in pursuing a contract with the Village. Where the Village makes such a determination, the Village shall retain the bid security as liquidated damages pursuant to Section F, Bid Security.

If, at any time after the execution and approval of this contract and the performance and payment bonds required by the contract documents, the Village of Ossining shall deem any of the sureties upon such bond to be inadequate security for the Contract, the Contractor shall, within five (5) calendar days after notice from the Village of Ossining, furnish a new or additional bond in form, sum and signed by such sureties as shall be satisfactory to the Village of Ossining. No further payment shall be deemed due nor shall any further payment be made to the Contractor unless and until such new or additional bond shall be furnished and approved. Premiums on such bonds will be paid for by the Contractor.

P. INSURANCE REQUIRED

The attention of bidders is called to the fact that the Contractor shall be required to take out and continue in effect during the life of the contract insurance with the provisions fully set forth elsewhere in this contract and in the amounts specified herein. If binders or certificates are accepted temporarily, bidders should note that policies must be furnished and approved before any payment will be made under a contract.

Q. LICENSING

All contractors must be properly licensed by all required municipal and/or other regulating entities to perform all matters of business required by this Contract prior to the execution of work.

R. APPROVAL OF SUBCONTRACTORS

The Village of Ossining reserves the right of approval or disapproval of all Subcontractors.

S. TAXES

The Village of Ossining is exempt from payment of all State and local sales and compensating use taxes of the State of New York and of cities and counties on the purchase of all materials and supplies incorporated in and becoming an integral component part of the work, structures, buildings or real property. Such taxes shall not be included in the Price Bid. This exemption does not, however, apply to tools, machinery, equipment or other property purchased by or leased to the Contractor or a subcontractor or to supplies, machinery, equipment and materials which, even though they are consumed in the performance of the Contract, are not incorporated into the completed work. The Contractor and all subcontractors shall be responsible for and shall pay any and all applicable taxes, including sales and compensating use taxes, on such tools, machinery, equipment or other property and upon all such unincorporated supplies and materials.

The Village of Ossining will furnish the required certificates of tax exemption to the Contractor for use in the purchase of supplies and materials to be incorporated into the work.

The Contractor and all subcontractors and material suppliers shall be solely responsible for obtaining or delivering any and all exemption or other certificates and for furnishing a Contractor Exemption Purchase Certificate or other appropriate certificates to all persons, firms or corporations from whom they purchase supplies, materials and equipment for the performance of the work.

T. SUPPLEMENTARY DEFINITIONS

Wherever reference is made to any published standards, codes or standard specifications, it shall mean the latest standard, code, specification or tentative specification of the technical society, organization or body referred to, which is in effect at the date of the Notice to Bidders. Where specified articles, sections, paragraphs or other subdivisions of the referenced publications are not stated, the referenced publication shall apply in full.

The following is a partial list of typical abbreviations that may be used in the specifications and the organizations to which they refer:

AASHTO	American Association of State Highway and Transportation Officials
AIA	American Institute of Architects
ACI	American Concrete Institute
ACIFS	American Cast Iron Flange Standards
AGA	American Gas Association
AGMA	American Gear Manufacturer Association

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AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASME	American Society Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
API	American Petroleum Institute
EEI	Edison Electric Institute
Fed Spec	Federal Specifications
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
NBC	National Building Code
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NPC	National Plumbing Code
NSF	National Sanitation Foundation
NYSBCC	New York State Building Construction Code
OSHA	Occupational Safety and Health Administration

STANDARD SPECIFICATIONS - The STANDARD SPECIFICATIONS, CONSTRUCTION AND MATERIALS, latest version, and any ADDENDA as prepared by the New York State Department of Transportation.

The Contractor shall, when required, furnish evidence satisfactory to the Village Engineer that those materials and methods are in accordance with such standards where so specified. Should any questions arise as to the application of these standards, the Contractor shall supply copies on site. The same procedure shall be followed in regard to manufacturers' instructions and recommendations.

U. SUBMITTAL OF PAYROLL RECORDS

The Contractor must submit certified transcripts of his or her payroll records and all subcontractor payroll records with each request for payment. Said payroll transcripts must include all work performed under this Contract for the period of time covered on the accompanying payment request.

Pursuant to New York Labor Law section 220(3-a)(a)(iv) the Village of Ossining as the Department of Jurisdiction is required to maintain such original payroll records or transcripts thereof for five years from the date of completion of the work on the awarded contract. The

Village of Ossining Department of Public Works shall designate in writing the employee responsible for the receipt, collection and review of the facial validity of payrolls.

The Contractor and all Subcontractors shall comply with the requirements of New York Labor Law section 220-j, Payroll Reporting Requirements.

V. OSHA REQUIRED TRAINING

OSHA 10-hour Construction Safety and Health Course:

This provision is in addition to the existing prevailing wage rate law (New York Labor Law section 220). Labor Law section 220-h requires that on all contracts for the construction, reconstruction, maintenance and/or repair of public work to which the state or a municipality is a party, where the total cost of the work to be performed under the contract is at least \$250,000, all laborers, workers and mechanics employed in the performance of the contract on the public work site as contractor, sub-contractor or other person doing or contracting to do all or part of the work shall be certified prior to performing any work on the project as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration which course is at least 10 hours in duration.

The General Contractor will submit certification of each on-site employee's OSHA-certified completion of this course to the Village Engineer, or his/her designated representative, prior to beginning work on site. These certifications will be randomly audited by the Village of Ossining against certified payroll records submitted with payment requests.

Any questions regarding this statute should be directed to the New York State Department of Labor, Bureau of Public Work, at 518-485-5696.

W. MINORITY AND OWNED BUSINESS PARTICIPATION POLICY

It is the policy of the Village of Ossining to include minority and women-owned businesses in the village's solicitations and to take affirmative steps that MWBEs have full participation in the village's procurement process. Additionally, the village is receiving a grant of \$2,500,000 from the New York State Department of State Downtown Revitalization Initiative for the redesign and renovation of the Joseph G. Caputo Community Center. **For this project, the specific MWBE goals are MBE-15% and WBE-15%, which equals \$375,000 for MBE and \$375,000 for WBE.** The Village agrees to fully comply and cooperate with the Department of State in the implementation of New York State Executive Law Article 15-A and the regulations promulgated

thereunder. These requirements include equal employment opportunities for minority group members and women and contracting opportunities for New York-certified minority and women-owned enterprises. Nothing herein shall be construed to authorize the Village of Ossining to award any contract in violation of the competitive bidding laws of New York State (General Municipal Law section 103) and the Charter and local laws of the Village of Ossining.

X. PROTEST POLICY

1. It is the policy of the Village of Ossining to provide all bidders with an opportunity to administratively resolve complaints or inquiries related to bid solicitations or pending contract awards. The Village encourages bidders to seek resolution of complaints concerning the contract award process through consultation with the responsible Department Head and Village Manager. All such matters will be accorded impartial and timely consideration.
2. It is strongly recommended that Village staff encourage, be receptive to and resolve issues, inquiries, questions and complaints on an informal basis, whenever possible. Information provided by any interested party should be fully reviewed by the Department Head and the Village Manager. Responses to the inquirer should indicate the existence of a formal protest policy available to them should the informal process fail to resolve the matter. Staff should document the subject matter and results of any informal inquiries.
3. Bidders may file formal written protests. Final Village determinations or recommendations for award generally may only be reconsidered in the context of a formal written protest. Any potential bidder, who believes it has been aggrieved in the drafting or issuance of a bid solicitation, request for proposals or by a pending contract award, may present to the Village Manager a formal complaint and request administrative relief concerning such action ("Formal Protest").
4. Formal protests which concern the drafting of bid solicitations or requests for proposals must be received by the Village Manager at least ten (10) business days before the date set in the solicitation for receipt of bids or date to submit responses to a request for proposals. If the date set in the solicitation for receipt of bids is less than ten (10) business days from the date of issue, formal protests concerning the bid document must be received by the Village Manager at least twenty-four (24) hours before the time designated for receipt of bids.
5. Formal protests concerning a pending contract award must be received within ten (10) business days after the protesting party knows or should have known of the facts which form the basis of a protest.

6. A formal protest must be submitted in writing to the Village Manager by mail, facsimile transmission or e-mail. The formal protest must include; a) a statement of all grounds for disagreement with the Village's bid solicitation or procurement determination; b) a description of all remedies or relief requested; and c) all applicable supporting documentation. Protests should be delivered to the Village Manager at 16 Croton Avenue, 2nd Floor, Ossining, New York 10562 or by email at kdattore@villageofossiningny.gov.
7. Protests may be resolved through verbal or written correspondence, and/or either the protesting party or the Village Manager may request a meeting to discuss a formal protest. The Village Manager will conduct a review of the records involved in the protest. If a formal bid protest is received, a final determination on the protest should be made prior to approval of the award. However, during the pendency of the protest, bid evaluation and review of the recommended award may continue to be conducted at the discretion of the Village Manager.
8. A copy of the Village Manager's decision stating the reasons upon which it is based and informing the protester of the right to appeal an unfavorable decision to the Board of Trustees shall be sent to the protesting party within twenty (20) business days of receipt of the protest, except upon notice to the protesting party, the period may be extended. The Village Manager's determination shall be included in the bid file. If the Village Manager determines that there are compelling reasons, including the need to proceed immediately with the contract award in the best interest of the Village, then the protest procedure herein may be suspended and such determination shall be documented in the procurement documents.
9. Should the protesting party be dissatisfied with the protest determination, a written appeal may be directed to the Board of Trustees by mail at 16 Croton Avenue, 2nd Floor, Ossining, New York 10562 or by email at BOT@villageofossiningny.gov. Written notice of appeal must be received no more than ten (10) business days after the decision is sent to the protesting party. Unless a timely Notice of Appeal is received, the decision of the Village Manager shall be a final determination. The decision of the Board of Trustees shall be issued within twenty (20) business days of receipt of the notice of appeal. The appeal to the Board of Trustees may not introduce new facts unless responding to issues raised by the Village Manager in the initial protest determination.

Y. PROCUREMENT ETHICS

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1. Procurements are an expenditure of public monies, and public employees must always ensure that all procurements are conducted so as not to cause any concern that special considerations have been shown to a bidder/proposer. Actions such as providing a bidder/proposer with information that is not available to other bidders/proposers or accepting a gift from a potential contractor could be construed as showing favoritism, and may violate state and/or Village law. Attention is called to General Municipal Law Article 18 and Village of Ossining Code Chapter 17.
2. Contractors and their representatives have a responsibility to deal ethically with the Village and its employees, and to respect the ethical duties of Village employees. Information provided by contractors to the Village must be complete and accurate. Contractors must at all times avoid conduct that is in restraint of competition. Contractors must not request Village employees to engage in conduct that would violate the law.
3. Pursuant to Village of Ossining Code section 17-6D, "the Corporation Counsel or the Village Manager or their designee, shall cause each person or legal entity signing a contract with the Village providing for payments in excess of \$25,000 to be given a copy of the Code of Ethics and such person or legal entity subject to this provision shall be required to acknowledge receipt thereof in writing unless the Code of Ethics is referenced in and attached to the signed agreement."

AA. CONFIDENTIALITY

To provide the requested services, it may be necessary for the Village and the bidder to disclose certain confidential information to each other. All confidential information shall be marked **CONFIDENTIAL**. The Village and the bidder agree not to disclose any confidential information to a third party unless: i) disclosure is required by law and, if so, advance written notice of disclosure (minimum of three business days) is given; ii) the information actually and demonstrably was known to the disclosing party before it was obtained from or developed in cooperation with the other party; iii) the information was obtained or acquired by the disclosing party in good faith from a third party who acquired it in good faith and who is not under any direct or indirect obligation of secrecy to the other party; iv) the information is or becomes available to the public, in general, through a widely disseminated publication where such publication does not arise directly or indirectly from the breach of any obligation of confidentiality to the other party; and v) a written release is obtained by the disclosing party from the other party.

BB. REGISTRATION SYSTEM FOR CONTRACTORS AND SUBCONTRACTORS

Section 220-i of New York’s Labor Law, effective **December 30, 2024** requires contractors and subcontractors covered by the Labor Law to register with the Commissioner of Labor (220-i(2)). The project detailed in this document is a “covered project” under the Labor Law including section 220-i. The law further requires:

- No contractor shall bid on a contract for public work unless such contractor is registered pursuant to this section. In the case of a covered project subject to section 224-a or 224-d of this article, or other projects that are privately owned and subject to the provisions of this article, contractors must register prior to commencing any work on a covered project. Subcontractors must be registered prior to commencing any work on a covered project. **Further, each contractor must submit their certificate of registration at the time the bid is made.** Applications for registration shall not be accepted as a substitute for a certificate of registration for the purposes of this section. (220-i(6))
- A contractor who bids on a contract for public work knowing that it is not registered, or allows a subcontractor to commence work on a covered project that it knows or should have known is not registered pursuant to subdivision six of this section shall, after notice and a hearing, be subject to a civil penalty of up to \$1,000. A contractor or subcontractor who commences work on a covered project knowing that it is not registered or contracts with a subcontractor that it knows or should have known is not registered for work on a covered project shall, after notice and hearing, be subject to a civil penalty of up to \$1,000. (220-i(8)(a))

CC. ADDITIONAL REQUIREMENTS WHERE NEW YORK STATE GRANTS FUNDS ARE RECEIVED

- Pursuant to Contract Number C11002400 between the Village of Ossining and the New York State Department of State, “The Village agrees that it shall not enter into any contract for the performance of work in furtherance of this contract with any contractor that at the time of contracting: (1) is listed on the New York State Department of Labor’s list of companies with which New York State cannot do business(available at <https://dbr.labor.state.ny.us/EDList/searchPage.do>); (2) is listed as an entity debarred from federal contracts (available at <https://www.sam.gov/portal/public/SAM>); or (3) fails to possess requisite workers compensation and disability insurance coverage (see <http://www.wcb.ny.gov>). The Village also agrees that it shall immediately suspend or terminate any subcontract entered into for the performance of work

in furtherance of this contract if at any time during the term of such contract the selected contractor: (1) is listed on the New York State Department of Labor's list of companies with which New York State cannot do business (available at <https://dbr.labor.state.ny.us/EDList/searchPage.do>); (2) is listed as an entity debarred from federal contracts (list available at <https://www.sam.gov/portal/public/SAM>); or (3) fails to maintain requisite workers compensation or disability insurance coverage (see at <http://www.wcb.ny.gov>). The selected contractor agrees that any such suspension shall remain in place until the condition giving rise to the suspension is corrected by the selected contractor."

- The prospective contractor shall provide to the Village such information as may be requested by the Department of State as necessary to assess whether the prospective contractor is a responsible entity capable of lawfully and satisfactorily performing the work. In the event the Department of State invokes the right of prior approval and a request for prior approval is submitted by the Village and denied by the Department of State, the Village agrees that it shall not enter into the proposed contract and that no costs associated that contract shall be allowed under the Village's Master Grant Agreement with New York State.

DD.DUTIES OF CONTRACTORS AND SUBCONTRACTORS PERTAINING TO IMMIGRATION ENFORCEMENT

General Municipal Law Article 19-D, effective May 20, 2026, "Duties of Municipal Governments and their employees pertaining to immigration enforcement" defines "municipal government employee" as, "any individual employed by a municipal government; **or any contractor or subcontractor while performing services on behalf of a municipal government...**" Pursuant to General Municipal Law section 996-a contractors or subcontractors while performing work for the village shall not:

- Disclose to an immigration authority or employee thereof an individual's personally identifiable information which includes the person's name, social security number, physical description, associated addresses, telephone numbers, financial information, medical information, education or place of employment. "Immigration authority" means, "an agency that primarily enforces immigration law including, but not limited to, United States Immigration and Customs Enforcement or United States Customs and Border Protection, and any successor agencies having similar duties; or a federal agency making a request or taking enforcement action pursuant to the civil enforcement provisions of the federal Immigration and Nationality Act." (Executive Law section 319(3))

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- Question, investigate, or interrogate an individual solely on the basis of an immigration detainer, a civil immigration warrant or for the sole purpose of immigration enforcement.
- Inquire about a person's citizenship, immigration status, nationality, or country of origin.
- Collect information about a person's citizenship, immigration status, nationality or country of origin.
- Grant permission to access or facilitate access to non-public areas of property owned or operated by or under the control of the Village of Ossining to an immigration authority or employee thereof.
- Use an immigration authority or employee thereof as an interpreter or translator for law enforcement purposes

Pursuant to General Municipal Law section 996-a(9), contractors and subcontractors while performing services on behalf of the Village of Ossining are **not prohibited** from, "complying with court orders issued by a judge appointed pursuant to Article III of the United States Constitution or a federal magistrate judge appointed pursuant to 28 U.S.C. 631, or judicial warrants issued by a judge appointed pursuant to Article III of the United States Constitution or federal magistrate judge appointed pursuant to 28 U.S.C. 631, or as otherwise required by law." It is expected that contractors and subcontractors will familiarize themselves with Article 19-D.

SECTION II – BIDDER'S PROPOSAL

SECTION II BIDDER'S PROPOSAL

A. STATEMENT AND CERTIFICATION OF NON-COLLUSION

COMPLIANCE WITH SECTION 103-d of GENERAL MUNICIPAL LAW

1. 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 their knowledge and belief:
 - a) The prices in this 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 bidder or with any competitor;
 - b) Unless otherwise required by law, the prices which have been quoted in this 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
 - c) 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.
2. A bid shall not be considered for award nor shall any award be made where (1) (a), (b) and (c) above have not been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets further in detail the reasons therefor. Where (1) (a), (b) and (c) above have not been complied with, the bid shall not be considered for award nor shall any award be made unless the Village of Ossining Corporation Counsel, or its designee, determines that disclosure was not made for the purpose of restricting competition.
3. The fact that a bidder has published price lists, rates, or tariffs covering items being procured, has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or has sold the same items to other customers at the same prices being bid, does not constitute, without more, a disclosure within the meaning of paragraph 1 above.
4. Any bid hereafter made hereunder by a corporate bidder for work or services performed or to be performed by, goods sold or to be sold, where competitive bidding is required by statute, rule regulation, or local law, and where such bid contains the certification referred to in paragraph 1 above, shall be deemed to have been authorized by the Board of

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Directors, partners, or members of the bidder, and such authorization shall be deemed to include the signing and submission of the bid and the inclusion therein of the certificate to non-collusion as the act and deed of the corporation.

Dated _____
Legal Name of Person, Firm, or Corp.

(Seal of Corporation) _____

Business Address of Person, Firm or Corporation

By: _____
Signature

NON-COLLUSIVE BIDDING CERTIFICATION BIDDER INFORMATION

Bidder to provide information listed below: (Please print)

Bidder Address: _____

Federal Identification No.: _____

Name of Contact Person: _____

Phone # of Contact Person: _____

If Bidder is a Corporation: _____

President's Name & Address: _____

Secretary's Name & Address: _____

Treasurer's Name & Address: _____

If Bidder is a Partnership: _____

Partner's Name & Address: _____

Partner's Name & Address: _____

If Bidder is a Sole Proprietorship: _____

Owner's Name & Address: _____

If Bidder is a Joint Venture: _____

Names & Addresses of Each Member Must be Identified: _____

B. IRAN DIVESTMENT ACT OF 2012 CERTIFICATION

General Municipal Law section 103-g imposed requirements on local governments to ensure that public contracts are not awarded to entities invested in the Iranian energy sector. The statute also notes that, “a bid may not be considered for award nor may an award be made where the bidder has not submitted the statement of non-investment.” (Purchasing Goods and Services: A Guide to Competitive Bidding and Procurement, (NYCOM March, 2015).

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 that each bidder is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the State Finance Law.

Affirmation:

Legal Name of Person, Firm or Corp.

Business Address of Person, Firm or Corp.

Signature

Print Name

Print Title

Date

C. BIDDER’S QUALIFICATIONS

The undersigned offers the following information as evidence of the facilities, ability and/or financial resources available for the fulfillment of the contract, if so awarded.

FACILITIES - That it has available for immediate use on the proposed work, the following plant and equipment:

ABILITY - That it has experience in the performance of the trades in projects of similar scope and size.

REFERENCES - Provide references from projects of similar scope and magnitude.

PROJECT NAME	LOCATION	OWNER/TEL.#	CONTRACT \$

The contractor hereby authorizes the Village to contact the above people:

SIGNED DATE

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FINANCIAL RESOURCES - That information relative to financial resources can and may be obtained from the following (give, name, business and address; at least one must be a bank):

NAME

BUSINESS

ADDRESS

Upon request, the undersigned will amplify the foregoing statements as may be required and necessary to satisfy the Village concerning the ability to successfully perform the work in a satisfactory manner within the required time.

SUBCONTRACTOR(S) - List any subcontractor(s) you plan to use for any part of this work and provide details:

SUBCONTRACTOR NAME

DETAIL OF WORK TO BE SUBCONTRACTED

The Bidder shall submit with the bid the above qualification information for each of the listed subcontractors.

BUSINESS ORGANIZATION INFORMATION – State the bidder’s complete legal name including corporate legal status (corporation, partnership, joint venture, limited liability company, limited liability partnership, sole proprietorship) and any names under which the bidder is doing business. For a corporation identify the president and secretary, for a partnership, the general or managing partner(s), for a limited liability company, the managing member(s), and for a joint venture identify each member of the joint venture. **This information must be provided.**

Please fill-in completely and print unless signature required.

- a) Correct name of Bidder _____
- b) The business is a _____
- c) The principal place of business address is:

- d) The names of the corporate officers, or partners, or individual(s) doing business under a trade name, are as follows:

Signature of Bidder’s Representative _____

Title of Bidder’s Representative _____

D. REGISTRATION FOR CONTRACTORS AND SUBCONTRACTORS

By submission of this bid, the bidder certifies that it has registered with the New York State Commissioner of Labor pursuant to section 220-i(6) of the Labor Law. The bidder has provided a copy of its current certification with this bid. The bidder further certifies that all of the subcontractors identified in section C also are registered with the New York State Commissioner of Labor. Current registration certificates for subcontractors also are provided with this bid. It is understood that applications for registration **shall not** be accepted as a substitute for a certificate of registration.

Affirmation:

Legal Name of Person, Firm or Corp.

Business Address of Person, Firm or Corp.

Signature

Print Name

Print Title

Date

E. MINORITY AND WOMEN-OWNED BUSINESS CERTIFICATIONS

In order to monitor minority and women-owned business enterprise (MWBE) participation in the Village of Ossining's solicitation and procurement processes, we request that you answer the questions below. If you do not answer the questions, we will assume that you do not wish to be considered a minority and/or women-owned business.

A minority-owned business is defined as a business that is 51% or more owned and controlled in a substantial and continuing manner by people who are eligible minorities or, in the case of a publicly owned business, where 51% or more of the voting shares of the corporation are owned by people who are eligible minorities.

Eligible minorities are defined as Blacks, Hispanics, Asians, American Indians, Eskimos and Aleuts.

A women-owned business is defined as a business that is 51% or more owned and controlled in a substantial and continuing manner by women, or in the case of a publicly owned business, where 51% or more of the voting shares of the corporation are owned by women.

Are you a Minority-Owned Business? Yes ☐ No ☐

Are you a Women-Owned Business? Yes ☐ No ☐

What Minority group(s) are you?

What percentage of ownership or voting power in shares of your business do Minorities and/or Women own?

Please identify, by name, Minority/Women owners of your business and ownership percentage of each:

VILLAGE OF OSSINING
WESTCHESTER COUNTY, NEW YORK

F. BIDDER'S PROPOSAL

INFORMATION

A. Bid presented to: Village of Ossining, Municipal Building, 16 Croton Avenue, Ossining, NY

B. Bid presented by:

a. Legal name and address of Bidder: _____

C. Bid presented for: Improvements-Renovation and Remodeling-at Joseph G.Caputo Community Center:

TRADE	CONTRACT NO.	CHECK ONE
General Construction	REC-26-01G	
Plumbing Construction	REC-26-01P	
Mechanical Construction	REC-26-01M	
Electrical Construction	REC-26-01E	

D. The bidder by making a bid represents that:

- The Bidder has read and understands the Bidding Documents titled Joseph G. Caputo Community Center and the Bid is made in accordance therewith;
- The Bidder has read and understands the Bidding Documents and Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction;
- The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidders personal observations with the requirements of the proposed Contract Documents;
- The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

E. Addenda:

- The Bidder acknowledges receiving addenda and including their provisions in the Bid.
- Indicate the addenda numbers received: Addendum #1 _____ Date _____
Addendum #2 _____ Date _____
Addendum #3 _____ Date _____
Addendum #4 _____ Date _____
Addendum #5 _____ Date _____

F. Bid:

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

- a. The Bidder proposes to perform the Work for the following lump sum amount:

LUMP SUM BASE BID:

\$ _____
(Numerical amount)

(_____ Dollars)
(Written amount)

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

ADD ALTERNATE NO. 1

General Construction Contract No. 1: All work described, detailed and associated with landscape drawings L-1 through L-10.

\$ _____
(Numerical amount)

(_____ Dollars)
(Written amount)

Electrical Construction Contract No. 4: All work described, detailed and associated with landscape drawings L-1 through L-10.

\$ _____
(Numerical amount)

(_____ Dollars)
(Written amount)

G. Complete the following applicable page(s) and the final page "Execution" paragraph:

H. General Construction Contract No. 1:

1. Unit Prices (only applicable unit prices are listed):

Item	Unit of Measure	Unit Price Add	Unit Price Deduct
Trench Rock Excavation	Cubic Yard		
Utilities Excavation	Linear Foot		
Cast-In-Place Concrete	Cubic Yard		
Concrete Slab-On-Grade	Square Foot		
Structural Steel	Pounds		
Sawcut & Remove Masonry Wall	Square Foot		
Sawcut & Remove Concrete Slab	Square Foot		
Remove Interior Wall	Square Foot		
Remove VCT & Carpet Flooring	Square Foot		
Remove CT Flooring	Square Foot		
Remove GWB Ceiling	Square Foot		
Remove ACT Ceiling	Square Foot		
Wall G1-Framing, GWB & Paint	Square Foot		
3/8" GWB Laminate to Wall	Square Foot		
Paint Existing Wall	Square Foot		
Access Door & Frame at GWB Wall or Ceiling	Installed per Door		
Fire Access Door & Frame at GWB	Installed per		

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

Wall or Ceiling	Door		

2. Allowances: There are no allowances as part of this Base Bid.

I. Plumbing Construction Contract No. 2:

1. Unit Prices (only applicable unit prices are listed):

Item	Unit of Measure	Unit Price Add	Unit Price Deduct
FIXTURES:			
Water Closet	Each		
Urinal	Each		
Lavatory	Each		
Drinking Fountain	Each		
Mop Sink Basin	Each		
Floor Drain	Each		
Hose Bibb	Each		
General Laborer	Straight time/OT		
Plumber	Straight time/OT		
Insulator	Straight time/OT		

2. Allowances: There are no allowances in the Base Bid

J. Mechanical Construction Contract No. 3

1. Unit Prices (only applicable unit prices are listed):

Item	Unit of Measure	Unit Price Add	Unit Price Deduct
Galvanized Ductwork	Pounds		
Volume Damper	Each		
Unit Heater	Each		
Motorized Damper	Each		
General Laborer	Straight time/OT		
Steamfitter	Straight time/OT		
Sheet Metal Mechanic	Straight time/OT		
Insulator	Straight time/OT		
Controls Technician	Straight		

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

	time/OT		
Draftsperson	Straight time/OT		
Diffuser, Grille	Each		

2. Allowances: There are no allowances in the Base Bid

K. Electrical Contract No. 4

1. Unit Prices (only applicable unit prices are listed):

Item	Unit of Measure	Unit Price Add	Unit Price Deduct
Duplex Receptacle	Each		
Line Voltage Lighting Switch	Each		
Low Voltage Lighting Switch	Each		
Vacancy Sensor	Each		
Light Fixture (each type)	Each		
Empty Conduit & Junction Box for Telecommunications	Per Drop		
Smoke Detector	Each		
Pull Station	Each		
Tamper Switch	Each		
Horn/Strobe	Each		
Heat Detector	Each		
Fire Alarm Control Module	Each		
Branch Circuit 2#12,1#12G-¾" C	Per 20 Feet		
2#10,1#10G-¾" C	Per 20 Feet		
4#10, 1#10G-¾" C	Per 20 Feet		
5#10, 1#10G-¾" C	Per 20 Feet		
Feeder 4#4,1#8G-1 ¼" C	Linear Foot		
3#2,1#6G-2" C	Linear Foot		
4#4/0,1#2G-2.5"C	Linear Foot		
4#500mcm,1#350mcmG-3½" C	Linear Foot		
20A-1p breaker	Each		
30A-1p breaker	Each		
20A-2p breaker	Each		
30A-2p breaker	Each		
60A-3p breaker	Each		
80A-3p breaker	Each		
100A-3p breaker	Each		
150A-3p breaker	Each		
225A-3p breaker	Each		
Fire Alarm Branch Wiring	Linear Foot		

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

30A-3p Fused Disconnect Switch	Each		
60A-3p Fused Disconnect Switch	Each		
100A-3p Fused Disconnect Switch	Each		
200A-3p Fused Disconnect Switch	Each		
300A-3p Fused Disconnect Switch	Each		

2. Allowances : There are no allowances in the Base Bid

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

L. EXECUTION

1. The undersigned Bidder will accomplish all work required by the Bidding Documents and will provide Substantial Completion by May 11, 2027, from the Contract signing, and will provide the Project, ready for final acceptance, inclusive of all Punch List and Project Close Out Documents by June 30, 2027, from the Contract signing as per Preliminary Milestone Schedule date June 25, 2026.
2. The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.
3. Enclosed herewith, is the Bid Security in the form of:

Bid Bond() Certified Check ()

in the amount of _____ Dollars.

Indicate if the Bidder is a sole proprietor, partnership, corporation, or other legal entity.

Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have the current power of attorney attached certifying the agent's authority to bind the Bidder.

Bidders signature: _____

Title: _____

Date: _____

SEAL (if bid is a corporation)

Acknowledgement by Contractor, if a corporation.

State of New York

County of:

On this ____ day of _____, 2026, before me personally came

_____.

(Affix corporate seal here if applicable)

to me know and known and known to me, who, being sworn, did depose and say that he/she resides in the _____:

that he/she is the _____ of the _____,

a body corporate and the corporation described in and which erected the foregoing instruments; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; and that it was so affixed by order of said corporation; and that he/she signed his name thereto by like order.

Seal

NOTARY PUBLIC

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

SEAL (if bid is a partnership)

Acknowledgement by Contractor, if a partnership.

State of New York

County of: _____

On this ____ day of _____, 2026, before me personally came

_____;

to me know and known and known to me, who, being sworn, did depose and say that he/she resides in the

_____:

that he/she is the _____ of the _____,

a body corporate and the corporation described in and which erected the foregoing instruments; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; and that it was so affixed by order of said corporation; and that he/she signed his name thereto by like order.

Seal

(Affix corporate seal here if applicable)

NOTARY PUBLIC

SEAL (if bid is a joint venture)

Acknowledgement by Contractor, if a joint venture

State of New York

County of: _____

On this ____ day of _____, 2026, before me personally came

_____;

to me know and known and known to me, who, being sworn, did depose and say that he/she resides in the

_____:

that he/she is the _____ of the _____,

a body corporate and the corporation described in and which erected the foregoing instruments; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; and that it was so affixed by order of said corporation; and that he/she signed his name thereto by like order.

Seal

(Affix corporate seal here if applicable)

NOTARY PUBLIC

Bidder's Proposal

G. BIDDER'S ACKNOWLEDGEMENT OF PROPOSAL

Pursuant to and in compliance with the Advertisement (Invitation for Bids) and the Information for Bidders relating thereto, the undersigned states that they have examined the Contract Documents and the site of the work, made all investigations which have been deemed necessary or desirable, and that they understand the purport and magnitude of the work intended, and the undersigned hereby offers to furnish all plant, labor, materials, equipment, supplies and other facilities and things necessary or proper for or incidental to the proper performance of the work advertised. The undersigned shall pursue said work in strict accordance with the Contract Documents of which this Proposal is a part and with such detailed directions, plans, and drawings as may be furnished from time to time during the progress of the work by the Engineer.

The undersigned hereby agrees to commence work under this Contract within five (5) calendar days following the issuance of a Notice to Proceed and to substantially complete the work in all respects, including the tentative list of items to be completed or corrected within **three hundred sixty-five (365)** calendar days from the issuance of the Notice to Proceed in accord with the Contract Agreement. The undersigned further agrees to pay damages in accordance with the Contract Agreement, Section III, Part D, Item No. 4.

The award will be made to the lowest responsible and responsive bidder based on the Base Bid.

The Owner shall have the right to reject any bids and to waive any informalities and irregularities in the bid received or modify the work required by addenda. The addenda will be mailed or delivered to all whom the Owner knows to have received a complete set of Contract Documents.

Accompanying this Proposal, under separate cover, is a bid bond, cashier's check, or certified check payable to the Owner. In case this Proposal is accepted by the Owner, and the undersigned shall fail to execute the Contract with and to give a bond to the Owner according to the Information for Bidders, then the said bid bond, cashier's check, or certified check shall be forfeited to the Owner; otherwise, it shall be returned to the undersigned.

If written notice of the acceptance of this bid is mailed or delivered to the undersigned within thirty (30) days after the date of opening of the bids, or any time thereafter before this bid is withdrawn, the undersigned shall, within ten (10) days after the date of such mailing or delivering of such notice, execute and deliver a contract in the Form of Contract attached hereto, and Bonds as hereinafter specified. The undersigned hereby designates the above address as the office to which such notice of acceptance may be mailed or delivered.

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

Name of Bidder _____

Name of Bidder's Representative _____

Signature of Bidder's Representative _____

Title of Bidder's Representative _____

SECTION III – CONTRACT AGREEMENT

SECTION III CONTRACT AGREEMENT

NOTE: The headings, titles, table of contents and indexes printed or written on the pages following, preceding or attached, are intended for the convenience of reference only, and do not form part of the contract or specifications.

A. PARTIES AND DEFINITIONS

This agreement dated as of the _____ day of _____, 20____ by and between the Village of Ossining, a municipal corporation of the State of New York, and hereinafter designated the Village, party of the first part, and

_____ hereinafter designated the Contractor, party of the second part.

The parties to these present, each in consideration of the mutual promises, covenants and agreements herein contained, do hereby covenant, promise and agree each with other as follows:

NOTE: Whenever the words defined in this article or pronounced used in their stead occur in this contract and in the Notice to Bidders, Information for Bidders, Bidder's Proposal, Plans and Specifications hereto attached and made a part of this contract, they shall have the meaning here given:

A-1. Acceptance

Shall mean at the conclusion of the period of maintenance, as provided for herein, and shall be followed by the payment to the Contractor of all moneys retained by the Village and the Village releasing the Contractor from all bond obligations.

A-2. Village

Shall mean the Village of Ossining.

A-3. Village Manager

Shall mean the Village Manager of the Village of Ossining, or any officer duly authorized by the Village Manager to act in his or her absences for the Village in the execution of the work required by this contract.

A-4. Village Clerk

Shall mean the Village Clerk of the Village of Ossining, or any officer duly authorized by the Village Clerk of the Village of Ossining to act for the Village in the execution of the work required by this contract.

A-5. Completion

Shall mean the finishing of all work of a contract and its preparation for test by actual use otherwise and shall be certified to by the Village Engineer. During the maintenance period provided for herein, the Contractor without undue interference with such use, shall maintain his work without extra cost to the Village in the condition specified, and his bond and retained percentage shall be held for such performance, as provided herein.

A-6. Contract

"Contract" shall mean and include in their entirety any "Special Notice(s) to Bidders"; the "Notice to Bidders", "Information for Bidders", "Bidder's Proposal", and the "Contract Agreement"; any "General Requirement(s)" clauses, terms, conditions, and/or specifications referred to as such or in a like manner; and all Technical Specifications and Drawings listed, attached, annexed, included, and/or referenced herein. Said "Contract" shall also include any and all Addenda issued to this Bid/Contract as specified in Section I - INFORMATION FOR BIDDERS. All required forms, acknowledgments, and certifications included herein shall be construed as integral parts of the "Contract".

A-7. Contractor

Shall mean the party of the second part above designated entering into this contract for the performance of the work required by it, and the legal representative of said party of the agent appointed to act for said party in the performance of the work. In the Contract Documents it shall be understood to mean each and every Prime Contractor who has a Contract with the Owner except in cases where the term is used in the Technical Specification Sections identified as work of one particular Contractor.

A-8. Village Engineer

Shall mean the person holding the position or acting in the capacity of the Village Engineer of the Village of Ossining, acting either directly or through his properly authorized agents, such agents acting severally within the scope of the particular duties entrusted to them. Whenever the aforesaid Village Engineer is unable to act in consequence of absence or other cause, then

such person shall designate an assistant and that assistant shall perform all the duties and be vested with all the powers herein given the said Village Engineer.

A-9. Notice

Shall mean written notice. Written notice shall have been deemed to have been duly served when delivered in person to the person, firm or corporation for whom intended or to his, their or its duly authorized officer, agent or representative, or when delivered at the last known business address of such person, firm or corporation, or when enclosed in a postage prepaid sealed wrapper or envelope addressed to such person, firm or corporation, or when enclosed in a postage prepared sealed wrapper or envelope addressed to such person, firm or corporation at his, their or its last known business address, and deposited in the U.S. Mails in a receptacle regularly maintained for such purposes by the government.

A-10. Plans

Shall mean all the plans of the work accompanying this contract, which such subsequent details as the Village Engineer may give or approve from time to time.

A-11. Site of Work

Shall mean the immediate locality of the work done or to be done under the contract, including all the land or easements thereto acquired or to be acquired by the Village, and the land, part of highway contiguous to the said work, land or easements, and all temporary or permanent storage place of equipment or material in the work.

A-12. Time

Year, month, week and day shall mean those respective calendar periods unless otherwise specified.

A-13. Terms of Authority

Unless the context clearly indicates the contrary, the words directed, required, permitted, ordered, designated, selected and prescribed, or words of like import used in the specifications or upon the plans shall mean, respectively, the direction, requirement, permission, order, designation, selection or prescription of the Village Engineer and similarly the words approved, acceptable, satisfactory, equal, and necessary, or words of like import shall mean respectively approved by or acceptable to, or satisfactory to or equal or necessary in the opinion of the Village Engineer.

A-14. Fiscal Officer

Shall mean the person holding the position of or acting in the capacity of the Treasurer of the Village of Ossining.

A-15. Engineer

Where the term "Engineer" appears in the Contract Documents, it shall be understood to mean **DCAK-MSA Architecture & Engineering, PC, and Indus Architects PLLC** or its authorized representatives. Indus Architects PLLC is responsible for the schematic design of specifications, review of submittals from contractors relating to the proposed roofing product, and payment applications for the described scope of work.

A-16. Construction Manager

Where the term "Construction Manager" appears in the Contract Documents, it shall be understood to mean Calgi Construction Company, Inc., or its authorized representatives.

A-17. Provide

Where the term "provide" appears in the Contract Documents it shall be understood to mean furnish and install.

A-18. Furnish

Where the term "Furnish" appears in the Contract Documents, it shall be understood to mean furnish only.

A-19. Install

Where the term "Install" appears in the Contract Documents, it shall be understood to mean install only.

A-20. Owner

Shall mean the "Village of Ossining".

B. AUTHORITY OF VILLAGE ENGINEER AND ENGINEER

B-1. General

The Village Engineer will give all orders and direction contemplated under the contract; will determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for; will determine all questions in relation to said work and the construction thereof, and will decide every question which may arise relative to the fulfillment of the contract on the part of the Contractor. His estimates and decisions shall be final and conclusive upon said Contractor; and in case any question shall arise between the parties hereto, regarding this contract, such estimate and decision shall be a condition precedent to the rights of the Contractor to receive any money under the contract.

The Engineer may stop any work under this contract, and within the Engineer's scope of work if the method or conditions are such that unsatisfactory work might result, or if improper material or workmanship is being used.

The order or sequence of execution of the work and the general conduct of the work shall be subject to the approval of the Engineer who shall have authority to direct the order or sequence where public necessity or welfare shall require, which approval or direction shall, however, in no way affect the sole responsibility of the Contractor in the conduct of the work, nor shall any claim against the Village arise or be allowed by reason of any such direction by the Engineer.

B-2. Orders to Foreman

Whenever the Contractor is not present on any part of the work where it may be desired to give directions, orders may be given by the Village Engineer/Engineer and shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which orders are given. All superintendents and foreman shall be English speaking.

The superintendent or foreman in charge of the work shall have full authority to execute the orders or the directions of the Village Engineer/ Engineer without delay and to supply promptly such materials, equipment, tools, labor and incidentals as may be required.

B-3. Alterations or Deletions

The Village may make alterations or deletions in the line, grade, plan, form, dimensions, or materials or the work or any part thereof, either before or after the commencement of construction. If such alterations or deletions increase or diminish the quantity of work to be

performed, there shall be an adjustment for such work under this contract, except that if unit prices are not stipulated for such work, compensation for increased work shall be under the item of Extra Work, and for decreased work the Contractor shall allow the Village a credit as determined by the Village Engineer. If such alterations or deletions diminish the quantity of work to be done, they shall not warrant any claim for damages or for anticipated profits on the work that is dispensed with, and the Contractor waives and releases any claim therefor.

B-4. Access to Work, Places of Manufacture and Accounts

The Village Engineer of the Village of Ossining, inspectors, agents or other employees, shall for any purpose, and other parties who may enter into contract with the Village of Ossining for doing work within the territory covered by this contract shall, for all purposes which may be required by the contract, have access to the work and the premises used by the Contractor and the Contractor shall provide safe and proper facilities therefor.

Furthermore, the Village Engineer / Engineer and his inspectors and agents shall, at all times, have immediate access to all places of manufacture where materials are being made for this contract and shall be given full facilities for determining that all such materials are being made strictly and in accordance with the specifications and plans.

The Contractor shall, whenever requested, provide scales and assistance for weighing, or assistance for measuring any of the materials, and shall give the Village's agents and employees access to invoices, bills of lading, payroll, accounts and memoranda relating to this contract or the work performed or to be performed hereunder.

B-5. Inspection

The Village Engineer, Engineer, and Construction Manager shall be furnished with every reasonable facility for ascertaining whether the work is in accordance with the requirements and intentions of this contract.

B-6. Defective Work

The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill said contract as herein prescribed and defective work shall be made good and unsuitable materials may be rejected, notwithstanding that such work and materials have been previously overlooked by the Engineer and accepted or estimated for payment.

If the work, or any part thereof, shall be found defective before the final acceptance of the whole work, the Contractor shall forthwith make good such defects in a manner satisfactory to the Village Engineer/ Engineer and Construction Manager, and if any materials brought upon

the ground for use in the work or selected for the same shall be condemned by the Engineer as unsuitable or not in conformity with the specifications, the Contractor shall forthwith remove such materials to a satisfactory distance from the vicinity of the work.

C. RESPONSIBILITY OF CONSTRUCTION MANAGER

C-1. General

The Construction Manager shall provide overall field coordination, contractor oversight, schedule management, quality assurance and safety compliance to ensure that this project is executed in accordance with the contract documents and in the Village's best interest.

D. RESPONSIBILITY OF THE CONTRACTOR

D-1. General

The Contractor shall do all the work and shall furnish all the materials, tools, and appliances except as herein otherwise specified, necessary or proper for performing and completing the work required by this contract, in the manner and within the time hereinafter specified. The said Contractor shall complete the entire work to the satisfaction of the Village Engineer/Engineer and in accordance with the specifications and drawings herein mentioned, at the prices herein agreed upon and affixed therefor. All the work, labor and materials to be done and furnished under this contract shall be done and furnished strictly pursuant to and in conformity with the attached specifications and the directions of the Engineer as may be given from time to time during the progress of the work under the terms of this contract and also in accordance with the Contract Plans, which said Specifications and Plans, together with the Notice to Bidders, the Information for Bidders and the Bidder's Proposal form parts of this agreement. The Contractor further agrees that all work done or materials furnished shall be of the best of their respective kinds and qualities.

D-2. Contractor's Obligation

The Contractor shall take all responsibility of the work of his respective trade, said Contractor shall bear all losses resulting to said contractor on account of the amount or character of work, or because the nature of the land in or on which the work is done is different from the assumed or expected, or on account of the weather, floods, or other causes; and the said contractor shall at said Contractor's own proper cost and expense assume the defense of and indemnify and save harmless the Village, the Village Engineer, Engineer and their employees, officers, and

agents from all claims of any kind arising from the performance of this contract, whether or not any active or passive or concurrent or negligent act or omission by the Village, the Village Engineer, Engineer or any of their employees, officers or agents may have directly or indirectly caused or contributed thereto. Any expense necessarily incurred by the Village in any criminal action or proceedings against any person employed on any work constructed or in the suppression of riots among persons employed on said work, or in the prevention of the commission of crime by such persons, after being duly audited, as required by law, shall constitute a claim in favor of the Village of Ossining and an action may be maintained on such audit as for money paid to the use of the Village and said Contractor shall be responsible to the Village for any amount of expense incurred by reason of and upon the grounds set forth hereinabove.

D-3. Contractor to Provide Village Engineering

Unless otherwise specified in this Contract, the Contractor shall provide his own Village Engineering and/or surveying services to give all lines and grades, including such changes as may be necessitated by unforeseen conditions, and as ordered by the Engineer, and other technical advice necessary for the satisfactory installation of the work. The Contractor shall furnish all stakes, forms, grade boards and templates and shall be responsible for the preservation of grade stakes and for the accurate setting, laying and execution of the work in all its parts. Said Contractor shall also provide the Engineer with all necessary assistance when required. All stakes set for lines or grades that may be disturbed by the Contractor or the employees of said Contractor shall be replaced at the expense of said Contractor.

D-4. Contractor to Give Personal Attention

The Contractor shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the Engineer in every possible way.

The superintendent or foreman in charge of the work shall have full authority to execute the orders or the directions of the Village Engineer without delay and to supply promptly such materials, equipment, tools, labor, and incidentals as may be required.

D-5. Contractor's Mistakes

The Contractor shall pay to the Village all expenses, losses and damages, as determined by the Engineer, incurred in consequences of any defect, omission or mistake of the Contractor or his employees, or the making good thereof.

D-6. Contractor to Employ Sufficient Labor and Equipment

The Contractor shall employ only competent and skillful personnel to do the work and whenever the Village Engineer/ Engineer shall notify the Contractor in writing that any person on the work is, in his opinion, incompetent, unfaithful, disorderly or otherwise, unsatisfactory, such person shall be discharged from the work and shall not again be employed in it, except with the consent of the Village Engineer.

If, in the opinion of the Engineer, the Contractor is not employing sufficient labor or sufficient equipment in good repair to complete this contract within the time specified, said Engineer may, after giving written notice, require said Contractor to employ such additional labor and equipment as may be necessary to enable said work to progress properly.

D-7. Patents and Brands

The Contractor shall be liable for any claims made against the Village of any infringements of patents by the use of patented articles in the construction and completion of the work, any process connected with the work agreed to be performed under this contract or of any materials used upon the said work, and which the Village, the Village Engineer, Engineer their employees, officers or agents shall be obliged to pay by reason of any infringement of patents used in the construction and completion of the work.

D-8. Intoxicants

The Contractor shall not sell and shall neither permit nor suffer the introduction or use of intoxicating liquors, unlawful drugs, or cannabinoid hemp as defined in section 3(3) of the New York Cannabis Law and cannabis as defined in section 3(5) of the Cannabis Law upon or about the site of the work under this contract or allow any worker to be on site while that person may be under the influence of any of the above.

D-9. Prevention of Dust Hazard

In accordance with New York State Labor Law, Section 222-a, the Contractor agrees that in the event a silica or other harmful dust hazard is created in the construction of his work herein contracted to be done and for which appliances or methods for the elimination of such silica dust or other harmful dust have been approved by the State and local authorities, said Contractor will install, maintain and keep in effective operation such appliances and methods for the elimination of such silica dust or other harmful dust hazard or hazards, and, in the event this provision is not complied with, this contract shall be void.

D-10. Additional Contractor Responsibilities

The work performed by the selected contractor must be in accordance with the terms of the Master Contract (Contract Number C1002440) entered into between the New York State Department of State and the Village of Ossining.

Nothing contained in this contract shall impair the rights of the State of New York under the aforementioned Master Contract.

Nothing contained in this contract nor under the Master Contract, shall be deemed to create any contractual relationship between the selected contractor and the State.

If the contract equals or exceeds \$100,000 the selected contractor must submit a Vendor Responsibility Questionnaire, which can be accessed using this link: <https://www.osc.ny.gov/files/state-vendors/vendrep/pdf/ac3292s.pdf>

The selected contractor shall submit to the Village all financial claims for services or work rendered and required supporting documentation and reports as necessary to permit the Village to meet claim deadlines and documentation requirements as required by the Payment Reporting Schedule (Attachment D to Master Contract). The selected contractor is advised of the possibility of non-payment or rejection by the Village of claims that do not contain the required information and/or are not received by the Village by the due date.

Equal Employment Opportunity- If the selected contractor does not have an **existing** Equal Employment Opportunity (EEO) policy, the Department of State may require the selected contractor to adopt a model statement. The selected contractor's EEO policy statement shall include the following language:

- The selected contractor will not discriminate against any employee or applicant for employment because of the race, creed, color, national origin, sex, age, disability or marital status, will undertake or continue existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination, and shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force.
- The selected contractor shall state in all solicitations or advertisements for employees that, in the performance of the contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status.
- The selected contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining agreement or other agreement or understanding, to furnish a written statement that such employment agency, labor union, or representative will not discriminate on the

basis of race, creed, color, national origin, sex, age, disability or marital status and that such union or representative will affirmatively cooperate in the implementation of the selected contractor's obligations.

Non-Discrimination Requirement- Pursuant to Article 15 of the Executive Law (also known as the Human Rights Law) and all other State and Federal statutory constitutional non-discrimination provisions, the selected contractor will not discriminate against any employee or applicant for employment because of race, creed (religion), color, sex (including gender expression), national origin, sexual orientation, military status, age, disability, predisposing genetic characteristic, marital status, and shall also follow the requirements of the Human Rights law with regard to non-discrimination on the basis of prior criminal conviction and prior arrest. Furthermore, in accordance with section 220-e of the Labor Law, if this is a contract for the construction, alteration or repair of any public building or public work or for the manufacture, sale or distribution of materials, equipment or supplies, and to the extent that the Master Contract shall be performed within the State of New York, the selected contractor agrees that it shall not by reason of race, creed, color, disability, sex or national origin: (a) discriminate in hiring any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for work under the Master Contract.

Selected contractor to provide a detailed work plan with adequate opportunity for review at appropriate stages.

Provide a payment schedule with payments tied to receipt of project milestones and project costs.

E. TIME

E-1. To Begin Work

The Contractor shall begin the work embraced in this contract within five (5) calendar days after the service of a written notice by the Village Engineer/Engineer instructing the said Contractor to begin work. It is further agreed by the Contractor, however, that no work shall be begun by said Contractor and no liability incurred on the part of the Contractor or on the part of the Village until the Corporation Counsel of the Village of Ossining has first approved the payment and performance bonds and insurance required in the contract.

E-2. To Complete Work

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

The Contractor shall complete all work embraced in this contract as specified in Section I - INFORMATION FOR BIDDERS for the particular contract involved. The allotted time as specified in the INFORMATION FOR BIDDERS shall commence five (5) calendar days after the Contractor is served with a notice to begin work or after the actual beginning of work by the Contractor, whichever shall occur first, as determined by the Engineer.

In the event the completion time specified in the INFORMATION FOR BIDDERS is set forth in calendar days, the Contractor agrees that a calendar day shall be any day, including Saturdays, Sundays and legal holidays, and that said completion time amply provides sufficient extra time to adjust for all delays caused by inclement weather conditions and other causes.

In the event the completion time specified in the INFORMATION FOR BIDDERS is set forth in working days, the Contractor agrees that each day except Saturdays, Sundays and legal holidays shall constitute a working day unless, in the opinion of the Engineer, weather conditions prevent the Contractor from carrying on the work embraced in this contract.

In the event the completion time specified in the INFORMATION FOR BIDDERS is set forth as a date of completion, the Contractor agrees that delays resulting from weather conditions or any other causes shall not be considered as justifiable reasons for extending the specified date of completion and acknowledges that the specified date of completion amply provides sufficient extra time for such delays. In the event of unusual or extraordinary causes delaying work progress, the Contractor agrees to employ sufficient extra shifts and employees to complete the work by the date fixed therefor.

The time in which the contract is to be completed is of the essence of this agreement.

E-3. Delay, Suspension and Extension

The Village Engineer/ Engineer reserves the right to suspend the whole or any part of the work herein contracted to be done, if the Engineer shall deem it in the best interest of the Village to do so.

The Contractor agrees to make no claim for damages for delay in the performance of this contract occasioned by any act or omission of any person, firm or corporation or any acts or omissions of the Village or any of its representatives, and agrees that any such claims shall be fully compensated for by an extension of time to complete performance of the work as provided herein.

No extension of time will be made for ordinary delays or accidents.

E-4. Liquidated Damages

The Contractor shall, in addition to any other indemnification provided for elsewhere in this contract, pay to the Village all expenses, losses and damages, as determined by the Engineer, incurred in consequences of any negligence, defect, omission or mistake of the Contractor or his employees, or making good thereof.

As time is of the essence for this Contract, the Contractor shall also pay the sum of **\$1,000.00** for each calendar day (Saturdays, Sundays and Legal Holidays included) that it shall be in default in substantially completing the entire work to be done under this Contract within **three hundred sixty-five (365)** calendar days after written Notice to Proceed, plus any extensions allowed in accordance with the terms of this Contract. Substantial completion of the work shall be defined as completing the work in all respects, including all parts thereof, except for permanent grass/sod and final sidewalk, curb, and asphalt pavement replacement (if required) and warranty work. The Engineer acting on behalf of the Village Engineer, shall certify substantial completion of the work as described in this Contract Agreement.

If the Contractor subsequently fails to complete all the work on or before thirty (30) calendar days from certification of substantial completion, plus any extensions allowed in accordance with the terms of this Contract, the Contractor shall further pay the sum of **\$500.00** for each calendar day (Saturdays, Sundays and Legal Holidays included) of delay in completing the work.

The above sums are hereby expressly agreed upon, not as a penalty but as a reasonable estimate of liquidated damages, which the Village will suffer by reason of such default(s). The Engineer shall have the right to deduct the amount of any such damages from any moneys due or to become due the Contractor under this contract provided, however, that the Engineer shall have the right in his discretion to extend the time for completion as described below.

E-5. Extension of Time for Completing the Work

If the Contractor is delayed in completion of the work, or phases of the work, under this Contract by any act or neglect of the Owner or of any other Contractor employed by the Owner, or by changes in the work, or by any priority or allocation order duly issued by the Federal government, or by any unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of the public enemy, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormally severe weather, or by delays of subcontractors or suppliers occasioned by any of the causes described above, or by a delay authorized by the Village Engineer for any cause which the Village Engineer shall deem justifiable, then:

For each day of delay in the completion of the work or a phase of the work so caused, the Contractor will be allowed one day additional to the time limitation specified in the Contract, it being understood and agreed that the allowance of same shall be solely at the discretion and approval of the Village Engineer and Engineer.

No such extension of time will be made for any delay unless the Contractor, within three (3) calendar days after the beginning of the delay, shall have informed the Engineer in writing of the nature of the delay, its cause, and its estimated duration. The Engineer will ascertain the facts regarding the delay and notify the Contractor within a reasonable time of his decision in the matter.

The Contractor shall use all honorable and reasonable means to prevent or settle strikes, to avoid violations of labor agreements or other actions calculated to create dissatisfaction with working conditions. Should strikes occur, the Contractor shall make all proper and reasonable efforts to effect early settlement and resumption of the work. Should collusion by the Contractor be proven in the case of strikes or lockouts, then no extension of time for completion of the Contract will be given. Burden of proof in this case shall rest entirely with the Contractor.

If adverse weather conditions are cited as the basis for a claim for additional time, such claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that said weather conditions had an adverse effect on the scheduled construction.

No claim for damages or any claim other than for extensions of time as herein provided shall be made or asserted against the Owner by reason of any delays caused by the reasons hereinabove mentioned unless otherwise provided in the Contract Documents.

E-6. Abandonment and Suspension

If the work to be done under this contract shall be abandoned by the Contractor, or if this contract shall be assigned or the work sublet by said Contractor otherwise than as herein specified, or if at any time the Engineer shall be of the opinion and shall so certify in writing that the performance of this contract is unnecessarily delayed, or that the Contractor is violating any of the conditions or covenants of this contract or of the specifications or is executing the same in bad faith, or not in accordance with the terms thereof, or if the work is not fully completed within the time stated in this contract for its completion or started as specified for starting, or completed with the time to which completion of the contract may be extended by the Village in the manner herein provided, the Village may notify the Contractor to discontinue the work, or such part thereof, and may terminate the contract in whole or part. Village shall thereupon have the power to complete or contract for the completion of the contract in the manner

prescribed by law or to place such and so many persons as the Village may deem advisable, by contract or otherwise, upon the work herein described, or such part thereof, and to take possession of and use any of the materials, plant, tools, equipment, supplies and property of every kind provided by the Contractor for the purposes of his work and to procure other materials for the completion of the same, and to charge the expense of such labor and materials to the Contractor. The expense so charged shall be deducted and paid by the village out of such moneys as may be due or may, at any time thereafter, become due to the Contractor under and by virtue of this contract, or any part thereof. And in case such expense shall exceed the amount which would have been payable under this contract if the same had been completed by the contractor, he shall be liable and responsible therefore; and, if less, he shall forfeit all claims to the difference; and when any particular part of the work is being carried on by the Village, by contract or otherwise under provisions of this article of the contract, the Contractor shall continue the remainder of the work in conformity with the terms of this contract, and in such manner as in no way to hinder or interfere with the persons or workmen employed, as above provided, by the Village by contract or otherwise, to do any part of the work or to complete the same under the provisions of this contract.

The Village shall, however, prior to taking possession for completion, notify the Contractor's surety of the Contractor's defaults hereunder and the surety may remedy the defaults by undertaking and commencing due performance within thirty (30) calendar days after such notice, and by subsequent diligent performance and completion of the contract; and, if the surety shall not faithfully undertake and commence such performance within said period and thereafter diligently complete or perform at the surety's expense (not in excess of the bond amount) the Village may proceed as aforesaid.

However, if, in the Village's opinion, any conditions dangerous to life or property shall exist by reason of the Contractor's default, the Village may proceed forthwith without notice to the surety, but at the expense of the Contractor and surety, to remedy any such dangerous conditions.

F. INSURANCE AND INDEMNITY

F-1. General

The Contractor shall, during the performance of this work, take all necessary precautions and place proper guards for the prevention of accidents, and shall defend, indemnify and save harmless the Village of Ossining, its assigns, elected officials, employees and volunteers and **DCAK-MSA Architecture & Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc., its agents, officers, employees, and consultants and State of New York** from all claims, suits and actions and all damages and costs, including reasonable attorneys' fees to

which they may be put by reason of death, personal injury or property damage to another resulting from unskillfulness, willfulness, negligence or carelessness in the performance of the work, or in guarding and protecting the performance or construction, or by or on account of any direct or indirect act or omission of the Contractor or its employees or agents, and whether or not any active, passive, concurrent or negligent act or omission of the Village of Ossining, its assigns, elected officials, employees and volunteers, **DCAK-MSA Architecture & Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc., its agents, officers, employees, and consultants and State of New York** may have directly or indirectly contributed thereto. The duty to defend, indemnify and save harmless shall extend beyond the expiration/termination/completion of this Contract Agreement.

The Contractor also shall take out and maintain during the life of the contract such contingent property damage, public liability insurance policies, automobile liability and umbrella coverages in amounts hereinafter specified as will protect the Village of Ossining, its assigns, elected officials, employees and volunteers, **DCAK-MSA Architecture & Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc., its agents, officers, employees, and consultants and State of New York** from any and all of the above matters, including a contractual coverage clause where applicable.

The Contractor before execution of this contract by the Village Manager or designee, shall file with the Village Engineer and Corporation Counsel for their approval, one copy of each and every insurance and indemnity policy required by the terms of this contract which policies shall carry an endorsement to the effect that the insurance company shall provide at least thirty (30) days' written notice to the Village Engineer and Corporation Counsel of any cancellation, modification and/or expiration of the insurance policies. Said insurance and indemnity policies, certificates or binders shall be subject to the approval of the Village of Ossining with regard to company, adequacy and form of protection as detailed below. The certified check or bid bond submitted with the Contractor's bid may be held for and until such approval has been given. Upon the failure of the Contractor to furnish, deliver, and maintain such acceptable binders, certificates of insurance, policies as above provided, this contract may, at the option of the Village of Ossining, be held willfully violated by the Contractor and may be declared suspended, discontinued or terminated by the Village. The Contractor acknowledges that the failure to obtain the insurance detailed below constitutes a material breach of the contract and subjects the Contractor to liability for damages, indemnification and all other legal remedies. The failure of the Village of Ossining to object to the contents of the Certificates of Insurance or policies shall not be deemed a waiver of any and all rights held by the Village. Failure of the Contractor to take out and/or maintain any required insurance shall not relieve the Contractor from any responsibility or liability under this contract, nor shall the insurance requirements be construed to conflict with the obligations of the Contractor concerning indemnification.

The cost of furnishing the below detailed insurance coverage shall be borne by the Contractor. The cost for the insurance will be deemed to have been included in the price bid for the contract.

All insurance companies listed on the Certificates of Insurance shall be A.M. Best rated A VIII or better and be admitted in New York State.

All required insurance must be in effect and continued during the life of the contract **in not less than the following amounts:**

- **Workers' Compensation and Employer's Liability-** Contractor to provide New York State Workers' Compensation Board form DB-120.1 or equivalent for proof of compliance with the New York State Disability Law. Form to note the location of operations to be **Joseph G. Caputo Community Center, 95 Broadway, Ossining, NY 10562**. Workers' Compensation shall have unlimited coverage. Such insurance also shall include Employer's Liability in an amount not less than \$1,000,000. Policies to cover operations in New York State. Where applicable, U.S. Longshore and Harbor Workers' Compensation Act Endorsement and Maritime Coverage Endorsement shall be attached to the policy. The Village of Ossining, its employees, elected officials, volunteers and agents; **DCAK-MSA Architecture & Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc., its agents, officers, employees, and consultants, and State of New York** shall be included in a waiver of subrogation clause without the need for a contract or agreement.
- **Commercial General Liability-** **\$1,000,000** per occurrence and **\$2,000,000** general aggregate limits per location for Bodily Injury and Property Damage. Such policy shall include the following coverages: a) Premises and operations; b) Products/completed operations; c) Independent contractors; d) Personal and advertising injury; e) Blanket contractual liability; and f) **The Village of Ossining, its elected officials, employees, agents and volunteers, DCAK-MSA Architecture & Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc, its agents, officers, employees, and consultants and the State of New York shall be named as additional insureds on the policy using ISO Additional Insured Endorsement CG 20 10 11/85 or an endorsement providing equivalent or broader coverage which coverage shall apply on a primary and noncontributory basis, including any self-insured retentions without the need for a contract or agreement.** The Certificate of Insurance shall indicate that the aforementioned requirement applies to the Commercial General Liability insurance policy and the additional insured endorsement shall be attached to the insurance certificate; g) To the extent permitted by New York law, the Contractor waives all rights

of subrogation or similar rights against the Village of Ossining, **DCAK-MSA Architecture & Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc., its agents, officers, employees, and consultants and State of New York** h) Cross liability coverage; i) Coverage to be written on an occurrence policy form; j) Coverage shall include Labor Law/third-party action over claims; k) The clause "other insurance provisions" in a policy in which the Village is named as an insured shall not apply to the Village; l) The insurance company issuing the policy shall have no recourse against the Village for payment of any premium under the policy; and m) any and all deductibles in the policy shall be assumed by and be the sole responsibility of the Contractor.

- **Comprehensive Business Automobile Liability-** \$1,000,000 per occurrence and \$2,000,000 general aggregate or \$2,000,000 combined single limit for bodily injury and property damage including coverage for any owned, non-owned and hired private passenger and commercial vehicles. Such policy to include: a) **The Village of Ossining, its elected officials, employees, agents and volunteers, DCAK-MSA Architecture & Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc., its agents, officers, employees, and consultants and State of New York shall be named as additional insureds on the policy using ISO Additional Insured endorsement CG 20 10 11/85 or an endorsement providing equivalent or broader coverage and shall apply on a primary and noncontributory basis, including any self-insured retentions without the need for a contract or agreement.** The Certificate of Insurance shall indicate that the aforementioned requirement applies to the Comprehensive Business Automobile coverage and the additional insured endorsement shall be attached to the insurance certificate; b) To the extent permitted by New York law, the Contractor waives all rights of subrogation or similar rights against the Village of Ossining, **DCAK-MSA Architecture & Engineering PC; INDUS Architects PLLC; Calgi Construction Company, Inc., its agents, officers, employees, and consultants and State of New York** c) The clause "other insurance provisions" in the policy in which the Village is named as an insured shall not apply to the Village; d) The insurance company issuing the policy shall have no recourse against the Village for payment of any premium under the policy; and e) Any and all deductibles in the policy shall be assumed by and be the sole responsibility of the Contractor.
- **Umbrella/Excess Liability-** \$1,000,000 per occurrence and \$2,000,000 general aggregate per location. Such coverage to follow the Commercial General Liability and Comprehensive Business Automobile Liability policies. Such coverage shall include: a) coverage to be written on an occurrence policy form; b) **The Village of Ossining, its elected officials, employees, agents and volunteers, DCAK-MSA Architecture &**

Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc., its agents, officers, employees, and consultants and State of New York shall be named as additional insureds on the policy using ISO Additional Insured endorsement CG 20 10 11/85 or an endorsement providing equivalent or broader coverage and shall apply on a primary and noncontributory basis, including any self-insured retentions without the need for a contract or agreement; c) to the extent permitted by New York law, the Contractor waives all rights of subrogation or similar rights against the Village of Ossining, **DCAK-MSA Architecture & Engineering, PC; INDUS Architects PLLC; Calgi Construction Company, Inc., , its agents, officers, employees, and consultants and State of New York** d) The clause “other insurance provisions” in a policy in which the Village is named as an insured shall not apply to the Village; e) The insurance company issuing the policy shall have no recourse against the Village for payment of any premium under the policy; and f) Umbrella/Excess coverage shall follow the forms of the commercial general liability and automobile liability coverages.

- **Owner’s and Contractor’s Protective Liability-** \$1,000,000 per occurrence and \$2,000,000 general aggregate limits per location for bodily injury and property damage. Village of Ossining is the sole named insured.

Blasting or explosives coverage may be required if and when deemed necessary by the Village Engineer at the commencement of or during performance of the contract. Such work will be subject to all necessary approvals and permit requirements.

The above-listed minimum insurance coverage requirements may be increased upon review and determination made by the Village Engineer in consultation with the Corporation Counsel and Engineer.

In the event that claims in excess of the required insurance coverage amounts are made by reason of any operations pursuant to the contract, the amount by which such claims exceed the available insurance coverage may be withheld from payments due or to become due the Contractor until such time as the Contractor shall furnish such additional security as may be determined by and satisfactory to the Village Engineer.

G. LABOR

G-1. No Discrimination in Employment

The Contractor agrees:

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

- (a) That in the hiring of employees for the performance of work under this contract or any subcontract hereunder, no contractor, subcontractor, nor any persons acting on behalf of such Contractor or subcontractor, shall by reason of race, creed, color, national origin or gender discriminate against any citizen of the United States who is qualified and available to perform the work to which the employment relates,
- (b) That no Contractor, subcontractor, or any person on his behalf shall in any manner discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, color, national origin or gender.
- (c) That there may be deducted from the amount payable to the Contractor by the Village of Ossining under this contract a penalty of five (\$5.00) for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of the contract; and
- (d) That this contract may be canceled or terminated by the Village of Ossining and all moneys due 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.

G-2. Hours of Work

The Contractor agrees that no laborers, workmen or mechanics in the employ of the Contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract shall be permitted or required to work more than eight (8) hours in any one calendar day or more than five (5) days in any one week, except in cases of extraordinary emergency, including fire, flood or danger to life and property. No such person shall be employed more than eight (8) hours in any day or more than five (5) days in any one (1) week except in such emergency.

G-3. Wage Rates and Supplements

The wages to be paid for a legal day's work, as hereinbefore defined, to laborers, workmen or mechanics upon such public work, shall be not less than the prevailing rate of wages as hereinafter defined. Serving laborers, helpers, assistants and apprentices shall not be paid less than the prevailing rate of wages as hereinafter defined. The wages to be paid for a legal day's work, as hereinbefore defined, to laborers, workmen or mechanics upon any material to be used upon or in connection therewith, shall be not less than the prevailing rate for a day's work in the same trade or occupation in the locality within the state where such public work on, about, or in connection with such labor is performed in its final or completed form is to be situated, erected or used and shall be paid in cash.

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

Such wages shall be paid promptly in cash and in lawful money of the United States, provided, however, that the Contractor may pay his employees by check upon a certificate of the Industrial Commissioner to be issued only after a hearing upon the application to pay by check, which hearing shall be with notice of at least five (5) days to be served personally or by mail on all interested persons, or, if not served as aforesaid, then to be published in a manner directed by the Industrial Commissioner, which shall afford interested persons the opportunity to appear and be heard at such hearing and after proof has been furnished satisfactorily to the Industrial Commissioner of the contractor's financial responsibility and the Contractor gives assurance that such checks may be cashed by employees without difficulty and for the full amount for which they are drawn.

The supplements, as hereinafter defined, to be provided to laborers, workmen or mechanics upon such public works, shall be in accordance with the prevailing practices in the locality, as hereinafter defined. Serving laborers, helpers, assistants and apprentices shall not be classified as common laborers and shall be provided supplements in accordance with the prevailing practices as hereinafter defined. The supplements, as hereinafter defined, to be provided to laborers, workmen or mechanics upon any material to be used or in connection therewith, shall be in accordance with the prevailing practices in the same trade or occupation in the locality within the state where such public work on, about, or in connection with which such labor is performed in its final or completed form is to be situated, erected or used.

"Supplements" means all enumeration for employment paid in any medium other than cash, or reimbursement for expenses, or any payments which are not "wages" within the meaning of the law, including but not limited to, health, welfare, non-occupational disability, retirement, vacations benefits, holiday pay and life insurance.

"Prevailing practices in the locality" shall be practice of providing supplements, as hereinabove defined, to the majority of workmen, laborers or mechanics in the same trade or occupation in the locality as hereinafter defined.

Where contracts are not awarded within ninety (90) days of the date of establishment of prevailing rate of wages by the fiscal officer, the department of jurisdiction shall request of the fiscal officer a re-determination of a schedule of wages and supplements.

The said Contractor agrees that any person or corporation that willfully pays or provides, after entering into such contract, less than such stipulated wage scale as established by the fiscal officer shall, in addition to the penalties provided in Section 220 and other applicable provisions of the Labor Law, be subject to forfeiture of the contract at the option of the Village Manager for a first offense; and no such person or corporation shall be entitled to receive any sum nor shall any officer, agent or employee of the Village pay the same or authorize its payments from

the funds under his charge or control to any person or corporation for work done upon any such contract.

The said Contractor agrees that each such laborer, mechanic or workman employed in his/her performance of this contract, either by the Contractor, a subcontractor, or any other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be provided supplements of not less than prevailing supplements.

In order to comply with the provisions of the Labor Law of the State of New York, the Contractor further agrees that not less than the applicable schedules of wages and supplements (see New York State Department of Labor (**PRC # 2026015824**)) shall be paid and provided to laborers, workmen or mechanics in carrying out the work provided for under this contract.

H. LAWS AND REGULATIONS

H-1. General

The Contractor and his agents and employees shall at all times observe and comply with all existing and future laws, ordinance, regulations, orders and decrees that in any manner affect their work, including Federal permits and regulations, and shall defend, protect, indemnify and save harmless the Engineer, Village Engineer and the Village of Ossining, its agents and employees against any claim or liability arising from or based on the violation of any such law, ordinance, regulations, order or decree, whether by himself or by his employees. If any discrepancy or inconsistency should be discovered in this contract, or in the plans or specifications herein referred to, in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same in writing to the Village Engineer / Engineer.

Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein and if, through mistake or otherwise, any such provision is not inserted, or is not correctly inserted, then upon the application of either party the contract shall forthwith be physically amended to make such insertion.

H-2. Labor and Other Laws

The Contractor and his agents and employees shall at all times observe and comply with all the applicable provisions of the Labor Law, the Public Health Law, the Lien Law, the Workmen's Compensation Law, the State Unemployment Insurance Law, the Federal Social Security Law, the Occupational Safety and Health Laws, Village of Ossining local laws, ordinances, resolutions or regulation and all amendments and additions thereto.

H-3. Refusal to Testify

Upon the refusal of a person when called before a grand jury to testify concerning any transaction or contract had with the State, any political subdivision thereof, a public authority or with any public department, agency or official of the State or of any political subdivision thereof or of a public authority, to sign a waiver of immunity against subsequent criminal prosecution or to answer any relevant questions concerning such transaction or contract;

(a) Such person, and any firm, partnership or corporation of which he is a member, partner, director or officer shall be disqualified from thereafter selling to or submitting bids to or receiving awards from or entering into any contract with any municipal corporation or any public department, agency or official thereof, for goods, work or services for a period of five (5) years after such refusal and also

(b) Any and all contracts made with any municipal corporation or any public department, agency official thereof, by such person, and by any firm partnership or corporation of which he is a member, partner, director or officer may be canceled or terminated by the municipal corporation for goods delivered or work done (Municipal Law Section 103-a).

H-4. Permits

Unless otherwise specified in this Contract, the Contractor shall, at his own expense, obtain all necessary permits and licenses required by County, State or other public authorities; shall give all notices required by law or ordinances; and shall post all bonds and pay all fees and charges incidental to the due and lawful prosecution of the work covered by this contract. If any of the Contractor's work shall be done contrary to such laws, ordinances, rules and regulations, without such notice, he shall bear all cost arising therefrom.

All fees for Village of Ossining permits shall be waived.

H-5. Notice to Consolidated Edison

The Contractor further agrees to comply with General Business Law, Article 36, and shall give prior written notice to the Consolidated Edison Company of New York, Inc., at least seventy-two (72) hours in advance before excavating in any street or public place and before a proposed discharge of explosives in any location.

H-6. Code 53 (16 NYCRR Part 753)

Under Industrial Code Rule 53 the Contractor will be required to notify the Central Registry prior to the start of his work and obtain a listing of the various underground utility operators to notify of impending work under this contract so that said utility operators may locate and mark the locations of their utilities upon the pavement. Notification of all operators must be made forty-eight (48) hours prior to the start of any construction. No work by the Contractor shall commence until all the operators have acknowledged being notified and their utilities have been located and marked.

I. EXTRA WORK

I-1. Modifications and Extra Work

The Contractor in entering into this Contract understands that the Owner reserves the right to modify the arrangement, character or size of the work or appurtenances whenever, in its opinion, it shall deem it necessary or advisable so to do. Minor changes in the work not involving extra cost and not inconsistent with the purposes of the work may be made by verbal order, but no modification involving extra work or material changes shall be made unless ordered in writing by the Village Engineer / Engineer. The Contractor shall and will accept such modifications when ordered in writing by the Village as stated above and the same shall not vitiate or void this Contract. Any such modifications so made shall not, however, subject the Contractor to increased expense without equitable compensation, which shall be determined by the Village Engineer / Engineer. If such modifications result in a decrease in the cost of work involved, an equitable deduction from the Contract price shall be made which shall be determined by the Village Engineer / Engineer. The Village Engineer's / Engineer's determination of any such additional compensation or said deduction shall be based upon the bids submitted and accepted. In no event shall any modification in the work shown on the plans and specifications be made unless the nature and extent thereof has first been certified by the Engineer in writing and sent to the Contractor.

I-2. Payment for Extra Work

The Contractor shall and will do any work and furnish any materials not herein provided which, in the opinion of the Engineer, may be found necessary or advisable for the proper completion of the work, or the purposes thereof, to include any modifications or alterations. All extra work and materials shall be ordered in writing by the Village Engineer / Engineer, and in no case will any work or materials in excess of the amount shown by said plans and specifications be paid for unless so ordered. The Contractor further agrees that it will accept as full compensation for such extra work and materials the unit prices bid in the case of items covered by unit prices in the proposal, and no more; and for such items as are not covered by a unit price, the

Contractor will accept as full compensation the reasonable cost, as determined by the Village Engineer / Engineer, of all necessary labor, including insurance and payroll taxes, equipment rental and materials, plus twenty percent (20%) for superintendence, the use of tools and plant, and other overhead expenses and profit.

The Contractor agrees to prosecute such extra work with all reasonable diligence, and to employ thereon competent personnel. The Contractor shall give the Village Engineer / Engineer, or its authorized agent, access to all accounts, bills, payrolls, and vouchers relating to extra work, and the Contractor agrees that it shall have no claim for compensation for such extra work unless a statement in writing of the actual cost of the same, fully itemized as to labor and materials, is presented to the Village Engineer / Engineer before the fifteenth (15th) day of the month following that during which each specific order was complied with by the Contractor.

I-3. Records

If ordered by the Village Engineer / Engineer, the Contractor shall submit daily records of all extra work. These daily records shall include the names of the men employed and hours worked, material incorporated into the work, machinery used and work actually accomplished. These daily records shall be signed by both the Contractor's authorized representative and the Engineer.

In addition to the daily records set forth in the paragraph immediately above, the Contractor may be required to submit certified copies or photocopies of his payrolls for the days worked, which payrolls shall show the hourly wage rate actually paid to each man.

The Contractor may also be required to submit photocopies of the original receipted bills showing the actual costs of all material incorporated in the work.

I-4. Subcontractors

The Contractor shall not be paid any allowance for profit or overhead on extra work done by subcontractors or others.

I-5. Failure to Perform Extra Work

If the Contractor shall decline or fail to perform such extra work or furnish such materials as authorized or ordered by the Village Engineer in writing, as aforesaid, the Village Engineer may then arrange for the performance of the extra work or the furnishing of the material in any manner as he may see fit, the same as if this contract had not been executed, and the

Contractor shall not interfere with such performance of the extra work nor make any claim against the Village because of such performance.

I-6. Extension of Time

When extra work is ordered near the completion of the contract, or when extra work is ordered at any time during the progress of the extra work which requires, in the opinion of the Village Engineer, an unavoidable increase in time for the completion of the contract, a suitable extension of the item for completion shall be made, as may be determined by the Village Engineer.

I-7. Not to Affect Bonds

It is distinctly agreed and understood that any changes made in the plans and specifications for such extra work or otherwise (whether such changes increase or decrease the amount thereof) or any change in the manner or time of payments made by the Village to the Contractor, or extra work performed, shall in no way annul, release or effect the liability of the surety on the bonds given by the Contractor.

J. PAYMENT

J-1. Promises for Payment

The Contractor shall not demand nor be entitled to receive payment for the work or materials, or any portion thereof, except in the manner set forth in this contract, nor unless each and every one of the promises, agreements, stipulations, terms and conditions herein contained to be performed, kept, observed and fulfilled on the part of the Contractor shall have been so performed, kept, observed and fulfilled on the part of the Contractor and the Engineer shall have given his certificate to that effect and shall have been satisfied with and accepted the work. All requisition for payments and change orders shall be submitted on AIA Document Forms and as otherwise required by the Village.

The Contractor shall submit to the Village Engineer / Engineer prior to the commencement of work a schedule of values of all work. Such schedule shall be reviewed and approved by the Village Engineer / Engineer and will provide a basis of payment for all submittal if accepted by the Village / Engineer.

J-2. Statements Showing Amounts Due Others

In accordance with Section 200-a of the Labor Law as amended, before payment is made by or on behalf of the Village of Ossining of any sum or sums due on account of this contract, it shall be the duty of the Village Treasurer of the Village of Ossining to require the Contractor and each and every subcontractor from the Contractor or a subcontractor to file a statement in writing in a form satisfactory to such Village Treasurer certifying to the amounts then due and owing from such Contractor or subcontractor filing such statement to or on behalf of any and all laborers for daily or weekly wages or supplements on account of labor performed upon the work under the contract, setting forth therein the names of the persons whose wages or supplements are unpaid, and the amount due to each or on behalf of each respectively, which statement so to be filed shall be verified by the oath of the Contractor or subcontractor as the case may be that he/she has read such statement subscribed by him/her and knows the contents thereof, and that the same is true of his/her own knowledge.

J-3. Amounts Due for Wages May be Withheld

In accordance with Section 220-b of the Labor Law as amended, in case any interested person shall have previously filed a protest in writing objecting to the payment of any contractor or subcontractor to the extent of the amount or amounts due or to become due to him for daily or weekly wages or supplements for labor performed on the public improvement for which such contractor was entered into, or if for any other reason it may be deemed advisable, the Village Treasurer of the Village of Ossining may deduct from the whole amount of any payment on account thereof the sum or sums admitted by any Contractor or subcontractor in such statement or statements so filed to be due and owing by him on account of labor performed on such public improvements before making payment of the amount certified for payment in any estimate or voucher, and may withhold the amount so deducted for the benefit of the laborers whose wages or supplements are unpaid or not provided, as shown by the verified statements filed by any contractor or subcontractor, and may pay directly to any person the amount or amounts shown to be due to him or his duly authorized collective bargaining labor organization for such wages or supplements by the statements filed as hereinbefore required, thereby discharging the obligation of the Contractor or subcontractor to the person or his duly authorized collective bargaining labor organization receiving such payment to the extent of the amount thereof, or when any interested person shall file a written complaint with the Village Treasurer of the Village of Ossining alleging unpaid wages or supplements due for labor performed on a public improvement for which a contract has been entered into or if, on the said Village Treasurer's own initiative, unpaid wages or supplements appear to be due, the Village Treasurer of the Village of Ossining shall immediately so notify the financial officer of the civil division interested who shall withhold from any payment on account thereof, due the Contractor or subcontractor executing said public improvements, sufficient moneys to satisfy said wages and supplements pending a final determination as further set forth in said Section 220-a.

J-4. Liens

If, at any time before or within thirty (30) calendar days after the whole work herein agreed to be performed, and all labor and materials herein agreed to be delivered to the Village of Ossining have been performed and delivered or completed and accepted by the Village, any person or persons claiming to have performed any labor or furnished any materials towards the performance or completion of this contract shall file with the Village Clerk any such notice as is described in the New York State Lien Law. The Village Treasurer shall retain until and for the discharge thereof, from the moneys under his control, so much of such moneys as shall be sufficient to satisfy and discharge the amount in such notice claimed to be due, together with the costs of any actions or proceedings brought to enforce such claim or lien by filing of such notice.

J-5. Money May Be Retained

The Village of Ossining may keep moneys which would otherwise be payable at any time hereunder, and apply the same or so much as may be necessary therefor to the payment of any expenses, losses, or damages incurred by the Village, as determined by the Village, and may retain until all claims shall have been satisfied and/or settled, so much of such moneys as the Village shall be of the opinion will be required to settle in full all claims, and the costs and expenses thereof, against the Village, its employees, officers and agents as described in this agreement and all claims for materials for the work, notice of which, signed and sworn to by the claimants, shall have been filed in the office of the Village Clerk, or the Village may make such settlement and apply thereto any moneys retained under this contract.

J-6. Prices for Work

The Village shall pay and the Contractor shall receive in full compensation for the furnishing all materials and labor and for performing and completing all work which is necessary or proper to be furnished or performed in order to complete the entire work in this contract as described and specified in such specifications and plans described and shown and also for all loss or damages arising out of the nature of work aforesaid or from the action of the elements, or from any unforeseen obstruction or difficulty encountered in the prosecution of the work and for all risks of any description connected with the work and for all expenses incurred by or in consequence of the suspension or discontinuance of any work as herein specified, the lump sum and/or unit prices named in the Bidder's Proposals.

J-7. Partial Estimates

In order to assist the Contractor to prosecute the work advantageously, the Contractor, from time to time as the work progresses but not more than once a month, shall submit written

estimates of the amount and value of the work done and materials incorporated in the work by the Contractor in the performance of this contract. Said written estimates shall be submitted on AIA Document Forms and as otherwise required by the Village.

The first estimate shall be of the amount and value of work done and materials incorporated in the work since the Contractor commenced the performance of this contract on his part, and every subsequent estimate, except the final estimate, shall be of the amount and value of the work done and materials incorporated in the work since the last preceding estimate was made; provided, however, that no such estimate shall be made when, in the judgment of the Engineer, the total value of the work done and materials incorporated in the work since the last preceding estimate amounts to less than TWO THOUSAND DOLLARS (\$2,000.00).

Partial estimates shall not include any materials not incorporated in the work nor any of the Contractor's plan. Such estimates shall not be required to be made by precise measurements, but they may be made by measurement or by estimation or partly by one method and partly by the other, and it shall be sufficient if they are approximate only.

J-8. Partial Payment

Upon each estimate being made and certified by the Engineer in writing to the Village Treasurer, the Village shall, within forty - five (45) business days after the date of the estimate, pay to the Contractor ninety - five percent (95%) of the amount stated in such estimate or certificate to be the value of the work done and materials furnished, retaining, however, in addition to the contract or by laws of the State of New York, what the Village is or may be authorized. Such payment shall not be used as evidence against the Village that the work already done has been completed according to contract, nor shall it preclude the Village from contesting the claims of the Contractor that the work has been completed according to contract.

J-9. Withholding of Payments

The payments under an estimate provided for by this agreement may at any time be withheld or reduced if, in the opinion of the Engineer, the work is not proceeding in accordance with the contract; or if the required insurance policies have not been furnished and maintained by the Contractor.

If the Contractor fails to meet and pay all of his just obligations outstanding for labor, materials, and/or supplies at the time when an estimate for payment is due him, or if any liens, claims or demands arising out of or in connection with the work or its performance shall be outstanding at the time any payment may be due or is likely to be made thereafter, or if any claims arising out of or in connection with the Contractor's operations under this contract are made against

the party of the first part by any other person other than the Contractor, or, if in the opinion of the Engineer, the Contractor is not proceeding with the work in accordance with the provisions of this contract, the Village shall have the right to withhold out of any payments, final or otherwise, such sums as the Engineer deems ample to protect the Village against delay or loss and/or to assure the payment of just claims of third persons and, at its option as agent for the Contractor, to apply such sums in such manner as the Engineer may deem proper to secure such protection and/or to satisfy such claims. The Village shall also have the right to withhold from the Contractor so much of the accrued payments as may be necessary to pay to laborers or mechanics employed on the difference between the rate of wages and supplements required by his contract to be paid laborers or mechanics on the work and the rate of wages and supplements actually paid to such laborers or mechanics. Such application shall be deemed payments for the Contractor's account. The Village may withhold payment to the Contractor on account of the failure of the Contractor to fully comply with any requirements of the contract.

J-10. Certificate of Substantial Completion

Upon substantial completion of all work under this Contract including any testing and startup required, but excluding final cleanup and minor punch list items, the Contractor shall submit a Substantial Completion Release as noted below and the Engineer, acting on behalf of the Village Engineer, will file a Certificate of Substantial Completion with the Contractor, certifying that essentially all work has been performed and materials and equipment supplied in full accordance with the terms of the Contract Documents.

The Contractor shall execute and deliver a Substantial Completion Release on forms specified elsewhere in this Contract, or absent such forms, in a manner deemed acceptable by the Engineer, acting on behalf of the Village Engineer.

If the Contractor wishes to reserve from the Release specific claims against the Owner, such claims excepted from the Release shall be specifically delineated by the Contractor.

J-11. Semi-Final Payment

Payment of the Contractor's semi-final estimate shall be made upon the Engineer's certification of Substantial Completion. Before semi-final payment is made, the Contractor must remove all surplus materials, falsework, temporary structures including foundations thereof, plant of any description, and refuse, rubbish and debris of every nature resulting from the Contractor's operations or workers and to put the site in a neat, orderly condition. Additionally, before semi-final payment is made, the Contractor must restore all areas that have been disturbed by the Contractor's operations to their original condition, or to a condition satisfactory to and approved by the Engineer.

J-12. Acceptance of Semi-Final Payment Constitutes Acceptance

Acceptance by the Contractor of the Semi-Final Payment shall operate as a release for all things done or furnished in connection with this work and for every act of the Owner and others relating to or arising out of this work. No payment, however, semi-final or otherwise, shall operate to release the Contractor or the Contractor's Sureties from any obligations under this Contract or the Performance and Payment Contract Bonds. As noted above, the Contractor shall submit the Release as therein described, prior to the Semi-Final Payment.

J-13. Final Completion and Final Estimate

Whenever, in the opinion of the Engineer, the Contractor shall have completely performed this contract, except maintenance, the Engineer shall so certify the Contractor's final estimate as to the whole amount of work performed by the Contractor and also the total value of such work performed under and according to the terms of this contract. All prior certificates upon which partial payments may have been made, being merely approximate estimates, shall be subject to correction in the final estimate, which final estimate may be made without notice to the Contractor thereof or of the measurements upon which it is based. Said written final estimate shall be submitted on AIA Document Forms and as otherwise required by the Village.

Before final payment is made, the Contractor must satisfy the Village that all bills for labor and materials have been paid.

J-14. Correction of Estimate

The Village shall not, nor shall any department or officer thereof, be precluded or estopped, by any return or certificate made or given by the Engineer or any other officer, agent or employee of the Village under any provision of this contract, from at any time either before or after the final completion and acceptance of the work and payment therefor pursuant to any such return or certificate showing the true and correct amount and character of the work done and materials furnished by the Contractor or any other person under this agreement or from showing at any time that any such return or certificate is untrue and incorrect or improperly made in any particular, or that the work and materials or any part thereof do not in fact conform to the specifications, and the Village shall not be precluded or estopped, notwithstanding any such return or certificate and payment in accordance therewith, from demanding and recovering from the Contractor such damage as it may sustain by reason of his failure to comply with the specifications.

Neither the acceptance of the Engineer, or any of the Engineer's agents, nor any other measurement or certificate of the Engineer or his agents, nor any order of the Village for payment of money, nor any payment for or acceptance of the whole or any part of the work by

the Village of Ossining, nor any extension of time, nor any possession taken by the Village of Ossining or its employees, shall operate as a waiver of any right of the Village to damages as herein provided.

J-15. Five Percent to be Retained

On the expiration of thirty (30) business days after the completion of the work agreed to be done by the Contractor and the filing of a certificate of such completion by the Village Engineer, the Village shall pay to the Contractor, by warrant or check of the Village, the amount remaining after deducting five percent (5%) from the total value of the work performed according to the terms of the contract. Said five percent (5%) of the total amount of work performed according to the terms of the contract shall be retained by the Village until the conclusion of the period of maintenance hereinafter described.

It is agreed that the Village, without limiting any other right or remedy of the Village, may keep the whole or any portion of the sum retained, for settlement of all claims arising out of this contract against the Village, its officers or agents and for all expenses, losses or damages incurred by the Village by reason of said claims.

J-16. Final Estimate to End Liability

No person or corporation, other than the signer of this contract as Contractor, now has any interest hereunder, and no claim shall be made or filed by and such person or corporation and neither the Village nor any of its agents shall be liable or held to pay any moneys except as provided for hereinabove. The acceptance by the contractor of the final estimate aforesaid shall operate as, and shall be a release to the Village and its agents from all claims and liability from anything done or furnished for, or relating to the work, or for any act or neglect of the Village or of any agent, or relating to or affecting the work, excepting the claim against the Village for the remainder, if there be any, of the amounts kept or retained.

K. PERIOD OF MAINTENANCE

K-1. General

The Contractor shall be responsible for the entire work and shall keep, warranty, and maintain every portion of it in perfect order and repair for a period of twelve (12) months after the date upon which Substantial Completion is certified by the Engineer, excepting in regard to such damages as may be directly caused by the Village of Ossining, its agents or servants, and except as provided hereinafter.

K-2. Guarantee

The Contractor guarantees the work done under this Contract, and that the materials and equipment furnished by him and used in the construction of the same are free from defects or flaws, and the guarantee shall apply for the period of maintenance. It is hereby agreed, however, and understood, that this guarantee shall not include any repairs made necessary by any cause or causes other than defective materials furnished by or defective work done by the Contractor.

K-3. Repairs

The Contractor agrees that within five (5) calendar days of notification that repairs are required as guaranteed above, he will begin work necessary to make such repairs. He further agrees and understands that the Village will retain the previously described sum of five (5%) for the maintenance period. If the Contractor does not begin work on the repairs within the time herein required, or if emergency repairs are required in the sole judgment of the Village, this work may be done by the Village and the cost thereof either deducted from the amount retained and/or, at the Village's sole option, claimed against any and all sureties held to guarantee performance under this Contract. The Engineer, whose determination shall be conclusive, shall resolve all questions or disputes in regard to repairs required during the period of maintenance.

K-4. Manufacturer's Equipment Certification

For all significant items of equipment and those items requested by the Engineer, the Contractor shall supply to the Engineer a certificate from each manufacturer of equipment, certifying that the equipment as installed and tested meets all requirements of the Contract Documents, that it is fully suitable and will function properly for the use intended and within the system called for by the Contract Documents, and that the guarantee or warranty required by the Contract Documents will be in full force and effect.

When the specifications call for “supervision, installation, adjustment, start-up”, and words of similar intent, by the manufacturer’s factory employed technicians, the Contractor shall provide a certificate co-signed by the manufacturer as to compliance with the stipulated requirements.

The Contractor is hereby put on notice that final acceptance of any equipment will be withheld, the Owner will retain appropriate amounts of money and the warranty maintenance period will not commence until such certifications are supplied.

The aforementioned manufacturers’ certifications must be provided to the Engineer before the Certificate of Substantial Completion is provided. Additionally, all manufacturers’ warranties for equipment installed must be provided to the Engineer before the Certificate of Substantial completion is provided. Such warranties shall be in hard copy and electronic format if so available.

K-5. Final Certificate and Final Payment

At the conclusion of the period of maintenance, the Engineer will issue a Final Certificate for all work performed and equipment and materials supplied, provided it be then in good order and repair, that it conforms entirely with the required lines, grades, dimensions, and specifications, and if all other obligations on the part of the contractor under this contract have been fulfilled. The Final Certificate shall state the amount retained. Upon certification and final acceptance by the Engineer to the above effect, the bonds retained shall be released and the aforementioned five (5%) retained shall be released.

Final payment, however, will not be released to the Contractor until:

1. The Contractor presents proof that all claims against the Contractor have been satisfied;
2. The Contractor executes and delivers a Final Completion Release Form on the forms provided elsewhere in this Contract or, absent such forms, in a manner deemed acceptable by the Engineer;
3. The Contractor secures releases from highway officials and private property owners, as applicable, that they are fully satisfied with their property restoration(s);
4. The Contractor furnishes the Engineer an affidavit stating he has paid his employees the minimum wage required under the terms of the Contract Document;
5. The Contractor furnishes the Engineer notarized releases from all subcontractors and materialmen stating that they have been paid in full by the Contractor.

L. MISCELLANEOUS CONTRACT DATA

L-1. Plans and Specifications Cooperative

The plans and specifications are intended to be explanatory of each other, but should any discrepancy appear or any misunderstanding arise as to the import of anything contained in either, the interpretation and decision of the Village shall be final and binding on the contractor.

The Village may make any correction of errors or omissions in plans and specifications when such correction is necessary for the proper fulfillment of their intention as construed by the Village. Where said correction of errors or omissions, except as provided in the next two paragraphs below, adds to the amount of work to be done by the contractor, compensation for said additional work shall be made under the item for Extra Work, except where the additional work may be classed under some item of work for which a unit price is included in the Proposal.

The fact that specific mention of a fixture or of any part of the work is omitted in the specifications, whether intentionally or otherwise, when the same is clearly indicated on the plans, or is usually and customarily required to complete fully in the matter of any claim for extra compensation, the said fixtures or work or both shall be installed or done the same as if called for both by the plans and the specifications.

All work indicated on the plans and not mentioned in the specifications, or vice versa, and all work and materials usual and necessary to make the work completed in all its parts, whether or not they are indicated on the plans or mentioned in the specifications, shall be furnished and executed the same as if they were called for both by the plans and specifications without additional compensation to the contractor.

L-2. Ownership of Materials

Nothing in this contract shall be considered as vesting in the Contractor any right or property in materials used after they shall have been attached or affixed to the work on the soil, but all such materials shall, upon being so attached or affixed, become the property of the Village.

L-3. Village's Representative Only

It is understood and agreed between the parties hereto, that the Village of Ossining, its officers, employees and other agents are acting in a representative capacity and not for their own benefit, and that nothing contained in this contract shall be deemed to vest in the Contractor or said Contractor's representative, successors, or assigns, or said Contractor's agent, servants, or employees, any claims against any of them as individuals.

L-4. Limitation of Waiver Clause

No waiver by the Village or the Village Engineer of any breach of this contract shall be held to be a waiver of any other or subsequent breach. Any illegality or error in one or more clauses compromising any part or parts of this contract will not make the remainder of the contract void.

L-5. Contract Binding on Successors

All of the stipulations and agreements aforesaid shall apply and bind the heirs, executors, administrators and successors of the respective parties hereto, but this clause shall not be deemed consent to any assignment of this contract.

L-6. Assignment Restricted

Said Contractor shall not assign, transfer, convey, sublet or otherwise dispose of this contract, or his rights, title or interest in or to the same or any part thereof, without the previous consent in writing of the Village Manager endorsed herein or annexed hereto, and said Contractor shall not assign by power of attorney or otherwise any of the moneys due or to become due and payable under this contract unless by and with said consent, signified in like manner. If the Contractor shall, without such previous written consent, assign, transfer convey, sublet or otherwise dispose of this contract, or if his right, title or interest herein or any of the moneys due or to become due under this contract to any such person, company or other corporation, this contract may, at the option of the Village of Ossining, be revoked and annulled and all liability and obligations of the Village of Ossining growing out of the same to the Contractor and to his assignee or transferee shall cease and be at an end as of the date and time of such assignment, transfer, conveyance, subletting or other disposition of this contract to hinder, prevent or affect an assignment of the Contractor's creditors, made pursuant to the Statutes of the State of New York; and no right under this contractor to any money due or to become due hereunder, shall be asserted against the Village by said persons who may acquire any interest in law or equity by reason of any so called assignment of this contract, or any part thereof of any moneys due or to grow due hereunder, unless authorized as aforesaid by written consent of the Village Manager.

L-7. Sub-letting

No part of the work embraced in this Contract shall be sub-let or in any way removed from the control of the Contractor except with the written consent of the Village Manager or designee, but this provision shall not apply to the purchase and delivery of materials necessarily manufactured and provided elsewhere.

L-8. Contractor's Address for Service

The business address given in the bid or proposal upon which the contract is founded is hereby designated as the place to which letters or other communications under this contract shall be mailed or delivered to the Contractor. Such address may be changed at any time by an instrument in writing executed and acknowledged by the Contractor and delivered to the Office of the Village Engineer and the Office of the Village Clerk. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter or other communication upon the Contractor personally at such address or any other place in this State.

[Contract Agreement continues on following page.]

M. EXECUTION OF CONTRACT AND ACKNOWLEDGMENTS

IN WITNESS WHEREOF THE respective parties hereto have caused this contract to be executed and delivered as of the day and year first above written.

VILLAGE OF OSSINING

BY: _____
Karen D'Attore
Village Manager

Village
Seal

CONTRACTOR

BY: _____
Signature

Print

Title

Company Name

Address

Contractor's
Corporate
Seal (if any)

Designated Representative: Name: _____

Title: _____

Address: _____

Phone: _____

Email: _____

For contract:

TRADE	CONTRACT NO.	CHECK ONE
General Construction	REC-26-01G	
Plumbing Construction	REC-26-01P	
Mechanical/HVAC Construction	REC-26-01M	
Electrical Construction	REC-26-01E	

ACKNOWLEDGMENT OF THE VILLAGE MANAGER

**STATE OF NEW YORK)
COUNTY OF WESTCHESTER)**

On this _____ day of _____, 20____, before me personally came _____ to me known, who being by me duly sworn, did depose and say that she resides in the Village of Ossining, that she is the Village Manager of the Village of Ossining, the municipal corporation described in and which executed the above instrument; that she knows the seal of said municipal corporation; that the seal affixed to said instrument is such corporate seal; that it was affixed by order of the Village Board of said municipal corporation and she signed her name thereto by like order.

Notary Public

Seal

ACKNOWLEDGMENT IF CONTRACTOR IS A CORPORATION

STATE OF)
COUNTY OF)ss:

On this ____ day of _____, 20 ____, before me personally appeared,
_____ to me known, who, being by me duly sworn, did depose and say:

that he resides at _____

that he is the _____ of _____

the corporation described in and which executed the within instrument; that he knows the seal of said corporation; that the seal affixed to said instrument was such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order

Notary Public

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

ACKNOWLEDGMENT IF THE CONTRACTOR IS AN INDIVIDUAL

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20____, before me personally appeared, _____
to me known and known to be the person described in and who executed the foregoing contract, and
who acknowledged to me the execution thereof for the purpose therein mentioned.

Notary Public

ACKNOWLEDGMENT IF CONTRACTOR IS A PARTNERSHIP

STATE OF)
COUNTY)SS:

On this ____ day of _____, 20____, before me personally appeared, _____

to me known and known to me to be a member of _____, the firm described in
and who executed the foregoing contract, and he acknowledged to me that he subscribed the name of
said firm thereto in behalf of said firm for the purpose therein mentioned

Notary Public

N. SAMPLE PERFORMANCE BOND AND ACKNOWLEDGMENTS

(Name of Bonding Company)

(Address)

KNOW ALL MEN BY THESE PRESENTS, THAT WE _____

(Insert name and address of Contractor)

hereinafter referred to as the principal, and _____

(Name and State of Incorporation of Surety)

hereinafter referred to as the Surety, and held and firmly bound unto THE VILLAGE OF Ossining, a municipal corporation located in the County of Westchester, New York, hereinafter referred to as the Village, in the sum of _____

(Words and Figures)

DOLLARS lawful money of the United States of America, to be paid to the Village of Ossining, or to its certain attorneys, successors, or assigns, for which payment will and truly be made, we bind ourselves and our several and respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals. Dated this _____ day of

_____ in the year Two Thousand and _____

_____.

WHEREAS, the above Principal, by an instrument in writing, signed by the Principal, as Contractor, and bearing even date with or date prior to these present, has contracted with the Village to perform all the work and furnished all the materials and plan called for in the said contract.

(Insert Full Description and Number of Contract)

which contract is by reference made a part hereof.

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

NOW, THEREFORE, if the Principals shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Village, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then these obligations shall be void, otherwise to remain in full force and effect.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, deletion or alteration or addition to the terms of the contract or to the work to be performed thereunder or to the plans and specifications accompanying the same shall in any way affect or limit or release its obligation of this bond.

No right of action shall accrue on this bond to or from the use of any person or corporation other than the Village named herein or its successors.

(Name of Contractor) Principal

(Corporate Seals Required)

By: _____
(Signature and Title)

(Name of Surety)

By: _____
(Signature and Title)

(Qualifications of Surety company and proper acknowledgments to be annexed thereto).

(Surety company must be authorized by the State of New York to transact business).

ACKNOWLEDGMENT BY PRINCIPAL UNLESS IT BE A CORPORATION

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20____, before me personally appeared, _____
to me known and known to be the person described in an who executed the foregoing
instrument and acknowledged that he executed the same.

Notary Public

ACKNOWLEDGMENT BY PRINCIPAL, IF A CORPORATION

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20____, before me personally came _____
to me known, who, being by me duly sworn, did depose and say the he resides in
_____; that he is the _____of _____,
the corporation described in and which executed the within instrument; that he knows the seal
of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so
affixed by order of the Board of Directors of said corporation, and the he signed his name
thereto by like order.

Notary Public

ACKNOWLEDGMENT BY SURETY COMPANY

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20____ before me personally came _____, to me known, who, being by me duly sworn, did depose and say the he resides in _____; that he is the _____ of _____, the corporation descried in and which executed the within instrument; the he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order; and that the liabilities of said company do not exceed its assets as ascertained in the manner provided by the Laws of the State of New York, and the said _____ further said that he is acquainted with _____ and knows him to be the _____ of said company, that the signature of the said _____ subscribed to the within the said instrument is the genuine handwriting of _____ the _____ said _____ and was subscribed thereto by like order of the Board of Directors, in the presence of him the said.

Notary Public

O. SAMPLE PAYMENT BOND (Labor and Materials) AND ACKNOWLEDGMENTS

(Name of Bonding Company)

(Address)

KNOW ALL MEN BY THOSE PRESENTS, THAT WE _____

(Name and Address of Contractor)

hereinafter referred to as the Principal, and _____

(Name and State of Incorporation of Surety)

hereinafter referred to as the Surety, are held and firmly bound unto THE VILLAGE OF Ossining, a municipal corporation located in the County of Westchester, New York, hereinafter referred to as the Village, in the sum of _____

(Words and Figures)

DOLLARS lawful money of the United States of America, to be paid to the Village of Ossining, or to its certain attorneys, successors, or assigns for the use and benefit of claimants supplying labor and/or materials for the work hereinafter specified, for which payment will and truly be made, we bind ourselves and our several and respective heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

Sealed with our seals. Dated this _____ day of _____ in the year Two Thousand and _____.

WHEREAS, the above Principal, by an instrument in writing, signed by the Principal, as Contractor, and bearing even date with or a date prior to these presents, has contracted with the Village of Ossining to perform all the work and furnished all the materials and plan called for in the said contract for

(Insert Full Description and Number of Contract)

which contract is by reference made a part hereof.

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

NOW, THEREFORE, if the Principal shall promptly make payment to all claimants supplying labor and or material used or reasonably required for use in the prosecution and performance of the work provided for in said contract, and any and all duly authorized modification of said contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then this obligation shall be void, otherwise to remain in full force and effect, subject to the conditions specified below.

Any beneficiary-claimant hereunder who has not been paid in full within ninety (90) calendar days after the date on which the last of such claimant's work or labor was done or performed or materials furnished, may sue the Surety and Principal in this bond for such sum as may be justly due, provided, however, that no such suit or action shall be commenced hereunder by such claimant after the expiration of one (1) year following the date on which the Principal ceased work on said contract nor other than in a State court or the United States District Court of competent jurisdiction in and for the County and District in which the contract work is situated. The amount of this bond shall be reduced by and to the extent of payments made in good faith hereunder, inclusive of the payment by Surety of any mechanics' liens which may be filed or received against said improvement pursuant to said contract, whether or not claim for the amount of such mechanics' liens be presented under and against this bond.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, deletion or alteration or addition to the terms of the contract or to the work to be performed thereunder or to the plans or specifications accompanying the same shall in any way discharge or limit or release its obligation on this bond.

(Name of Contractor) Principal

(Corporate Seals
Required)

By: _____
(Signature and Title)

(Name of Surety)

By: _____
(Signature and Title)

(Qualifications of Surety company and proper acknowledgments to be annexed thereto. Surety company must be authorized by the State of New York to transact business).

ACKNOWLEDGMENT BY PRINCIPAL UNLESS IT BE A CORPORATION

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20____, before me personally appeared, _____
to me known and known to me to be the person described in and who executed the foregoing
instrument and acknowledged that he executed the same.

Notary Public

ACKNOWLEDGMENT BY PRINCIPAL, IF A CORPORATION

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20____, before me personally came _____
to me known, who, being by me duly sworn, did depose and say that he resides in
_____; that he is the _____ of _____,
the corporation described in and which executed the within instrument; that he knows the seal
of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so
affixed by order of the Board of Directors of said corporation, and that he signed his name
thereto by like order.

Notary Public

ACKNOWLEDGMENT BY SURETY COMPANY

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20____, before me personally came _____
to me known, who, being by me duly sworn, did depose and say that he resides in
_____; that he is the _____ of _____, the corporation
described in and which executed the within instrument; that he knows the seal of said
corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed
by order of the Board of Directors of said corporation, and that he signed his name thereto by
like order; and that the liabilities of said company do not exceed its assets as ascertained in the
manner provided by the Laws of the State of New York, and the said
further said that he is acquainted with _____ and knows him to be
the _____ of said company, that the signature of the said
subscribed to the within the said instrument is the genuine handwriting of _____
the said _____ and was subscribed thereto by like order of
the Board of Directors, in the presence of him the said.

Notary Public

SECTION IV – GENERAL REQUIREMENTS

SECTION IV GENERAL REQUIREMENTS

A. SCOPE OF WORK

The Information for Bidders contains a general description of the work to be done. The Contractor shall provide all labor, superintendence, materials, and equipment necessary for properly performing and completing, within the time stipulated, the defined work.

B. LINES

Unless otherwise specified in the Special Clauses and Specifications of this Contract, the Contractor shall provide his own engineering and/or surveying services to give all lines and grades as required in the Contract Agreement. No separate payment will be made for this work and the cost thereof shall be included in various items of this Contract unless a separate payment item for survey stakeout appears in the itemized proposal.

C. REPRESENTATIVE ALWAYS PRESENT

The Contractor, in case of his absence from the work, shall have a competent representative or foreman present, who shall follow, without delay, all instructions of the Village Engineer or the Engineer, or their assistants or agents, in the prosecution and completion of the work in conformity with this Contract, and who shall have full authority to supply labor and materials immediately to prosecute and complete said work.

D. ALTERATIONS

The Village Engineer / Engineer may make alterations in the line, grade, plan, form, dimensions, or materials of the work, or any part thereof, either before or after the commencement of the work. If such alterations increase the quantity of work, such extra work actually done will be paid for at the prices stipulated for such unit price items of the Contract. In the case where no price is established, it shall be paid for as extra work as defined in the Contract Agreement.

E. INFORMATION ABOUT QUANTITIES OF MATERIALS

To aid the Village Engineer/Engineer in determining quantities of materials to be paid for, the Contractor shall, when requested, give the Village Engineer/Engineer access to the proper invoices, bills of lading, etc., and shall provide means and assistance for measuring any of the materials. He shall carry out the work in such manner that required measurements can be properly made.

F. CONTRACTOR'S SUBCONTRACT AND MATERIAL LISTS

Prior to beginning work, or at any time during the Contract period, the Village Engineer and/or Engineer may, at either's option, request the Contractor to provide a complete list of subcontractors, materialmen, and/or materials that he plans to use in the performance of, or continued performance of, work under this Contract. The Village Engineer and/or Engineer may also, at either's option and at any time during the Contract period, request the Contractor to provide a complete list of subcontractors, materialmen, and/or materials that were used by the Contractor for any work performed under this Contract. Substitutes for the primary equipment are not allowed for this project.

G. EQUIVALENT QUALITY

Wherever in the Contract, an article, material, apparatus, product or process is called for by trade name or catalog reference, or by the name of the patentee, manufacturer or dealer, it shall be the basis of the bid and shall be furnished under the Contract unless otherwise permitted by the Village Engineer or Engineer.

Should the Contractor desire to substitute other articles, materials, apparatus, products or processes, he shall apply to the Village Engineer or Engineer, in writing, for approval of such substitution. With the application shall be furnished such information as required by the Village Engineer or the Engineer to demonstrate that the article, material, apparatus, product or process it wishes to use is the equal of that specified in quality, finish, design, efficiency, and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended. The Contractor shall set forth the reasons for desiring to make the substitution and shall further state what difference, if any, will be made in the contract price for such substitution should it be accepted; it being the intent hereunder that any savings shall accrue to the benefit of the Village of Ossining.

If the Village Engineer or Engineer rejects any such desired substitution as not being the equal of that specifically named in the contract, or if he shall determine that the adjustment in price in favor of the Village is insufficient, the Contractor shall immediately proceed to furnish the designated article, material, apparatus, product or process. Where two or more articles, materials, apparatus, products, or processes are listed as acceptable by reference to trade name or otherwise, the choice of these will be optional to the Contractor.

H. CARE AND PROTECTION OF WORK

From the commencement of work until the completion of the same, the Contractor shall be solely responsible for materials delivered at the site intended to be used in the work; and all injury, damage or loss of the same, from whatever cause, shall be made good at its expense before the final estimate is made. It shall provide suitable means of protection for all materials and for all work in progress of construction from damage by flood, freezing or inclement weather at any and all times. The methods used for this purpose shall be subject to approval.

I. EXPLOSIVES AND BLASTING

Explosives for blasting shall be stored, handled, and used in accordance with the laws, ordinances, and regulations of the State of New York and all Local Regulations as may pertain, and with such additional regulations as the Village Engineer may require. Blasting shall be conducted so as not to endanger person or property, and unless otherwise permitted, shall be covered or otherwise satisfactorily confined. The Contractor shall be responsible for and shall make good any damage of whatever nature caused by blasting or accidental explosions.

J. WORK IN BAD WEATHER

During freezing, stormy, or inclement weather, no work shall be done except such as can be done satisfactorily and in a manner to secure first-class construction throughout.

K. NIGHT AND SUNDAY WORK

Unless otherwise especially permitted, no work shall be done between the hours of 8:00 P.M. and 7:30 A.M., Monday thru Friday, and between the hours of 5:00 P.M. and 9:00 A.M. on Saturdays excluding holidays, nor on any Sunday or holiday, except as necessary for the proper care and protection of work already performed. If it shall become absolutely necessary to perform work at night, the Village Engineer/Engineer shall be informed a reasonable time in advance of the beginning of performance of such work. Only such work shall be done at night as can be done satisfactorily and in a first-class manner. Good lighting and all other necessary facilities for carrying out and observing the work shall be provided and maintained at all points where such work is being done. All noisy work shall be coordinated with the Owner.

L. EXISTING UTILITIES: UTILITY SERVICE

The Contract Drawings do not show all pipes, conduits, cables, or structures believed to exist in the working area. No attempt has been made to locate or show all utility service connections. Obstructions other than those shown may be encountered. The Contractor shall understand that the Owner is not responsible for the correctness or sufficiency of the information given and that the Contractor shall have no claim for relief from any obligation or responsibility under the Contract because the extent, location, size, or character of any pipe, conduit, cable or other underground structure is incorrectly shown or has been omitted from the Contract Drawings. The Contractor shall notify all utility companies and authorities having buried utility service in the project area and file certificate(s) of same with the Village Engineer or Engineer prior to beginning work.

The Contractor shall maintain service in main lines and service connections for all utilities encountered, regardless of the type of utility or the arrangements necessary to maintain service. Water lines and service connections exposed during cold weather shall be protected against freezing. Service connections may be cut only by permission of the Owner of the utility, and a temporary connection shall be installed immediately. The Contractor shall notify all utility customers before interrupting their service. A permanent, first-class replacement of the cutout portion of the original service connection shall be installed and observed by the Owner of the utility before backfilling.

The Contractor shall protect all utilities and subsurface structures encountered in the work. Because the Contractor may encounter some utilities and subsurface structures not shown on the Contract Drawings, the Contractor shall proceed with caution in executing his work. Insofar as feasible, the Contractor shall not disturb existing utilities but shall support and sustain them. The Contractor shall repair all damage to any utilities and pay all costs of protecting them and replacing them as necessary including service connections encountered in the course of the work, regardless of character, functions, conditions, size, location, materials, construction, ownership or interference with the alignment of pipeline to be built, whether such existing utilities, structures or service connections are shown or not shown.

The Contractor is held responsible for all damage to all utility or other underground or surface structures, whether or not they are shown on the Contract Drawings, and the Contractor shall pay all costs for protecting them or for repairing and/or replacing them if they are damaged.

The Contractor shall notify the Village Engineer or Engineer of all exposed pipe crossings where the utilities will have a clearance of 18" or less as measured between the outside walls of the pipe. The Contractor shall construct a concrete support as directed by the Village Engineer or Engineer and shall take all other measures it and/or the Village Engineer and/or Engineer deem necessary to protect the existing and new pipes, sewers, and utilities.

M. NOTIFICATION OF UTILITIES

In addition to the general notification requirements referred to above and per the requirements of the Contract Agreement, the Contractor shall strictly adhere to General Business Law, Article 36, regarding prior notification of Consolidated Edison and with Industrial Code 53 regarding prior notification of the Central Registry for utilities.

N. SANITARY REGULATIONS

The Contractor shall obey and enforce such sanitary regulations and orders and shall take such precautions against infectious diseases as may be deemed necessary. The building of shanties or other structures for housing or facilitating the men, tools, machinery or supplies will be permitted only at approved places, and the sanitary condition of the grounds in and at such shanties or other structures must be at all times maintained in a satisfactory manner.

O. PREVENTION OF DUST HAZARD

The Contractor will strictly comply with all requirements of the Contract Agreement to prevent dust hazards in the construction or prosecution of his work.

P. MAINTENANCE AND PROTECTION OF TRAFFIC, OBTAINING PERMITS

The Contractor shall maintain and protect traffic within construction activity for the duration of the Contract and shall, at all times, protect the traveling public from damage to person and property in accordance with the plans and specifications and as directed by the Engineer.

All work shall conform to the requirements of the New York State Manual of Uniform Traffic Control Devices and Section 619 of the Standard Specifications.

The Contractor shall meet with the Engineer and the Ossining Police Dept. prior to starting this work to ensure its proposed methods for maintaining and protecting traffic are acceptable. If, in the opinion of the Engineer and Chief of Police, uniformed police are required, the Contractor shall hire same for direction of traffic.

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

Unless otherwise specified in the Special Clauses and Specifications of this Contract, the Contractor shall take out all road permits as required in the Contract Agreement. The Contractor shall provide all flagmen, labor and materials necessary to meet permit requirements in force at the time of the work.

The Contractor shall maintain and protect traffic by so conducting his construction operations that the traveling public is subjected to a minimum of hazard and delay. In order to adequately maintain and protect traffic, the Contractor shall perform the following additional minimum requirements to comply with the provisions of this section and/or as directed by the Engineer:

1. Keep the surface of the traveled way free from mounds, depressions, and obstructions of any type which could present hazards or annoyance to pedestrians or traffic.
2. Keep the surface of all pavements used by the public free and clean of all dirt, debris, stone, timber or other obstructions to provide safe traveled ways.
3. Control dust and keep the traveled way free of materials spilled from hauling and construction equipment.
4. Conduct rigging on weekends to ensure that one-half of the roadway be opened to traffic at all times unless otherwise authorized.
5. Two-way traffic must be maintained at all times unless otherwise authorized.
6. Consult with the Village Engineer, Police, Fire and all other affected Public Services to ascertain requirements with respect to rigging, detouring, and street closures. Their directions are to be fully complied with in all details.
7. Provide flagmen and watchmen as may be required for the guiding of traffic and/or for use as directed by the Engineer.
8. Provide all cones, barricades, signs and warning devices as may be required, and/or as ordered by the Engineer to safely carry out the foregoing. All such signs and devices shall be fabricated and placed in accordance with the latest version of the New York State Manual of Uniform Traffic Control Devices and Section 619 of the Standard Specifications. Use of open flame flares is prohibited.
9. Cover all open trenches with steel plates at the close of each workday. Such plates shall abut each other and be wedged at each end of the trench(s) to prevent plates from sliding open. Plates shall be secured in such a manner so as to reduce noise from traffic to an absolute minimum.

10. Provide and maintain, at all times, safe and adequate ingress and egress to and from homes, businesses, commercial establishments, and intersecting roadways using existing or new access points, consistent with the work, unless otherwise authorized by the Engineer.
 - a. When work is to be performed fronting a driveway, the Contractor must notify the resident and advise the resident of the situation, affording the resident ample time to relocate any vehicle which might be rendered inoperable because of said work.
 - b. The Contractor shall ascertain the evenings on which business establishments are open in the section where work under the Contract is being performed and the Contractor will be required to clean up and prepare the business section for the usual activities on these evenings. The Contractor and its personnel are cautioned against parking vehicles in the business zones for any extended period of time.
 - c. On roadways on which motor bus service is maintained, the Contractor shall provide suitable areas or locations for the loading and unloading of passengers.

The existing pavement, at improved intersection streets, shall not be disturbed without prior consent of the Engineer.

Traffic laws are to be carefully observed and obeyed.

Withholding of Payment:

- a. For each calendar day, or part thereof, of unsatisfactory performance of the maintenance and protection of traffic requirements of this Contract, the Village will assess the Contractor liquidated damages in the amount of **\$200.00**.
- b. If, upon notification by the Engineer, the Contractor fails to correct any unsatisfactory condition within 24 hours of being so directed, the Engineer will immediately proceed with adequate forces to properly maintain the project, and the entire cost of such maintenance shall be deducted from any moneys due the Contractor.
- c. If the Contractor fails to maintain and protect traffic adequately and safely for a period of 24 hours, the Engineer shall correct the adverse condition(s) by any means the Engineer deems appropriate and shall deduct the cost of the corrective work from any moneys due the Contractor. Moneys withheld for corrective work shall be in addition to

the liquidated damages and non-payment provisions stated above regarding non-performance of maintenance and protection of traffic requirements.

- d. Notwithstanding the above-described provisions for withholding payment, where major nonconformance with the contract requirements for maintenance and protection of traffic is noted by the Village Engineer/Engineer, and prompt Contractor compliance is deemed not to be obtainable, all contract work may be stopped by direct order of the Engineer, regardless of whether corrections are made by the Village Engineer as described above.

No separate payment will be made for any part of Maintenance and Protection of Traffic provisions or for obtaining required road permits and the cost thereof shall be included in various items of this Contract unless a separate payment item for this work appears in the itemized proposal.

Q. GROSS LOADS HAULED ON HIGHWAY

The Contractor shall at no time during the construction of this Contract haul gross loads exceeding the legal limit prescribed by the Highway Law over access highways to any work site or over the highway(s) included in this Contract.

R. CLEANING UP SITE

During the course of the work, the Contractor shall maintain a clean and safe site at all times.

Upon completion of the work and before acceptance and final payment shall be made, the Contractor shall, excepting as otherwise expressly directed or permitted in writing, clean and remove from the facility, roof, streets, sidewalks, and adjacent property all surplus and discarded materials, rubbish and temporary structures. The Contractor shall restore, in an acceptable manner, all property, both public and private, which has been damaged during the prosecution of work and shall leave the whole in a neat and presentable condition. The Contractor shall repair any adjacent, disturbed lawn areas with topsoil and seeding, and will maintain said area until a good growth of grass is obtained. All other disturbed areas shall be replaced in kind by the Contractor. No direct payment will be made to the Contractor for the work stipulated in this section, but compensation for the same is understood to be included within the Contract price(s). As the various portions of the work are completed, the site shall be cleaned. Debris and excess fill shall be removed from the site and shall be legally disposed off-site at the sole cost of the Contractor.

S. PHOTOGRAPHS

This Section has been intentionally removed.

T. CLAIMS FOR DAMAGES CAUSED BY THE OWNER OR ITS AGENTS

Unless otherwise provided in this Contract, no claims of any description for damages or delays caused by the work, negligence, or acts of the Owner or its agents will be allowed. Allowance will be made, in accordance with the Contract Agreement, for an extension of the time of completion, provided, in the opinion of the Village Engineer and/or the Engineer, the delays of the Owner or its agents have actually delayed the Contractor's completion, and further provided that the Contractor has complied with those sections of the Contract Documents governing progress of the work, time of completion, and extension of time.

U. QUALITY CONTROL

If quality control tests of materials are stipulated in the technical specifications, they shall be performed by an Owner- approved laboratory at the Owner's expense. The Contractor shall make all arrangements with the Owner-approved laboratory to have all required tests performed. Quality control tests shall only be performed by the Owner-approved laboratory inspector. No work requiring tests shall be performed by the Contractor except in the presence of the Owner approved laboratory inspector.

V. SITE SUPERVISION

Full-time site supervision of staff, subcontractors, and suppliers shall be provided for the duration of the project. A competent superintendent shall be in attendance at the job site at all times when work is being performed. The site superintendent shall have the authority to represent and make decisions for their company regarding the project, provide guidance and direction to employees, subcontractors, and suppliers, and be knowledgeable of the work being performed. Failure to provide a qualified site superintendent at the job site or at a required project meeting shall subject the Contractor to a penalty of \$500 per day for each occurrence.

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

SUBSTANTIAL COMPLETION RELEASE

SUBSTANTIAL COMPLETION RELEASE FORMS

SUBSTANTIAL COMPLETION RELEASE

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

This release, dated _____, 20____, is given

BY: The Releasor(s)

_____ ("Contractor")

TO: The Village of Ossining, New York ("Owner") and

DCAK-MSA Architecture & Engineering, PC,
INDUS Architects PLLC,
Calgi Construction Company, Inc.
and
The State of New York

1. Release. The Contractor releases and gives up any and all claims and rights which it may have against the Owner, Village Engineer, and their agents, servants or employees. This releases all claims, including those of which Contractor is not aware and those not mentioned in this Release. This Release applies to claims resulting from anything which has happened up to now. Contractor specifically releases the following claims:

Any and all claims and liability of whatsoever nature for anything done or furnished or in any manner arising out of the performance of:

Contract #: REC-26-01

Contract Description: Improvements- Renovation and Remodeling at Joseph G Caputo
Community Center

2. Payment. Contractor has received payment in the amount of \$_____, in payment for the total value of work debiting prior payments and the value of \$_____ representing five percent (5%) retainage and completion of outstanding items. The Contractor will receive payment less the five percent (5%) retainage when in the opinion of the Engineer the Contractor has completely performed the contract, except for maintenance. Payment of the five percent (5%) retainage will be made at the end of the period of maintenance upon issuance of a Final Certificate by the Engineer.
3. Who is Bound. Contractor is bound by this Release. Anyone who succeeds to Contractor's rights and responsibilities is also bound. This Release is made for the benefit of Owner and Village Engineer and all who succeed to their rights and responsibilities.
4. Signatures. Contractor understands and agrees to the terms of this Release. If this Release is made by a corporation, its proper corporate officers have signed and the corporate seal is affixed.

Witnessed or Attested By:

Affix Corporate Seal

Contract No. REC-26-01
Improvements-Renovation and Remodeling-at Joseph G Caputo Community Center

ACKNOWLEDGMENT IF CONTRACTOR IS A CORPORATION

STATE OF)
COUNTY OF)ss:

On this ____ day of _____, 20 ____, before me personal appeared, _____
to me known, who, being by me duly sworn, did depose and say that he resides at _____
that he is the _____ of _____ the corporation described
in and which executed the within instrument; that he knows the seal of said corporation; that the seal
affixed to said instrument was such corporate seal; that it was so affixed by order of the Board of
Directors of said corporation, and that he signed his name thereto by like order

Notary Public

ACKNOWLEDGMENT IF THE CONTRACTOR IS AN INDIVIDUAL

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20 ____, before me personally appeared, _____
to me known and known to be the person described in and who executed the foregoing contract, and
who acknowledged to me the execution thereof for the purpose therein mentioned.

Notary Public

ACKNOWLEDGMENT IF CONTRACTOR IS A PARTNERSHIP

STATE OF)
COUNTY)SS:

On this ____ day of _____, 20 ____, before me personally appeared, _____
to me known and known to me to be a member of _____, the firm
described in and who executed the foregoing contract, and he acknowledged to me that he subscribed
the name of said firm thereto in behalf of said firm for the purpose therein mentioned

Notary Public

Contract No. REC-26-01
Improvements- Renovation and Remodeling at Joseph G. Caputo Community Center

FINAL COMPLETION RELEASE

FINAL COMPLETION RELEASE FORMS

FINAL COMPLETION RELEASE

This release, dated _____, 20____, is given

BY: The Releasor(s)

_____ ("Contractor")

TO: The Village of Ossining, New York ("Owner") and

DCAK-MSA Architecture & Engineering, PC,
INDUS Architects PLLC
Calgi Construction Company, Inc.
and
The State of New York

1. Release. The Contractor releases and gives up any and all claims and rights which it may have against the Owner, Village Engineer, and their agents, servants or employees. This Release releases all claims, including those of which Contractor is not aware and those not mentioned in this Release. This Release applies to claims resulting from anything which has happened up to now. Contractor specifically releases the following claims:

Any and all claims and liability of whatsoever nature for anything done or furnished or in any manner arising out of the performance of:

Contract #: REC-26-01

Contract Description: Improvements- Renovation and Remodeling- at Joseph G. Caputo Community Center

2. Payment. Upon payment of the Contractor's final invoice # _____, dated _____, in the amount of \$_____, the Contractor will have received total payments in the amount of \$_____, in consideration for making this Release. Contractor agrees that it will not seek anything further, including any other payment, from Owner or Village Engineer.
3. Who is Bound. Contractor is bound by this Release. Anyone who succeeds to Contractor's rights and responsibilities is also bound. This Release is made for the benefit of Owner and Village Engineer and all who succeed to their rights and responsibilities.
4. Signatures. Contractor understands and agrees to the terms of this Release. If this Release is made by a corporation, its proper corporate officers have signed and the corporate seal is affixed.

Contract No. REC-26-01
Improvements- Renovation and Remodeling at Joseph G. Caputo Community Center

Witnessed or Attested By:

_____ Affix Corporate Seal

ACKNOWLEDGMENT IF CONTRACTOR IS A CORPORATION

STATE OF)
COUNTY OF)ss:

On this ____ day of _____, 20 ____, before me personal appeared, _____
to me known, who, being by me duly sworn, did depose and say: that he resides at _____
that he is the _____ of _____ the corporation
described in and which executed the within instrument; that he knows the seal of said corporation; that
the seal affixed to said instrument was such corporate seal; that it was so affixed by order of the Board
of Directors of said corporation, and that he signed his name thereto by like order.

Notary Public

ACKNOWLEDGMENT IF THE CONTRACTOR IS AN INDIVIDUAL

STATE OF)
COUNTY OF)SS:

On this ____ day of _____, 20 ____, before me personally appeared, _____
to me known and known to be the person described in and who executed the foregoing contract, and
who acknowledged to me the execution thereof for the purpose therein mentioned.

Notary Public

ACKNOWLEDGMENT IF CONTRACTOR IS A PARTNERSHIP

STATE OF)
COUNTY)SS:

On this ____ day of _____, 20 ____, before me personally appeared, _____
to me known and known to me to be a member of _____, the firm described in
and who executed the foregoing contract, and he acknowledged to me that he subscribed the name of
said firm thereto in behalf of said firm for the purpose therein mentioned.

Notary Public

SCHEDULE OF MINIMUM PREVAILING WAGE RATES

SCHEDULE OF MINIMUM PREVAILING WAGE RATES

The Wage Rates schedule can be accessed and downloaded through the NYSDOL website:
<https://dol.ny.gov/public-work-and-prevailing-wage> using the job-specific PRC# 2026015824.

SECTION 01 00 00
CONSTRUCTION MILESTONE SCHEDULE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Divisions 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Milestone dates to be met and indicated in the Contractor's Construction Schedule.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary of Multiple of Primes" for preparing combined Contractor's combined Construction Schedule.
 - 2. Division 1 Section "Submittal Procedures" for submitting schedules and reports and for submittal schedule.
 - 3. Division 1 Section "Progress Schedule" for preparing and submitting Contractor's Construction Schedule

1.3 MILESTONE

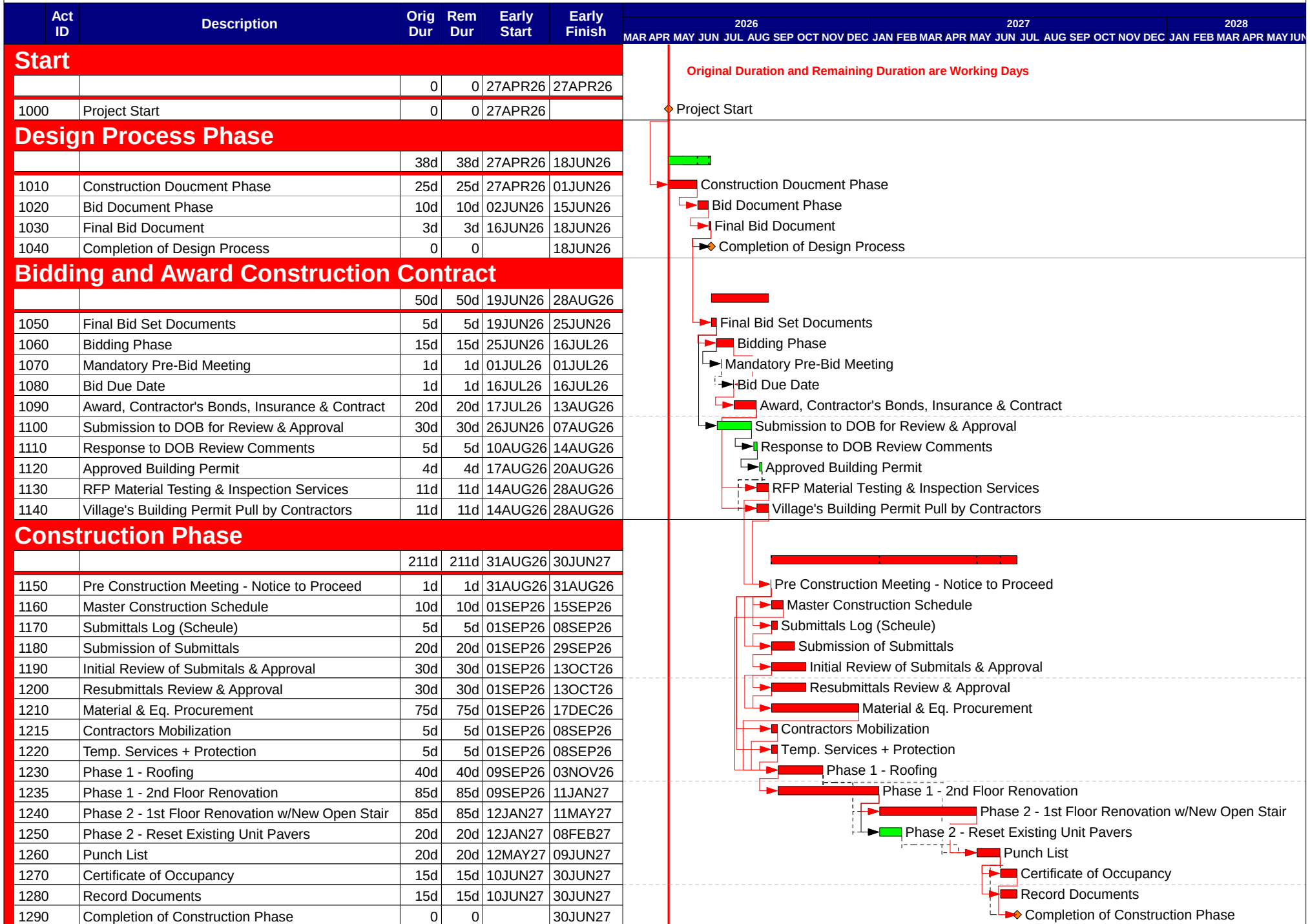
- A. The following preliminary construction schedule indicates milestones that are critical points in time, which must be incorporated in the Contractor's Construction Schedule.

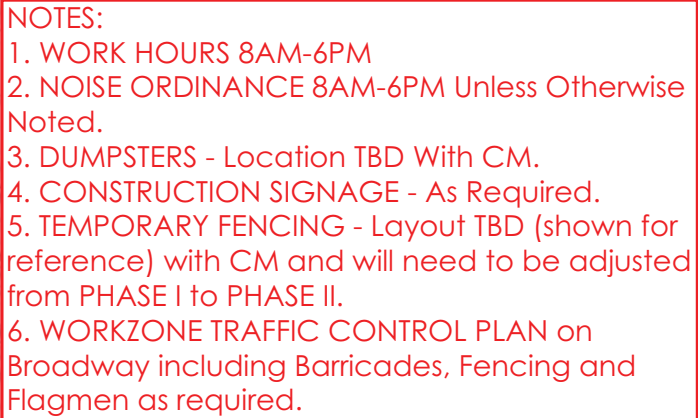
- 1. June 25, 2026 – Bid advertisement
- 2. July 1, 2026 - Pre-Bid Meeting
- 3. July 16, 2026 - Bid Due Date
- 4. August 2026 - Notice of Award
- 5. August 2026 - Pre Construction Meeting / Construction Start
- 6. June 2027 - Construction Completion

PART 2 – PRODUCTS (Not Used)

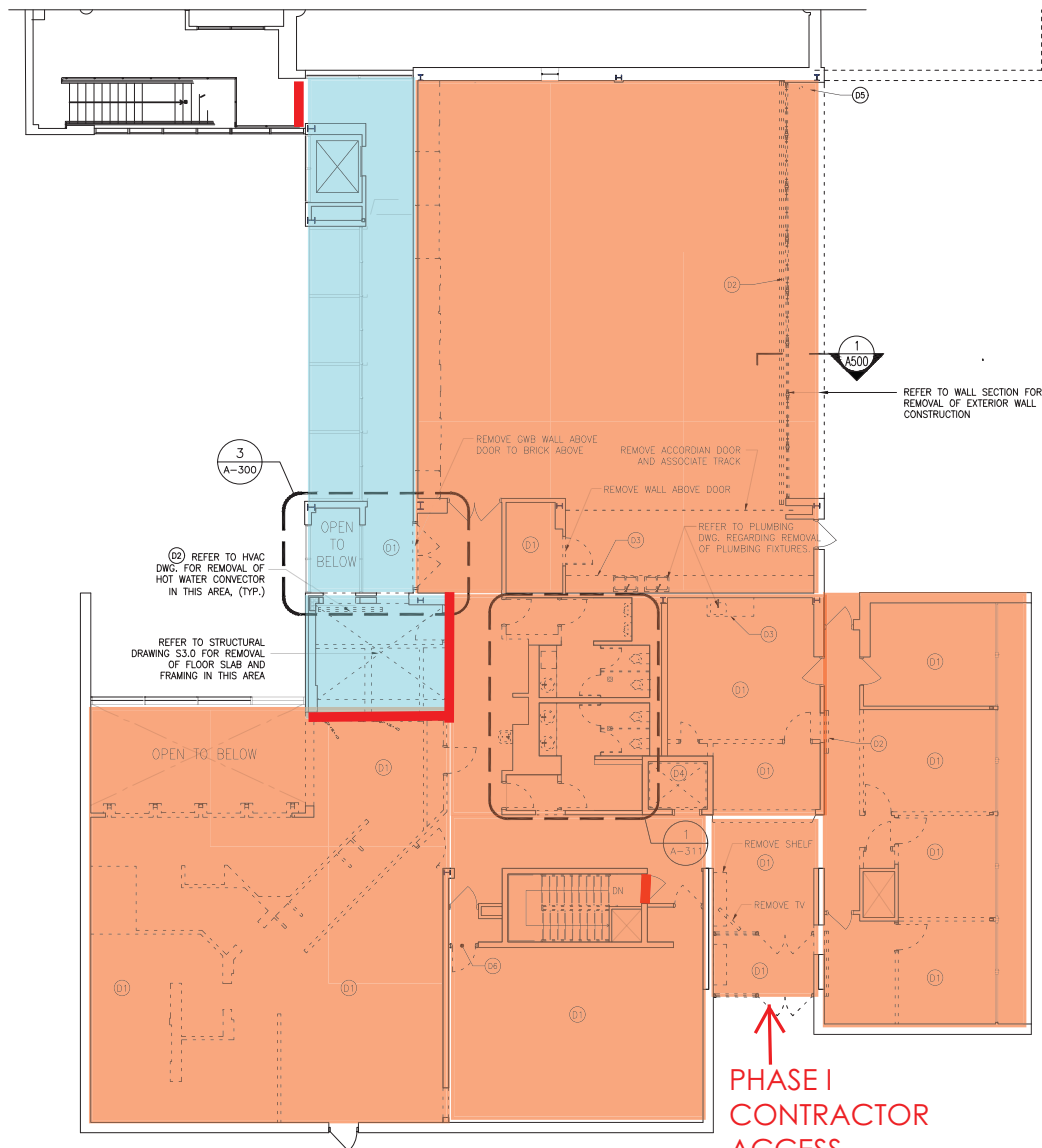
PART 3 – EXECUTIONS (Not Used)

END OF SECTION





202506 - CAPUTO COMMUNITY CENTER
CONSTRUCTION IMPLEMENTATION PLAN CIP-1
CALGI CONSTRUCTION COMPANY



1
AD-102 SECOND FLOOR DEMO. PLAN
SCALE: 1/8" = 1'-0"

PHASE I

PHASE II

— TEMPORARY PARTITION

LEGEND	
EL. 12'-0"	ELEVATION DATUM
—	EXISTING CONSTRUCTION TO REMAIN
- - - - -	EXISTING CONSTRUCTION TO BE REMOVED
—	EXISTING DOOR TO REMAIN
—	EXISTING DOOR AND FRAME TO BE REMOVED

DEMO NOTES

- D1 REMOVE EXISTING FINISH FLOOR/ BASE WALL THROUGHOUT.
- D2 REMOVE EXISTING HOT WATER CONVECTOR REFER TO PLUMBING DRAWINGS.
- D3 REMOVE MILLWORK.
- D4 REMOVE EXISTING ELEVATOR.
- D5 REMOVE/ RELOCATE EXISTING PIPE. REFER TO PLUMBING DRAWINGS FOR MORE DETAILS.
- D6 REMOVE MASONRY TO UNDERSIDE OF STRUCTURE ABOVE.

PRIORITY AREAS:

PHASE I

ROOF & 2ND FLOOR:

- 1) ROOF
- 2) ADMINISTRATION OFFICES
- 3) MUSEUM ROOM
- 4) MULTI-PUPOSE ROOM

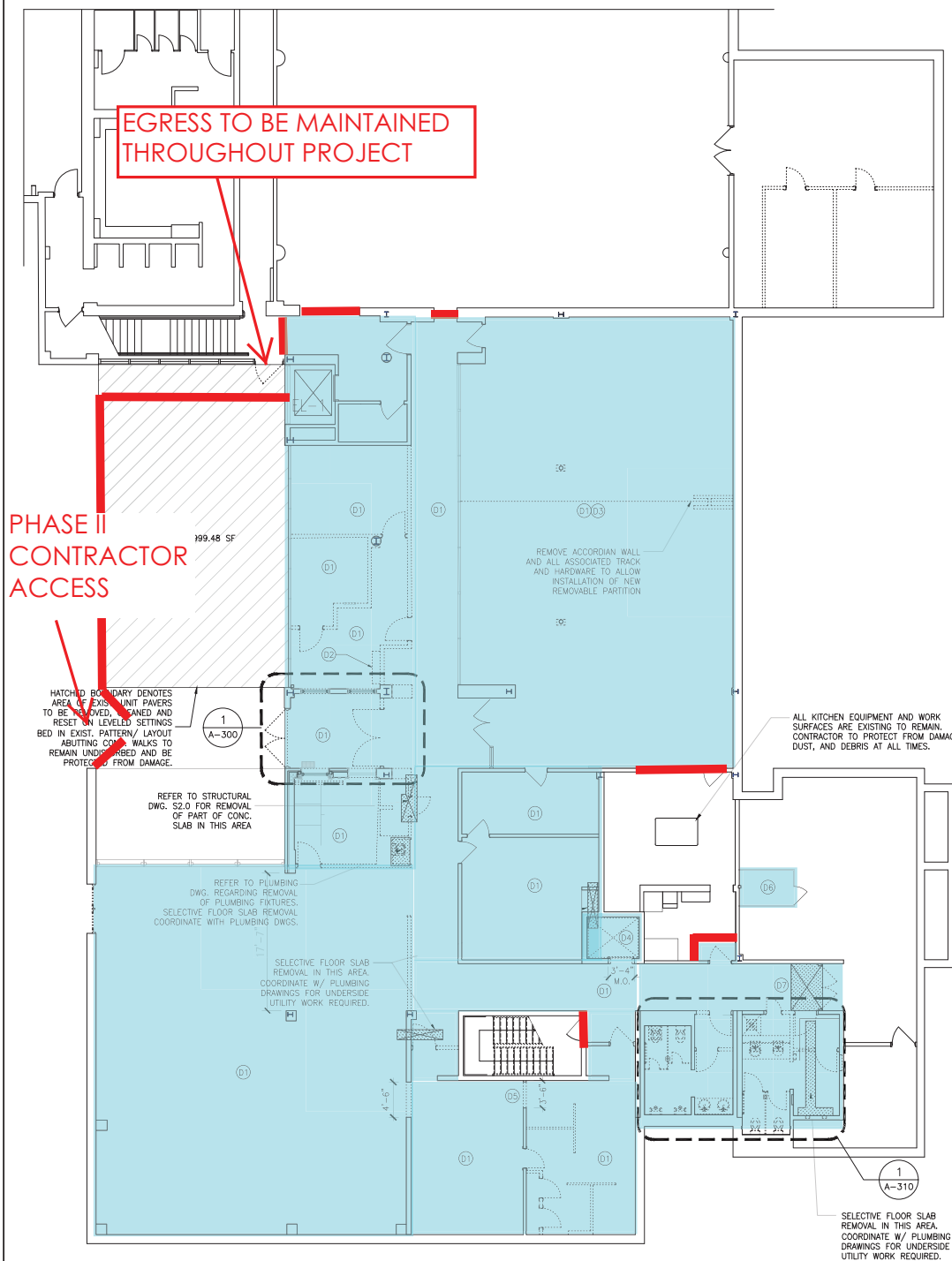
PHASE II

1ST FLOOR

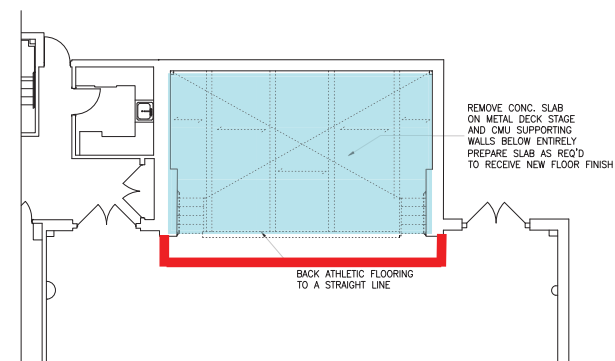
- 1) ENTRY, STAIRS
- 2) ELEVATOR FIREPROOFING



PHASING PLAN - PHASE I



1 PARTIAL FIRST FLOOR DEMO. PLAN
SCALE: 1/8" = 1'-0"



2 PARTIAL FIRST FLOOR DEMO. PLAN
SCALE: 1/8" = 1'-0"



DEMO NOTES

- D1 REMOVE EXISTING FINISH FLOOR THROUGHOUT.
- D2 REMOVE AND SALVAGE ROLLER SHUTTER SYSTEM
- D3 REMOVE EXISTING RAIL CHAIR ON WALLS/ COLUMNS
- D4 REMOVE EXISTING ELEVATOR
- D5 REMOVE WALL TO STRUCTURE ABOVE
- D6 REMOVE ALL ELEV. MECH. EQUIPMENT. REMOVE CAGE
- D7 REMOVE FLOOR FINISH AS INDICATED

PHASE I

PHASE II

TEMPORARY PARTITION

PRIORITY AREAS:

PHASE I

ROOF & 2ND FLOOR:

- 1) ROOF
- 2) ADMINISTRATION OFFICES
- 3) MUSEUM ROOM
- 4) MULTI-PUPOSE ROOM

PHASE II

1ST FLOOR

- 1) ENTRY, STAIRS
- 2) ELEVATOR FIREPROOFING

PHASING PLAN - PHASE II

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Contractor's use of site and premises.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Joseph G. Caputo Community Center, Project No. 24012

1. Project Location: 95 Broadway, Ossining, NY

B. Owner: Village of Ossining, Westchester County, NY

1. Owner's Representative:

C. Architect: DCAK-MSA Architecture & Engineering, PC, 53 Hudson Avenue, Nyack, NY 10960

1. Architect's Representative: Drazen Cackovic, AIA, 845-353-1300, dc@dcak-msa.com

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Structural Engineer: SEVA Engineering

- a. Structural Engineer: Representative: Fremal Patel, fremal@sevaengineering.com; 732-707-7382

2. MEP: SEVA Engineering

- a. MEP : Representative : Sanjay Patel, sanjay@sevaengineering.com; 732-707-7382

3. Landscape Architect: Imbiano Quigley Landscape Architects

- a. Landscape Architect: Representative: Shachi Patel, spatel@iqlandarch.com; 914-232-0200

E. Roofing Consultant: Indus Architects, PLLC responsible for the roofing design, roofing specifications, and roofing-related technical services during both the bidding and construction phases. .

Representative: **Sharon Lobo** <slobo@indusofny.com, (212) 398-6900-O (917) 903 4109 -M

F. Construction Manager: Calgi Construction Company, Inc: Représentative: 'Dorian De Laurentiis' Doriand@calgiconstruction.com; 914 447 3970

G. Contractor:

1. Contractor Representative: TBD

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The project involves renovating the existing building to create office and multipurpose spaces on the lower and upper levels, totaling approximately 18,069 SF. The scope of work also includes improvements to the courtyard. and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.

- a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.

2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Limits on Use of Site: Confine construction operations to
 2. Driveways, Walkways, and Entrances: Keep driveway and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
- D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- E. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1.7 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: 8 am – 6 pm
- C. Existing Utility Interruptions: Do not interrupt utilities without prior written permission of Construction Manager and Owner.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Construction Manager not less than one day in advance of proposed disruptive operations.
 - 2. Obtain Construction Manager's written permission before proceeding with disruptive operations.
 - 3. Noise Ordinance 8am-6pm unless otherwise noted
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Dumpsters TBD
- H. Construction Signage as required
- I. Temporary Fencing- layout to be determined with Construction Manager
- J. Submit Workzone Traffic Control Plan on Broadway including Barricades, Fencing and Flagmen as required
- K. Employee Screening: Comply with Owner's requirements for drug and back-ground screening of Contractor personnel working on Project site.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.

3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

END OF SECTION 011000

SECTION 01 12 50
SUMMARY OF MULTIPLE PRIMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary" for the Work covered by the Contract Documents, restrictions on use of the premises, Owner-occupancy requirements, and work restrictions.
 - 2. Division 1 Section "Administration Requirements" for general coordination requirements.
 - 3. Division 1 Section "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weather-tight; exterior walls are insulated and weather-tight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 COORDINATION

- A. Project Coordinator shall be responsible for coordination between the General Construction Contract, Plumbing & fire suppression Contract, Mechanical Contract and Electrical Contract.

1.The Construction Manager shall act as Project Coordinator.

1.5 PROJECT COORDINATOR

- A. Project Coordinator: Part-Time Project Coordinator.
 - 1. Coordination activities of Project Coordinator include, but are not limited to, the following:
 - a. Provide overall coordination of the Work.
 - b. Coordinate shared access to workspaces.
 - c. Coordinate product selections for compatibility.
 - d. Provide overall coordination of temporary facilities and controls.
 - e. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.

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- f. Coordinate construction and operations of the Work with work performed by each contract and Owner's construction forces.
- g. Coordinate preparation of Coordination Drawings prepared by each contractor to coordinate their work with each other.
- h. Coordinate sequencing and scheduling of the Work. Include the following:
 - 1) Initial Coordination Meeting: At earliest possible date, arrange and conduct a meeting with separate contractors for sequencing and coordinating the Work; negotiate reasonable adjustments to schedules.
 - 2) Update the Project Schedule utilizing the construction schedules provided by the Multiple Prime Contractors, incorporating the activities of the Owner, Architect, and Multiple Prime Contractors of the Project.
 - 3) Distribute copies of schedules to Architect, Owner, and separate contractors.
- i. Provide photographic documentation.
- j. Coordinate quality-assurance and quality-control services specified in Division 1 Section "Quality Requirements."
- k. Coordinate sequence of activities to accommodate tests and inspections and coordinate schedule of tests and inspections.
- l. Coordinate cutting and patching.
- m. Coordinate protection of the Work.
- n. Coordinate completion of interrelated punch list items.
- o. Coordinate preparation of Project Record Documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
- p. Collect Record Specification Sections from other contractors, collate Sections into numeric order, and submit complete set.
- q. Coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
- r. Coordinate sharing access to workspaces by plumbing, fire suppression systems, mechanical, and electrical contractors.
- s. Coordinate installation of plumbing, fire suppression systems, mechanical and electrical work into limited spaces.

1.6 GENERAL REQUIREMENTS OF MULTIPLE PRIME CONTRACTS

- A. Extent of Contract: Unless the Agreement contains a more specific description of the Work, names and terminology on Drawings and in Specification Sections determine which contract includes a specific element of Project.
 - 1. Unless otherwise indicated, the Work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
 - 2. Local custom and trade union jurisdictional settlements do not control the scope of the Work of each contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, affected contractors shall negotiate a reasonable settlement to avoid or minimize interruption and delays.
 - 3. Excavation and Back fill of Trenches for the Work of all contracts shall be provided by General Construction contractor for All Work inside and outside the building.
 - 4. Cutting and Patching: The General Construction Contractor to provide cutting and patching of the existing concrete slab. All other rough cutting and patching to be provided by each contractor for its own Work. Finishes are to be provided by General Construction Contractor.

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5. Through-penetration firestopping for the Work of each contract shall be provided by each contract for its own Work.
 6. Each Prime Contract is required to coordinate openings in any new walls and roof with the General Construction Contract.
 7. Within five (5) working days after the coordinated construction schedule provided by the General Construction Prime Contractor has been received by the Project Coordinator, the schedule will be shared with all other prime contractors to review and submit all comments, amendments to, and/or acceptance of said schedule. General Construction Prime Contractor shall reissue amended schedule as necessary showing construction operations sequenced and coordinated with overall construction.
 8. Project closeout requirements.
- B. Substitutions: Each contractor shall cooperate with other contractors involved to coordinate approved substitutions with the remainder of the Work.
- C. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Division 1 Section "Temporary Facilities and Controls," each contractor is responsible for the following:
1. Installation, operation, maintenance, and removal of each temporary facility are usually considered as its own normal construction activity, costs and use charges associated with each facility.
 2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
 3. Its own field office, complete with necessary furniture, utilities, telephone and internet services. Electrical service shall be brought in from temporary panel located 100 feet within property line to own field office.
 4. Its own storage and fabrication sheds.
 5. Temporary enclosures for its own construction activities.
 6. Hoisting facilities for its own construction activities.
 7. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary or other harmful waste materials.
 8. Progress cleaning of its own areas on a daily basis.
 9. Temporary fire-protection equipment including fire extinguishers.
 10. Secure lockup of its own tools, materials, and equipment.
 11. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
- D. Temporary Heating, Cooling, and Ventilation: Each Contractor is responsible for temporary heating, cooling and ventilation required for own work. Owner will pay for utility-use charges.
- E. Use Charges: Comply with the following:
1. Water Service: The Owner shall pay the cost for water service, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.
 2. Electric Power Service: Owner shall pay the cost for electric power service, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site with the following conditions:

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- a. The Owner shall pay for electric energy for temporary light and power except electric energy requiring more than single phase 400 amp service required for temporary trailers for duration of the project.
 - b. Any requirement for electric energy shall be provided by separate sources and completely paid for by each Contractor requiring such power until primary service is installed.
- F. Notice to Consolidated Edison
- 1. The Contractor further agrees to comply with General Business Law, Article 36, and shall give prior written notice to the Consolidated Edison Company of New York, Inc., at least seventy-two (72) hours in advance before excavating in any street or public place and before a proposed discharge of explosives in any location.
- G. Code 53 (16 NYCRR Part 753)
- 1. Under Industrial Code Rule 53 the Contractor will be required to notify the Central Registry prior to the start of his work and obtain a listing of the various underground utility operators to notify of impending work under this contract so that said utility operators may locate and mark the locations of their utilities upon the pavement. Notification of all operators must be made forty-eight (48) hours prior to the start of any construction. No work by the Contractor shall commence until all the operators have acknowledged being notified and their utilities have been located and marked.

1.7 GENERAL CONSTRUCTION CONTRACT

- A. Work in the General Construction Contract includes, but is not limited to, the following:
- 1. Work is outlined on Drawings with the Sheet Identifiers "TS", "G", "AD", "A", "S", and "L" and includes all interfacing work shown elsewhere on the remaining Contract Drawings: "PD", "P", "M," "E" and "FA".
 - 2. Preparation of coordination drawings, for use by other trades, in compliance with Division 1 Section "Administration Requirements":
 - a. Project Coordinator will allocate applicable portions of coordination drawings to the General Construction Contract, Plumbing Construction Contract, Mechanical Construction Contract and Electrical Construction Contract for functional and spatial relationships of components of architectural, structural, landscape, mechanical and electrical systems.
 - b. Indicate required installation sequences if necessary.
 - 3. Site preparation including, but not limited to, clearing, grubbing and earthwork as well as excavation for the building and building utilities 5'-0" outside building perimeter and related earthwork including "Court Yard" scope of work indicated on landscape Drawings.
 - 4. Site improvements including, but not limited to, roadways, drainage structures, parking lots, pedestrian paving, lawn areas, landscaping, site development furnishings and equipment.
 - 5. All Retaining Walls.

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6. All Slabs-on-grade and Stairs-on-grade outside of building footprint, including earthwork and insulation.
 7. Site layout including verifying layout information shown on Drawings, in relation to the property survey and existing benchmarks. Locate and lay out reference points as indicated on Site drawings in Contract Documents.
 8. Construction Layout including verifying layout information shown on Drawings, in relation to property survey and existing benchmarks. Locate and lay out reference points and control lines and levels for structures, building foundations, column grids, and floor levels, including control lines and levels required for plumbing, mechanical and electrical work from a starting point designated as per the drawings.
 9. Foundations including footings and foundation walls.
 10. Anchor Bolts Survey verifying all elevations, column grids and reference point location.
 11. Interior Slab-on-grade, including earthwork and insulation.
 12. Brick , Stone, etc. veneer and required Back-up on all exterior / interior walls, columns, etc. with all necessary reinforcing, ties, etc.
 13. Below-Grade building construction, including excavation, backfill and thermal and moisture protection.
 14. Superstructure, including floors, mezzanine and roof construction.
 15. Exterior enclosure, including walls, parapets, doors, windows and louvers, overhead doors and controls
 16. Roofing, including coverings, flashings, metal panels and roof specialties.
 17. Interior construction, including partitions, doors, interior glazed openings and fittings.
 18. Fire-protection specialties
 19. Stairs, including railings and finishes
 20. Interior finishes, finish carpentry, architectural woodwork and built –in casework.
 21. Conveying systems, including elevator(s)
 22. Equipment noted as supplied by General Contractor as well as equipment noted to be supplied by Owner and installed by General Contractor.
 23. Furnishings, including casework and floor mats.
 24. Final property survey.
 25. Final cleaning as specified in Section "Execution and Closeout Procedures."
 26. Miscellaneous specialties including, but not limited to the following:
 - a. Blocking for roof curbs, plumbing fixtures, etc. as required.
 - b. Toilet and bath accessories
 - c. Toilet Compartments
 - d. Installation of necessary / required access doors provided by other Prime Contractors
- B. Temporary facilities and controls in the General Construction Contract include, but are not limited to, the following (see also Spec Section 015000):
1. Temporary facilities and controls that are not otherwise specifically assigned to the Plumbing and fire suppression, Mechanical Contract, and Electrical Contract.
 2. Construction Manager's field office is not required.
 3. Trenching for all utilities by General Contractor.
 4. Stormwater control.
 5. Temporary roads and paved areas.
 6. Site storm control and drainage.
 7. Site sanitary sewerage.
 8. Un-piped temporary toilet fixtures and wash facilities, including disposable supplies.
 9. Dewatering facilities and drains, unless required solely for the Work of another

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contract.

10. Excavation support and protection, unless required solely for the Work of another contract.
11. Remove snow and ice from construction areas as required to minimize accumulations. Maintain safe, uninterrupted access to all construction areas.
12. Project identification and temporary signs.
13. Barricades, warning signs, and lights.
14. Site / Building enclosure fence and lockup as necessary.
15. Security enclosures and lockup.
16. Site / Building Environmental protection.
17. Temporary enclosure for building exterior, except as indicated.
18. Dust-proof Temp Partitions with temp doors, gasketing, lockable hasp with lock & spring-loaded hinge as required.
19. Until permanent stairs are available, provide temporary stairs where ladders are not adequate, including to roofs.
20. Dewatering facilities and drains, unless required solely for the Work of another contract.
21. Excavation support and protection, unless required solely for the Work of another Contract.
22. Pest control. Provide pest control inspection at project closeout as indicated in Division 1 Section " Execution and Closeout Requirements."
23. General waste disposal facilities.
24. Temporary fire-protection equipment.
25. Environmental protection.

1.8 PLUMBING CONSTRUCTION CONTRACT

A. Work in the Plumbing Construction Contract includes, but is not limited to, the following:

1. Work is outlined on Drawings with the Sheet Identifier "PD" , and "P", and includes all interfacing work shown elsewhere on the remaining Contract Drawings: "TS", "G", "AD", "A", "S", "L", "M," "E" and "FA".
2. Preparation of coordination drawings, for use by other trades, in compliance with Division 1 Section "Project Management and Coordination."
 - a. Project Coordinator will allocate applicable portions of coordination drawings to the General Construction Contract, Mechanical Construction Contract, Electrical Construction Contract for functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences if necessary
4. Plumbing fixtures.
5. Domestic water distribution.
6. Sanitary waste.
7. Stormwater drainage.
8. Plumbing connections to equipment furnished by the General Construction Contract, Mechanical Construction Contract and Electrical Construction Contract.

B. Temporary facilities and controls in the Plumbing Contract include, but are not limited to, the following:

1. Piped water service from point of connection to proposed facility, including, but not limited to, temporary standpipes and hoses for fire protection, and hose-bib,

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- backflow-prevention devices.
2. Plumbing connections to proposed systems and temporary facilities and controls furnished by the General Construction Contract, Mechanical Construction Contract and Electrical Construction Contract.

1.9 MECHANICAL CONTRACT

A. Work in the Mechanical Contract includes, but is not limited to, the following:

1. Work is outlined on Drawings with the Sheet Identifier "M" includes all interfacing work shown elsewhere on the remaining Contract Drawings: "TS", "G", "AD", "A", "S", "L", "PD", "P", "E" and "FA".
2. HVAC systems and equipment including rooftop equipment curbs and related vibration control curbs.
3. HVAC instrumentation and controls.
4. Preparation of coordination drawings, for use by other trades, in compliance with Division 1 Section "Administration Requirements."
 - a. Indicate elevations of HVAC systems (including piping and ductwork) with reference to finish floor elevations.
 - b. Project Coordinator will allocate applicable portions of coordination drawings to the General Construction Contract, Plumbing Construction Contract, Electrical Construction Contract, for functional and spatial relationships of components of architectural, structural, mechanical, and electrical systems.
 - c. Indicate required installation sequences if necessary.
7. Mechanical connections to equipment furnished by the General Construction Contract, Plumbing Construction Contract and Electrical Construction Contract.

1.10 ELECTRICAL CONTRACT

A. Work in the Electrical Contract includes, but is not limited to, the following:

1. Work is outlined on Drawings with the Sheet Identifiers "E", "FA", and "L" and includes all interfacing work shown elsewhere on the remaining Contract Drawings: "TS", "G", "AD", "A", "S", "PD", "P", and "M".
2. Preparation of coordination drawings, for use by other trades, in compliance with Division 1 Section "Administration Requirements"
 - a. Project Coordinator will allocate applicable portions of coordination drawings to the General Construction Contract, Plumbing Construction Contract and Mechanical Construction Contract for functional and spatial relationships of components of architectural, structural, mechanical, and electrical systems.
 - b. Indicate required installation sequences if necessary.
3. Site electrical distribution.
4. Site lighting.

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5. Exterior and interior lighting.
6. Exterior and interior power distribution.
7. Empty conduit with drag line and back box for security and data distribution. Security and Data wire device and equipment furnished and installed by Owner's vendor.
8. Special electrical systems, including the following:
 - a. Fire alarm system furnished and installed by Owner's Vendor.
9. Electrical connections to equipment furnished by the General Construction Contract, Plumbing Construction Contract and Mechanical Construction Contract.

B. Temporary facilities and controls in the Electrical Contract include, but are not limited to, the following (See also Spec 015000):

1. Temporary electric power service.
2. Electric power service and distribution.
3. Lighting, including site lighting.

PART 2 ·PRODUCTS (Not Used)

PART 3 ·EXECUTION (Not Used)

END OF SECTION 01 12 50

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be **ADDED** to or **DEDUCTED** from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. SEE BID PROPOSAL FORM

END OF SECTION 01 23 00

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form acceptable to Village of Ossining
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

- e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 10 days of receipt of a request for substitution. Architect will notify Contractor through Village of Ossining of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

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

1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed unless otherwise indicated.
- C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.

- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
 - 2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 "Architect Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 10days, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 016000 "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use AIA Document G709 for Proposal Requests

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

END OF SECTION 012600

SECTION 01 27 00
UNIT PRICES

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
 - 1. Division 1 Section below contains requirements that relate directly to unit prices.
 - 2. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders

1.3 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. Mobilization shall include all activities and associated costs for transportation of contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the contractor's operations at the site; premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable; and other items specified in section 4 of this specification. Mobilization does not include the start of work at a specific area on the project site while the contractor is present at other areas immediately prior to, during or following the work.

1.4 PROCEDURES

- A. Unit price shall be used when and if required by Owner through Architect for all additions and deletions to the Contract quantities and shall be inclusive of furnishing and installing all necessary material, plus costs for delivery, insurance, labor, applicable taxes, overhead, profit, equipment, hoisting, scaffolding, trucking, handling, submissions, layout, permits, coordination, hangers, inserts, couplings, testing, delivery, supervision, etc. as per change orders, and shall remain installed in quantities and locations as approved by the Architect/Construction Manager.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in the Bid Proposal Form.

END OF SECTION 01 27 00

SECTION 012900 -PAYMENT PROCEDURES

PART 1 -GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012700 "Unit Prices" for administrative requirements governing the use of unit prices.
 - 2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Section 013000 "Administrative Requirements" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect through Construction Manager at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of

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contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

- a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702/CMA and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 3. Written Order & Delivery Date Confirmations are required for each Payment Application
 4. General Conditions should equal 7% of total contract, which includes Meetings, Submittals, Supervision, Mobilization
 5. Punchlist should be 5%
 6. Closeouts should be 2.5%

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7. Provide Labor & Material broken out separately for each item
 8. For Public Works projects over \$250,000, please ensure compliance with the 10-Hour OSHA requirement under Labor Law 220-h. OSHA cards must be submitted with the first Certified Payroll. For any subsequent Certified Payrolls that include new employees, copies of those employees' OSHA cards must also be attached.
- E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Submittal schedule (preliminary if not final).
 5. List of Contractor's staff assignments.
 6. List of Contractor's principal consultants.
 7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 8. Initial progress report.
 9. Certificates of insurance and insurance policies.
 10. Written Order & Delivery Date Confirmations are required for each Payment Application
 11. Initial settlement survey and damage report, if required by particular project
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: After completing Project closeout requirements, submit final Application for

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Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707-1994, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final liquidated damages settlement statement.

PART 2 -PRODUCTS (Not Used)

PART 3 -EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013000

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Required reports to document construction progress.
- G. Availability of electronic drawing files for use by Contractor.
- H. Progress photographs.
- I. Coordination drawings.
- J. Submittals for review, information, and project closeout.
- K. Submittal procedures.

1.02 RELATED REQUIREMENTS

- B. Section 011000 -Summary
- C. Section 011250-Summary of Multiple Primes
- D. Section 013216 - Progress Schedule: Form, content, and administration of schedules.
- D. Sections 017000 -Section 017900 Execution and Closeout Requirements: Additional coordination requirements including Closeout Submittals and Project record documents.

1.03 PROJECT COORDINATION

- A. Project Coordinator: Construction Manager
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for site access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- E. Coordinate field engineering and layout work under instructions of the Project Coordinator.

PART 2 PRODUCTS -NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email. The Construction Manager uses Autodesk Build for this purpose and the Contractor will be required to communicate all documentation through this system. The Contractor will not be charged any licensing or usage fees for using this system.

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1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record.
2. Contractor is required to use this service.
3. It is Contractor's responsibility to submit documents in PDF format.
4. Users of the service need an email address, Internet access, and will use Autodesk Build for submission and PDF review. Access to Autodesk Build will be provided by the Construction Manager.
5. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
6. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:

1. Autodesk Build.

C. Training: Training videos are available on the Autodesk Build platform.

3.02 PRECONSTRUCTION MEETING

A. Project Coordinator will schedule a meeting after Notice of Award.

B. Attendance Required:

1. Owner.
2. Architect.
3. Contractor.

C. Agenda:

1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract, Contractor and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

D. Record minutes and distribute copies via Autodesk Build within

Seventy-two hours after meeting, with copies to Architect, Owner, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Project Coordinator will schedule a site mobilization meeting at the project site prior to Contractor occupancy.

B. Attendance Required:

1. Contractor.
2. Owner.
3. Architect.
4. Special Consultants.
5. Contractor's Superintendent.
6. Major Subcontractors.

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7. Suppliers.
8. Other concerned parties.

C. Agenda:

1. Use of premises by Owner and Contractor.
2. Owner's requirements and occupancy prior to completion.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.

D. Record minutes and distribute copies via Autodesk Build within three days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

- A. Project Coordinator will Schedule and administer meetings throughout progress of the Work at weekly intervals.
- B. Project Coordinator will Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Contractor's Project Superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting. See Instructions to Bidders regarding \$500 penalty for Contractor's who do not attend meetings.

D. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

- E. Project Coordinator will Record minutes and distribute copies via the Autodesk Build within three days prior to the next meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE -SEE SECTION 013216

3.06 DAILY CONSTRUCTION REPORTS

- A. Prepare and submit daily construction reports for Architect and Owner review which must contain the following information (at minimum):
 - 1. High and low temperatures and general weather conditions.
 - 2. List of subcontractors at Project site.
 - 3. List of separate contractors at Project site.
 - 4. Approximate count of personnel at Project site.
 - 5. Material deliveries.
 - 6. Equipment at Project site.
 - 7. Work Performed.
 - 8. Tests Performed.
 - 9. Inspections Performed.
 - 10. Accidents.
 - 11. Meetings and significant decisions.
 - 12. All other relevant items.

3.07 MATERIAL LOCATION REPORTS

- A. At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site.
- B. Include materials previously reported plus items recently delivered.
- C. Include statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

3.08 FIELD CONDITION REPORTS

- A. Prepare and submit a detailed report to the Architect immediately upon discovery of a difference between field conditions and the contract documents.
- B. Submit with a request for interpretation.
- C. Include detailed description of the differing conditions, together with recommendations for changing the contract documents

3.09 SPECIAL REPORTS

- A. Prepare and submit a special report when an event of an unusual and significant nature occurs at the Project site.
- B. Include chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information.
- C. Advise Owner in advance when these events are known or predictable.
- D. Submit within one day of occurrence and distribute copies to all parties affected by the occurrence.

3.10 PROGRESS PHOTOGRAPHS

- A. Photo documentation required using Autodesk Build
- B. Photography Type: Digital; electronic files.
- C. In addition to periodic, recurring views, take photographs of each of the following events:
 - 1. Completion of site clearing.

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2. Excavations in progress.
 3. Foundations in progress and upon completion.
 4. Final completion, minimum of ten (10) photos.
- D. Take photographs as evidence of existing project conditions, before commencement of demolition and site clearing, as follows:
1. Project site.
 2. Surrounding properties.
 3. Existing items to remain during construction.
- E. Final Completion Photographs: Take photographs after Date of Substantial Completion for submission as Record Documents; minimum 20 photos. Architect will direct photographer for desired views.

3.11 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. General Contractor Responsibilities:
1. Direct the overall coordination drawing process.
- C. Mechanical Contractor Responsibilities:
1. Initiate Coordination Drawings for areas or floors with Mechanical Contract work.
 2. Provide Coordination Drawing Digital Data File for use by all Contractors. Show every specified Mechanical Contract scope item. Distribute to Plumbing and Electrical Contractors to incorporate their work.
 3. Receive updated Coordination Drawing Digital Data File from Plumbing and Electrical Contractors after incorporation of work by each Contractor.
 4. Distribute completed and approved layouts on an area by area or floor by floor basis to Plumbing and Electrical Contractors. Issue one (1) copy each to General Construction Contractor and Architect.
- D. Plumbing Contractor Responsibilities:
1. Receive Coordination Drawing Digital Data File from Mechanical Contractor.
 2. Incorporate layouts of work into Coordination Drawing Digital Data File, including but not limited to piping, valves, and equipment. Return file to Mechanical Contractor for distribution.
 3. Initiate and provide coordination drawings for areas or floors with no Mechanical Contract work.
- E. Electrical Contractor Responsibilities:
1. Receive Coordination Drawing Digital Data File from Mechanical Contractor.
 2. Incorporate layouts of work into Coordination Drawing Digital Data File, including but not limited to lighting, conduit, junction boxes, fire alarm systems, and equipment. Return file to Mechanical Contractor for distribution.
 3. Initiate and provide coordination drawings for areas or floors with no Mechanical Contract or Plumbing Contract work.
- F. Coordination Drawing procedures shall be as indicated above and as follows:

Contractor:	Color Designation on Drawings	Completed by Contractor within:
Mechanical	Orange Pen	Two (2) weeks from receipt
Plumbing	Blue Pen	One (1) week from receipt
Electrical	Green Pen	One (1) week from receipt

- G. Review drawings with the Clerk of the Works to review and resolve identified coordination

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drawing conflicts prior to submission to Architect.

1. Submit drawings to Architect and Engineer for approval only after coordination is completed and Contractor has initialed the completed drawings.
 2. **Do not begin installations affected by the coordination drawings without Architect approval.**
- H. Prepare and submit coordination drawings to achieve maximum utilization of space for efficient installation of different components and for coordination of installation of products and materials fabricated.
- I. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
1. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 2. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 3. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 4. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 5. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 6. Indicate required installation sequences.
 7. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 8. Sheet Size: At least 24 by 36 inches but no larger than 30 by 42 inches at a scale suitable for presentation of the information.
 9. Number of Copies: Submit one (1) copy of each submittal via the Electronic Document Submittal Service. Submit one additional hardcopy where Coordination Drawings are required for operation and maintenance manuals. Mark up and retain one returned copy as a Project Record Drawing.
 10. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- J. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
 3. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 4. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems
 - b. Dimensions of major components, such as dampers valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.

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5. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
6. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
7. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.

3.12 ELECTRONIC DRAWING (CAD) FILES

- A. Available from Architect at the Architect's discretion for the architectural (A) sheets.
- B. Available from the Architect's Consultants, through the Architect, at the Consultants' discretion for all other sheets.
- C. Contractor must sign a release form and pay a per sheet fee prior to transmission of the requested sheets.

3.13 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect and Architect's Consultants for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. Product Data: Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.
- E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 -Closeout Submittals.

3.14 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.

- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.15 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for substantial completion
- B. Submit Final correction punch list for substantial completion
- C. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.16 NUMBER OF COPIES OF SUBMITTALS

- A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Extra Copies at Project Closeout: See Section 017700.
- C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect. If not otherwise specified, provide two (2) pieces.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.17 SUBMITTAL PROCEDURES

- A. Transmit each submittal through the electronic document submittal service.
- B. Provide submittals of all products, materials, items and equipment shown in the contract documents whether or not they are specified items in the project manual.
- C. Transmit each submittal with approved form through the Autodesk Build
- D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- E. Identify Project, Contractor, Subcontractor or supplier, date and revision date; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- F. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
 - 1. Verify that portions of the submittal package provided by a subcontractor or supplier or provided directly by the Contractor are complete.
 - 2. Correct any errors or omissions found prior to transmitting each submittal.
 - 3. Incomplete submittal packages transmitted for review will be returned without action.
 - 4. Architect or Consultant may identify any conspicuous errors or omissions on a submittal without prejudice to being held harmless to Contractor's examinations and responsibilities.
- G. Do not combine submittals of more than one specification section with submittals required by other specification sections unless otherwise specifically stated in the specifications.
- H. Deliver samples and color selection charts to Architect at business address. Record transmittal of each sample required through the Electronic Document Submittal Service. Architect's review results will be

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- posted and Contractor will be notified through the electronic document submittal service.
- I. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - J. Organize and transmit submittals in logical groupings to facilitate interrelation of several items.
 - 1. Finishes which involve Architect selection of colors, textures, or patterns.
 - 2. Associated items that require correlation for efficient function or for installation.
 - K. Architect will not choose any exterior colors until the entire exterior submittal package requiring color choices is submitted and approved.
 - L. For each submittal for review, allow fourteen (14) calendar days excluding delivery time to and from the Contractor.
 - M. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
 - N. Provide space for Contractor and Architect review stamps.
 - O. Where the submitted product is the specified product and shop drawings are not otherwise required, provide product data sufficient to prove it is the specified product.
 - P. For each revised submittal for review, identify all changes made since previous submission.
 - 1. If the resubmittal process involves three or more submissions due to Contractor's fault, the Architect, at his discretion, may charge the Contractor for the Architect's time by submitting a bill to the Owner, who may deduct the amount from the Contractor's application for payment.
 - Q. Distribute reviewed submittals, bearing Architect's approval stamp, as appropriate. Instruct parties to promptly report any inability to comply with requirements.
 - R. Multiple submittals of unacceptable materials will result in Contractor being charged for the Architect's time reviewing them.
 - S. Do not fabricate products or begin Work requiring submittals until return of submittal with Architect's approval.

END OF SECTION

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.3 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in 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 ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

1.4 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 3. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 4. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Preparation Format: DWG, Version 2013, operating in Microsoft Windows operating system.
 3. File Submittal Format: Submit or post coordination drawing files using PDF format.
 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. .
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

1.5 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Owner name.
 2. Owner's Project number.
 3. Name of Architect.
 4. Architect's Project number.
 5. Date.
 6. Name of Contractor.
 7. RFI number, numbered sequentially.
 8. RFI subject.
 9. Specification Section number and title and related paragraphs, as appropriate.
 10. Drawing number and detail references, as appropriate.
 11. Field dimensions and conditions, as appropriate.
 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 13. Contractor's signature.
 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: AIA Document G716

- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI as indicated in the Agreement. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly .
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect .
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

1.6 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.

3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD 2021 version .
4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
 - a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
5. The following digital data files will be furnished for each appropriate discipline:
 - a. Floor plans.
 - b. Reflected ceiling plans.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.7 PROJECT MEETINGS

- A. General: Village of Ossining will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
- B. Preconstruction Conference: Architect will schedule and conduct will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Critical work sequencing and long lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Sustainable design requirements.

- m. Preparation of Record Documents.
 - n. Use of the premises .
 - o. Work restrictions.
 - p. Working hours.
 - q. Owner's occupancy requirements.
 - r. Responsibility for temporary facilities and controls.
 - s. Procedures for moisture and mold control.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.

- v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at regular intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site use.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of Proposal Requests.

- 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 01 31 19

PROJECT 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 Construction Manager will conduct project meetings throughout the construction period.
- B. In general, project meetings will be held 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 relative to execution of the work.

1.3 RELATED SECTIONS

Administrative Requirements Section 01 30 00

- 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.

1.5 SUBMITTALS

- A. Agenda Items: To the maximum extent possible, advise the Construction Manager 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.
- C. Minutes: The Construction Manager shall compile minutes of each project meeting and shall distribute copies to the Owner and the Architect. The Construction Manager shall make and distribute such other copies as he wishes. The Architect and/or Owner may issue amendments to the minutes as necessary. Construction Manager shall issue same to other interested parties.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 MEETING SCHEDULE

- A. Coordinate with the Architect as required to establish a mutually acceptable schedule for project meetings.

3.2 MEETING LOCATION

- A. To the maximum extent practicable, project meetings shall be held at the job site. As practicable, the General Contractor shall provide adequate space and facility including table, chairs, and lighting for proper conduct of meeting, subject to available space and the progress of the work.

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.
- B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting. See Instructions to Bidders regarding \$500 penalty for Contractor's who do not attend meetings.

END OF SECTION 01 31 19

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Site condition reports.

1.2 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 Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- 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 connected chain of interdependent 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 is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
 2. PDF file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- C. CPM Reports: Concurrent with CPM schedule, submit each of the following 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 in calendar days.
1. Activity Report: List of 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 each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 3. Total Float Report: List of activities sorted in ascending order of total float.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at monthly intervals.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial 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.
- B. Activities:
1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.

2. Procurement Activities: Include procurement process activities for the following 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 Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 5. Commissioning Time: Include no fewer than 15 days for commissioning.
 6. 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.
 7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. 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. 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.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and the Contract Time.
- F. 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, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.

- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. 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.

1.6 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. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 7. Testing and inspection.
 - 8. Accidents.
 - 9. Meetings and significant decisions.
 - 10. Stoppages, delays, shortages, and losses.
 - 11. Meter readings and similar recordings.
 - 12. Emergency procedures.
 - 13. Orders and requests of authorities having jurisdiction.
 - 14. Change Orders received and implemented.
 - 15. Construction Change Directives received and implemented.
 - 16. Services connected and disconnected.
 - 17. Equipment or system tests and startups.
 - 18. Partial completions and occupancies.
 - 19. Substantial Completions authorized.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit 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.

END OF SECTION 013200

SECTION 01 32 16

PROGRESS SCHEDULE

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 progress schedule as specified herein, including, but not limited to, the following:
 - 1. Format.
 - 2. Content.
 - 3. Revisions to schedules.
 - 4. Submittals.

1.3 RELATED WORK

- A. Submittal Procedures - Section 01 33 00.

1.4 FORMAT

- A. Sample: Review provided Preliminary Milestone Schedule at the end of Section 000900 timeline estimates and minimum category requirements
- B. Prepare Schedules using a program that has been developed specifically to manage construction schedules
 - 1. Utilize Primavera Suretrak for Windows systems.
- C. Sequence of Listings: The chronological order of the start of each item of Work.
- D. Scale and Spacing: To provide space for notations and revisions.
- E. Diagram Sheet Size: Maximum 24x36 inches (600x900mm) or width required
- F. Sheet Size: Multiples of 11x17 inches (279.4x431.8mm)

1.5 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by Specification section number.
- C. Identify work of separate stages and other logically grouped activities.

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- D. Provide sub-schedules to define critical portions of the entire Schedule.
 - E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
 - F. Provide separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products and Products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision data for selection of finishes.
 - G. Indicate delivery dates for Owner furnished products and Products identified under Allowances.
 - H. Identify major milestones, including but not limited to, Project completion, punchlist, and turnover.
 - I. Include all procurement, off-site, and construction activities.
 - 1. Procurement activities include: periods for submittal transmission, review, and approval; fabrication periods for major and critical trades.
 - J. Illustrate order and interdependence of activities and sequence of Work; how start of a given activity depends on completion of preceding activities and how completion of the activity may restrain start of following activities.
 - K. Provide legend for symbols and abbreviations used.
 - L. Show sufficient detail to allow visual checking of progress on a monthly basis.
- 1.6 REVISIONS TO SCHEDULES
- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
 - B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
 - C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of separate contractors.
- 1.7 SUBMITTALS
- A. Submit initial Schedules within 14 days of date established for commencement of the Work. After review, resubmit required revised schedule within 10 days.
 - B. Submit revised Progress Schedule with each Application for Payment.
 - C. Submit one opaque reproduction and one reproducible transparency.

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1.8 RECOVERY SCHEDULE

- A. When periodic updates indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which the Contractor intends to regain compliance with the schedule.
- B. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

1.9 DELAYS

- A. Delays in the schedule will be determined through the Agreement and the General Conditions of the Contract.

1.10 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect, Clerk or both, at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.

1.11 DISTRIBUTION

- A. Distribute copies of reviewed Schedules to project site file, Subcontractors, suppliers, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in Schedules.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 01 32 16

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Concealed Work photographs.
 - 3. Periodic construction photographs.
 - 4. Final completion construction photographs.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos thumb-drive. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect .
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.
 - g. Unique sequential identifier keyed to accompanying key plan.

1.3 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.4 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- C. Metadata: Record accurate date and time from camera.
- D. File Names: Name media files with date and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag excavation area and construction limits before taking construction photographs.
 - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
 - 1. Underground utilities.
 - 2. Under slab services.
 - 3. Piping.
 - 4. Electrical conduit.
 - 5. Waterproofing and weather-resistant barriers.
- E. Periodic Construction Photographs: Take 20 photographs monthly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- F. Final Completion Construction Photographs: Take 50 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

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SECTION 01 33 00
SUBMITTAL 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. 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. Electrical Shop Drawings
 - 2. Shop drawings and samples.
 - 3. Integrated/coordinated drawings.

1.3 RELATED SECTIONS

- A. Progress Schedule - Section 013216.
- B. Operating and Maintenance Data - Section 017823.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENTS SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet – based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addresses via email. The Construction Manager uses Autodesk Build for this purpose and the Contractor will be required to communicate all documentation through this system.
 - 1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFI's), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.

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2. Contractor is required to use this service
3. It is the Contractor's responsibility to submit documents in PDF format
4. Subcontractors and suppliers will be permitted to use the service
5. Users of the service need an email address, Internet access, and will use Procore for submission of PDF review. Access to Autodesk Build will be provided by the Construction Manager.
6. Contractor is responsible for image resolution of PDF documents, utilizing original document size; increase resolution as required to adequately present the information
7. Provide and transmit full color reproduction of PDF documents requiring color to convey intent and compliance
8. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected services is:

1. Autodesk Build

3.02 INTEGRATED DRAWINGS

- A. The General Construction Contractor shall indicate on his reproducible any structural framing, ceiling hangers, etc
- B. The HVAC Contractor shall prepare a Drawing or Drawings showing duct work, heating. This Drawing shall include location of grilles, registers, etc., and access doors in hung ceilings. Locations shall be fixed by elevations and dimensions from column center lines and/or walls.
- C. The HVAC Contractor shall prepare and distribute to the Site, General, Plumbing, Fire Protection and Electrical Contractors, the General Contractor, and to the Architect and Construction Manager reproducible of the above.
- D. Each trade is to show their components in a different color.
- E. The HVAC Contractor shall lay out on his reproducible the reflected ceiling plan, beam soffit elevations, ceiling heights, roof openings, etc.
- F. The Plumbing and Fire Suppression Contractor shall lay out on his reproducible the piping, valves, clean-outs, etc., indicating locations and elevations and shall indicate the necessary access doors.
- G. The Plumbing and Fire Suppression Contractor shall indicate on his reproducible the fixtures, large conduit runs, clearances, pull boxes, junction boxes, sound system speakers, etc.
- H. The Electrical Contractor shall indicate on his reproducible the fixtures, large conduit runs, clearances, pull boxes, junction boxes, sound system speakers, etc.

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- I. The Construction Manager shall call as many meetings with the Contractors 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 Construction Manager is responsible for the coordination of the Drawing or Drawings between the Contractors.
- J. On resolution of the conflicts, each Contractor shall enter his own work on the HVAC Contractor's reproducible, which shall become the master or integrated Drawings. The master reproducible shall be signed by each contributing Contractor to indicate his acceptance of the arrangement of the work.
- K. A reproducible copy of the master integrated Drawing will be prepared by the HVAC Contractor. The Construction Manager will make distribution to the Contractors
- L. Each Contractor shall prepare his Shop Drawings in accordance with the integrated Drawings. No work will be permitted without approved Shop Drawings. It is therefore essential that this procedure be instituted as quickly as possible.
- M. Review drawings with the Construction Manager to review and resolve identified coordination drawing conflicts prior to submission to Architect.
 - 1. Submit drawings to Architect and Engineer for approval only after coordination is completed and Contractor has initialed the completed drawings.
 - 2. Do not begin installations affected by coordination drawings without Architect approval.

3.03 COORDINATION OF SUBMITTALS

- A. Prior to submittal for Architect's review, use all means necessary to fully coordinate all material, 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 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 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.

2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as indicated in-place portions of permanent construction, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.
 - a. Include each system, assembly, component, and part of the exterior wall to be constructed for the Project. Colors of components shall be those selected by the Architect for use in the Project.
 3. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 4. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall have the same meaning as testing agency.
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.
- 1.3 DELEGATED-DESIGN SERVICES
- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Statement: Submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be

designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.4 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.

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

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

1. Statement on condition of substrates and their acceptability for installation of product.
2. Statement that products at Project site comply with requirements.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

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

1. Statement that equipment complies with requirements.
2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
3. Other required items indicated in individual Specification Sections.

1.7 QUALITY ASSURANCE

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

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

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

- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections 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. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. **Testing and Inspecting Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - d. When testing is complete, remove test specimens and test assemblies, and laboratory mockups; do not reuse products on Project.
 - 2. **Testing Agency Responsibilities:** Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. **Mockups:** Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, .
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 1. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when the Work that requires testing or inspection will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 6. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, , and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, **and authorities' having jurisdiction** reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).

28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASSP - American Society of Safety Professionals (The); www.assp.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Info-comm International); www.soundandcommunications.com.
38. AWEA - American Wind Energy Association; www.awea.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWWA - American Water Works Association; www.awwa.org.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
50. CDA - Copper Development Association; www.copper.org.
51. CE - Conformite Europeenne; <http://ec.europa.eu/growth/single-market/ce-marking/>.
52. CEA - Canadian Electricity Association; www.electricity.ca.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.compositepanel.org.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa-group.org.
65. CSI - Construction Specifications Institute (The); www.csiresources.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTA - Consumer Technology Association; www.cta.tech.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.coolingtechnology.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.

71. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); www.decorativehardwoods.org.
72. DHI - Door and Hardware Institute; www.dhi.org.
73. ECA - Electronic Components Association; (See ECIA).
74. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
75. ECIA - Electronic Components Industry Association; www.eciaonline.org.
76. EIA - Electronic Industries Alliance; (See TIA).
77. EIMA - EIFS Industry Members Association; www.eima.com.
78. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
79. EOS/ESD Association; (Electrostatic Discharge Association); www.esda.org.
80. ESTA - Entertainment Services and Technology Association; (See PLASA).
81. ETL - Intertek (See Intertek); www.intertek.com.
82. EVO - Efficiency Valuation Organization; www.evo-world.org.
83. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
86. FM Approvals - FM Approvals LLC; www.fmglobal.com.
87. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
88. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; www.floridarooft.com.
89. FSA - Fluid Sealing Association; www.fluidsealing.com.
90. FSC - Forest Stewardship Council U.S.; www.fscus.org.
91. GA - Gypsum Association; www.gypsum.org.
92. GANA - Glass Association of North America; (See NGA).
93. GS - Green Seal; www.greenseal.org.
94. HI - Hydraulic Institute; www.pumps.org.
95. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
96. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
97. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
98. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
99. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
100. IAS - International Accreditation Service; www.iasonline.org.
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; www.iccsafe.org.
103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
104. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
106. IEC - International Electrotechnical Commission; www.iec.ch.
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
112. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
113. II - Infocomm International; (See AVIXA).
114. ILI - Indiana Limestone Institute of America, Inc.; www.ili.ai.
115. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.

116. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
117. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
118. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
119. ISO - International Organization for Standardization; www.iso.org.
120. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
121. ITU - International Telecommunication Union; www.itu.int/home.
122. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
123. LMA - Laminating Materials Association; (See CPA).
124. LPI - Lightning Protection Institute; www.lightning.org.
125. MBMA - Metal Building Manufacturers Association; www.mbma.com.
126. MCA - Metal Construction Association; www.metalconstruction.org.
127. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
128. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
129. MHIA - Material Handling Industry of America; www.mhia.org.
130. MIA - Marble Institute of America; (See NSI).
131. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
132. MPI - Master Painters Institute; www.paintinfo.com.
133. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
134. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
135. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
136. NADCA - National Air Duct Cleaners Association; www.nadca.com.
137. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
138. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
139. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
140. NBI - New Buildings Institute; www.newbuildings.org.
141. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
142. NCMA - National Concrete Masonry Association; www.ncma.org.
143. NEBB - National Environmental Balancing Bureau; www.nebb.org.
144. NECA - National Electrical Contractors Association; www.necanet.org.
145. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
146. NEMA - National Electrical Manufacturers Association; www.nema.org.
147. NETA - InterNational Electrical Testing Association; www.netaworld.org.
148. NFHS - National Federation of State High School Associations; www.nfhs.org.
149. NFPA - National Fire Protection Association; www.nfpa.org.
150. NFPA - NFPA International; (See NFPA).
151. NFRC - National Fenestration Rating Council; www.nfrc.org.
152. NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
153. NHLA - National Hardwood Lumber Association; www.nhla.com.
154. NLGA - National Lumber Grades Authority; www.nlga.org.
155. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
156. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
157. NRCA - National Roofing Contractors Association; www.nrca.net.
158. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
159. NSF - NSF International; www.nsf.org.

160. NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
161. NSPE - National Society of Professional Engineers; www.nspe.org.
162. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
163. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
164. NWFA - National Wood Flooring Association; www.nwfa.org.
165. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
166. PDI - Plumbing & Drainage Institute; www.pdionline.org.
167. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
168. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
169. RFCI - Resilient Floor Covering Institute; www.rfci.com.
170. RIS - Redwood Inspection Service; www.redwoodinspection.com.
171. SAE - SAE International; www.sae.org.
172. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
173. SDI - Steel Deck Institute; www.sdi.org.
174. SDI - Steel Door Institute; www.steeldoor.org.
175. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
176. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
177. SIA - Security Industry Association; www.siaonline.org.
178. SJI - Steel Joist Institute; www.steeljoist.org.
179. SMA - Screen Manufacturers Association; www.smainfo.org.
180. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
181. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
182. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
183. SPIB - Southern Pine Inspection Bureau; www.spib.org.
184. SPRI - Single Ply Roofing Industry; www.spri.org.
185. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
186. SSINA - Specialty Steel Industry of North America; www.ssina.com.
187. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
188. STI - Steel Tank Institute; www.steeltank.com.
189. SWI - Steel Window Institute; www.steelwindows.com.
190. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
191. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
192. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
193. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
194. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
195. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
196. TMS - The Masonry Society; www.masonrysociety.org.
197. TPI - Truss Plate Institute; www.tpinst.org.
198. TPI - Turfgrass Producers International; www.turfgrasssod.org.
199. TRI - Tile Roofing Institute; www.tilerroofing.org.
200. UL - Underwriters Laboratories Inc.; www.ul.com.
201. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
202. USAV - USA Volleyball; www.usavolleyball.org.
203. USGBC - U.S. Green Building Council; www.usgbc.org.

204. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
 205. WA - Wallcoverings Association; www.wallcoverings.org.
 206. WASTEC - Waste Equipment Technology Association; www.wastec.org.
 207. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 208. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 209. WDMA - Window & Door Manufacturers Association; www.wdma.com.
 210. WI - Woodwork Institute; www.wicnet.org.
 211. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
 212. WWPA - Western Wood Products Association; www.wwpa.org.
- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 3. ICC - International Code Council; www.iccsafe.org.
 4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; www.usace.army.mil.
 2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 4. DOD - Department of Defense; www.quicksearch.dla.mil.
 5. DOE - Department of Energy; www.energy.gov.
 6. EPA - Environmental Protection Agency; www.epa.gov.
 7. FAA - Federal Aviation Administration; www.faa.gov.
 8. FG - Federal Government Publications; www.gpo.gov/fdsys.
 9. GSA - General Services Administration; www.gsa.gov.
 10. HUD - Department of Housing and Urban Development; www.hud.gov.
 11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
 12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 13. SD - Department of State; www.state.gov.
 14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
 15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
 16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
 17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
 18. USP - U.S. Pharmacopeial Convention; www.usp.org.
 19. USPS - United States Postal Service; www.usps.com.
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and

regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestsERVICE.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. ~~Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:~~
 1. ~~Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.~~
 2. ~~Conference room of sufficient size to accommodate meetings. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.~~
 3. ~~Drinking water and private toilet.~~
 4. ~~Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).~~
 5. ~~Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.~~

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to as directed by authorities having jurisdiction.

- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower, and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead unless otherwise indicated.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install land-based telephone line(s) for each field office.
- J. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.
- K. Project Computer: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications.
 - 1. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
 - 2. Internet Service: Broadband modem, router, and ISP, equipped with hardware firewall.
 - 3. Backup: External hard drive, with automated backup software providing daily backups.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241.
 2. Utilize designated area within existing building for temporary field offices.
 3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use existing parking areas for construction personnel.
- D. Storage and Staging: Use Project site for storage and staging needs.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touch up signs so they are legible at all times.
- G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- L. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings..
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- G. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 3. Provide walk-off mats at each entrance through temporary partition.
- M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard and replace stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section,

provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

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

1.4 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.

1.5 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with

requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

- a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
 1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner's portion of the Work.
 - 6. Coordination of Owner-installed products.
 - 7. Progress cleaning.
 - 8. Starting and adjusting.
 - 9. Protection of installed construction.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 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.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in

- reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. 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.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, 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, gas service piping, and water-service piping; underground electrical services; and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. 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 and Owner 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 in accordance with requirements in Section 013100 "Project Management and Coordination."

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 and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- C. Building Lines and Levels: Locate and lay out control lines and levels for structures, 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.
- D. 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 and Construction Manager.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. 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.

3.5 INSTALLATION

- A. 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 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces, unless otherwise indicated on Drawings.
- 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 satisfactory results as judged by Architect. 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 of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

- 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. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering, and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel .
1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
 2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed products
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

3.8 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." and Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION AND REPAIR 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. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017326

EXISTING CONDITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The other Contract Documents complement this Section.
- B. Division 01 – General Requirements govern this Section.

1.02 SUMMARY

- A. Section provides for procedures used in conjunction with existing conditions and construction.
 - 1. The Contractor shall fully coordinate the provisions of this Section with applicable portions of Division 01.
 - 2. Hazardous Materials: To the best of the Owner's knowledge, the existing facility does not contain asbestos or lead-based coatings. If such materials or other hazardous materials are encountered, cease operations which may disturb them, and contact the Owner for instructions.
- B. The Contractor shall endeavor to ascertain all available information regarding the existing conditions of the facility and site prior to commencement of any work.
 - 1. Install temporary barriers, enclosures, or other protection to adequately protect existing work to remain from damage by demolition or new building work in close proximity.
- C. It is the Contractor's responsibility to fully understand the effect of proposed demolition and construction on the existing facilities, and to investigate all aspects of the facility and site, exposed and concealed, which may be involved.
 - 1. Locate and identify all exits from the existing building.
 - 2. At no time shall any work of this project reduce, block, re-configure, modify, or otherwise compromise any exits from building, or impair routes for egress away from building, unless approved alternatives are approved.
- D. If, in the course of investigating, conditions are encountered which vary from Contract Documents or are unusual in nature and not reasonably expected or able to be inferred or observed while preparing bids, and which have a significant effect on construction, notify Architect in writing of such discovery prior to proceeding.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Investigate existing site conditions, equipment, ductwork, conduit, piping, and other utilities, above and below grade, which may affect or be affected by demolition and/or new construction.
 - 1. Where any work listed above is encountered, stop work, and notify Architect immediately.
 - 2. Do not proceed with work of this Contract until formally notified by Architect that discovered conditions have been resolved.
 - 3. Work to cap-off, remove, or re-route existing utilities, as necessary to facilitate new construction, shall be performed by others as directed by the Architect and Owner.
- B. Investigate existing building elements and other construction in the areas of demolition and new work. Carefully investigate existing construction to ascertain structural systems and to determine potential effects of demolition and new work on existing structural elements.
 - 1. Determine internal construction of walls, floors, ceilings, roofs, etc. Carefully cut holes, remove outer construction, and take other measures to determine construction and materials not otherwise observable.
 - 2. Provide shoring and bracing of walls, roofs, floors, and other building elements which may become destabilized during demolition.
- C. Investigate existing building systems equipment, ductwork, conduit, piping, and other utilities which may affect or be affected by demolition and/or new work.
 - 1. Immediately notify Architect or Owner where conflicts and interferences with proposed work exist.
 - 2. Do not proceed with new work until notified that existing conditions have been resolved.
 - 3. Work to cap off, remove, or re-route existing utilities, as necessary to facilitate new construction, shall be performed by others under other contracts or as otherwise directed by the Architect or Owner.

END OF SECTION

SECTION 017329

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The other Contract Documents complement this Section.
- B. Division 01 – General Requirements govern this Section.

1.02 SUMMARY OF WORK

- A. This Section specifies cutting and patching of existing and previously installed construction.
- B. Related work specified elsewhere:
 - 1. Section 024113 - Selective Demolition is specified in Division 02.

1.03 DEFINITIONS

- A. Cutting and Patching: The process of selective cutting and removal of limited areas of existing or new building materials to facilitate installation of new work, to uncover or remove existing elements (including patching openings left after removal of existing utility lines, equipment, etc.), or to achieve indicated design configurations, and the subsequent restoration of remaining adjacent construction to remain and as required to accommodate new work.

1.04 QUALITY ASSURANCE

- A. Minimize the number of openings cut through existing work. Carefully lay out work, and coordinate with other trades to combine openings as far as feasible.
- B. Work to restore cut areas shall be performed only by trade workers experienced in installation of work similar to that to be patched.
- C. Fire resistance Ratings: Where penetrations are to be cut or patched in fire resistance rated construction, perform work in a manner to maintain existing rating. Patch openings or seal penetrations using materials and methods as required to achieve an assembly listed by Underwriters Laboratories (UL) for required hourly rating.

1.05 COORDINATION

- A. Coordinate cutting, fitting, and patching operations, including consequential excavation, backfill, and finishing required to complete work, with all affected trades, as required in Division 01.
- B. Coordinate cutting and patching work with Owner, when necessary, to minimize disruption of Owner's operations.

1.06 HAZARDOUS MATERIALS

- A. To the best of the Owner's knowledge, the existing facility does not contain asbestos or lead-based coatings. If such materials or other hazardous materials are encountered, cease operations which may disturb them, and contact the Owner for instructions.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION

3.01 GENERAL

- A. Perform cutting and patching as required for new work, whether or not specifically indicated on Drawings. Perform cutting and patching if required to expose, repair, or remove previously installed defective work.

3.02 PRECAUTIONS

- A. Before cutting existing surfaces, examine surfaces and conditions under which cutting and patching is to be performed. Take precautionary action before proceeding if unsafe or unsatisfactory conditions are observed or encountered.
- B. Provide temporary support of work to be cut, if necessary. For conditions posing potential hazards of collapse or damage, employ a professional engineer to design shoring or bracing.
 - 1. Compensation for design services will be paid by Owner and deducted from the Contract Sum.
 - 2. Architect will not design such shoring or bracing, unless directed by Owner.
- C. Avoid cutting existing pipe, conduit, or utilities until it is verified that they have been shut off, if to be abandoned, or bypassed, if to remain active.
- D. Do not cut or alter structural components.
- E. Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance or decreased operational life or safety.
 - 1. Prior to proceeding, notify Owner of any proposed cutting and patching related to operational equipment or safety related systems.
- F. Protection: Fully protect adjacent surfaces and equipment from damage due to cutting and patching operations.
- G. Ensure temporary watertight and airtight enclosures (provided by Owner's separate contractor) for openings made in exterior walls or roof and for openings made in interior walls which expose clean process areas to less clean areas.
- H. If hazardous or toxic materials are encountered during cutting operations, cease work in the affected area and notify Owner immediately. Do not cut, alter, remove, or otherwise disturb such materials without Owner's written permission.

3.03 CUTTING

- A. Areas of work to be cut and removed shall be held to the minimum required to install the new work, and shall be combined as much as possible to minimize the number of disrupted areas.
- B. Cutting: Select cutting methods which will cause least damage to existing materials and surfaces to remain.
- C. Generally, use hand and small power tools designed for sawing and grinding, rather than tools designed for hammering and chopping.
 - 1. Cut openings neatly to sizes required, with minimum disturbance of adjacent surfaces, and in a manner to facilitate patching.
- D. Cut or drill from exposed finish side into concealed spaces, to minimize disturbance to finished surfaces.
- E. In masonry and tile surfaces, cut or chisel openings at mortar or grout joints and remove whole units where possible, unless otherwise indicated.

3.04 PATCHING

- A. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that shows no evidence of patching and refinishing.
- B. Unless otherwise indicated, patch all walls, floors, roofs, and other elements where existing piping, conduit, and the like are removed.
 - 1. Where 4-inch and larger pipe and conduit penetrations through masonry walls are removed, remove and replace all disturbed masonry units and finish exposed surfaces to match adjacent surfaces.
 - 2. Where smaller than 4-inch pipe and conduit penetrations through masonry walls are removed, fill holes solid with mortar and finish to match adjacent surfaces on each side of wall.
- C. Patch surfaces with materials identical to those of adjacent surfaces. If identical materials are not available, use like materials to match as closely as possible
- D. When patching smooth finished surfaces, re-finish entire unbroken surface to nearest corner or other continuous break in plane.
- E. When patching masonry or tile surfaces, use materials of like size, color, surface texture, coursing, joint pattern, and other physical and visual characteristics.

END OF SECTION

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Recycling nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and] construction waste.

1.2 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for commencement of the Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons (tonnes).
 - 4. Quantity of waste recycled, both estimated and actual in tons (tonnes).

5. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
 6. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
 - C. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
 - D. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
 - E. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements.
- B. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Facilitate recycling and salvage of materials.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner .
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch (38-mm) size.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Pulverize masonry to maximum 1-1/2-inch (38-mm) size.
 - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

- J. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- K. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- L. Carpet Tile: Remove debris, trash, and adhesive.
 - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- M. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- N. Conduit: Reduce conduit to straight lengths and store by material and size.
- O. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.4 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces, and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
- D. Paint: Seal containers and store by type.

3.5 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Village of Ossining. Label with manufacturer's name and model number.
 5. Submit testing, adjusting, and balancing records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. 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.

1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 LIST OF INCOMPLETE ITEMS

- A. Organization 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, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, 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.
 4. Submit list of incomplete items in the following format:
 - a. PDF Electronic File: Architect, will return annotated file.

1.7 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- 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 or email to Architect.
- D. Warranties in Paper Form:
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.

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.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Perform 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 designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. 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.

- c. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- d. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
- e. Vacuum and mop concrete.
- f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- h. Remove labels that are not permanent.
- i. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - 1) Clean ducts, blowers, and coils Clean HVAC system in compliance with NADCA ACR.
- l. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- m. Clean strainers.
- n. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Architect or by email to Architect. Enable reviewer comments on draft submittals.
 - 2. Submit three paper copies. Architect will return two copies.
- C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- 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.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - 2. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Authority.

9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.5 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.

3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor have delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
 1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
 1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.

- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds, as described below.
- C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- H. Drawings: Prepare drawings supplementing manufacturers printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1.8 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.
 - 3. Record Product Data.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one set of file prints.
 - 3) Submit Record Digital Data Files and one set of plots.
 - 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit two paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned Record Prints and two set(s) of file prints.
 - 3) Print each drawing, whether, or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.3 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 1. Preparation: 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 provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file .
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect .
 - e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications 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. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file

1.5 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 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 Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 2. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.

- d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.
 - 1. Submit video recordings on thumb drive .
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
- E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 024113

SELECTIVE SITE DEMOLITION AND REMOVALS

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. Provide all equipment and do all work necessary to demolish and/or remove the structures indicated and prepare the site as indicated on the Drawings.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 311000, SITE CLEARING; Clearing and grubbing, stripping and stockpiling topsoil and tree removal.
 - 2. Section 312300, EARTHWORK; Excavation and backfill.

1.4 SUBMITTALS

- A. The following shall be submitted:
 - 1. Certificates of severance of utility services.
 - 2. Demolition procedures and operational sequence for review and acceptance by Engineer.
 - 3. Location plan of staging areas and schedule for moving staging equipment into those areas shall be submitted for Engineer's approval prior to mobilization and related site preparation operations.
 - 4. A list of all site operations and programs to be accommodated during construction period.
- B. Predemolition photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by building demolition operations. Submit before the Work begins.

1.5 QUALITY ASSURANCE

- A. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01, GENERAL REQUIREMENTS. Review methods and procedures related to selective demolition including, but not limited to, the following:

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

1.6 PROTECTION

- A. Do not interfere with the use of adjacent buildings. Maintain free and safe passage to and from.
- B. Prevent movement or settlement of adjacent structures. Provide and place bracing or shoring and be responsible for safety and support of structures. Assume liability for such movement, settlement, damage, or injury.
- C. Cease operations and notify Engineer immediately if safety of adjacent structures appears to be endangered. Take precautions to properly support structures. Do not resume operations until safety is restored.
- D. Prevent movement, settlement or collapse of adjacent services, sidewalks, driveways and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the Owner.
- E. Provide, erect, and maintain street boardings, sidewalk shed, barricades, lighting, and guardrails as required to protect general public, workers, and adjoining property.

1.7 EXISTING CONDITIONS

- A. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Disconnect and stub off. Notify the affected utility company in advance and obtain approval before starting this work.
- B. Place markers to indicate the location of disconnected services. Identify service lines and capping locations on Project Record Documents.
- C. The Owner agrees to remove all asbestos from structures to be demolished. Before Construction Documents are issued to the Contractor for construction, the Owner will certify to the Engineer and Contractor that the site is free of asbestos. If asbestos is found on the site and recognized as such, all work will cease without penalty to the Contractor or Engineer so that the Owner can take appropriate steps for its removal.

1.8 MAINTAINING TRAFFIC

- A. Do not close or obstruct roadways without permits.

- B. Conduct operations with minimum interference to public or private roadways.

1.9 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 SALVAGING

- A. Materials indicated on the Drawings or designated in the field by the Owner to be salvaged shall be carefully removed and delivered to a location on site to be determined by the Owner.
- B. Mechanical and electrical items to be salvaged shall be protected from the weather.
- C. Storage requirements during construction: storage site/location to be determined and reviewed by Engineer and Owner.

PART 3 EXECUTION

3.1 DEMOLITION

- A. Structures indicated to be removed shall be completely removed including foundations, except when approved by the Engineer, to a minimum of 4 ft. below finished grade for graded areas.
 - 1. Structures not indicated on the Drawings for removal but conflict with proposed site improvements shall be reviewed with Engineer prior to the start of any removal operations.
- B. Areas formerly occupied by structures shall be regraded to conform with surrounding topography following demolition.
- C. Remove from site, contaminated, vermin infested, or dangerous materials encountered and disposed of by safe means.

- D. Backfill areas excavated as a result of demolition. Use backfill material specified in Section 312300, EARTHWORK.
- E. Rough grade areas affected by demolition and leave areas level, maintaining grades and contours of site.
- F. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.2 ABANDONED PIPES - DRAINS AND SEWERS

- A. City will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Drain and sewer pipes indicated to be abandoned shall be completely filled with an 8 in. thick mortar jointed masonry bulkhead. If a pipe indicated to be abandoned and plugged appears to be in active service, it shall not be plugged, and the Engineer shall be notified.
- C. Other utility pipes shall be cut and capped outside the excavation and abandoned piping removed from the site.
- D. Frames, grates, covers, traps, and other castings shall be salvaged.

3.3 REMOVALS

- A. Materials indicated on the Drawings or designated by the Engineer in the field to be removed shall be dismantled, removed, and legally disposed of off-site or stockpiled as indicated on the Drawings.
- B. Areas formerly occupied by structures shall be regraded to conform with surrounding topography following demolition.

3.4 SALVAGEABLE MATERIALS

- A. Materials indicated on the Drawings or designated by the Engineer in the field to be salvaged shall be carefully removed, protected from damage, and put in temporary storage as follows:

- 1. Salvaged material shall be stockpiled on-site in an area designated by the Owner.

3.5 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. Existing items indicated on the Drawings to be protected shall be suitably and completely protected from damage throughout construction period.

3.6 PAVEMENT AND CURB REMOVAL

- A. Where pavement and/or curb to be removed abuts pavement and curb to remain, a neat, straight saw cut shall be made with a concrete power saw.

- 1. Pavement and/or curb removal shall include removal of subbase as required to accommodate proposed construction materials.

3.7 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 PROTECTION OF PROPERTY TO REMAIN

- A. The Contractor's attention is directed to Section 312300, EARTHWORK for protection of utilities to remain, and for the protection of existing trees, fences, etc.

3.9 DISPOSAL OF MATERIALS

- A. Surplus construction and demolition material shall be handled in accordance with the Contract Documents.
- B. Material resulting from demolition and not scheduled for salvaging shall become the property of the Contractor and shall be suitably disposed of off-site. Disposal shall be performed as promptly as possible and not left until the final clean up.
- C. Debris, rubbish, and other materials shall be removed and disposed of on a daily basis.

END OF SECTION

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

- B. Related Requirements:

1. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

- A. Pre demolition Conference: Conduct conference at Project site
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, , for dust control and, for noise control]. Indicate proposed locations and construction of barriers.
- C. Schedule of selective demolition activities with starting and ending dates for each activity. Pre demolition photographs or video. Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations submit before Work begins.
- D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician

1.7 CLOSEOUT SUBMITTALS

- A. Inventory of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.

2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.
- G. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped / protected before starting selective demolition operations.
- B. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- C. Inventory and record the condition of items to be removed and salvaged.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on the Architectural and MEP Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 3. Cover and protect equipment that not been removed
 - 4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

- C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 4. Maintain fire watch during and for at least 1 hour after flame-cutting operations.
 - 5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 6. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 - 1. Store items in a secure area until delivery to Owner.
 - 2. Transport items to Owner's storage area designated by Owner. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

3.6 CLEANING

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033001

CAST-IN-PLACE CONCRETE - SITEWORK

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. Provide all equipment and materials, and do all work necessary to construct the cast-in-place concrete for sitework, including but not limited to: concrete curbs, formwork, reinforcing, and concrete for slabs, pads, bases, footings, foundations and thrust blocks, complete, as indicated on the Drawings and as specified.

1.3 RELATED WORK

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

- 1. American Concrete Institute (ACI):

- 325.9R Guide for Construction of Concrete Pavements and Concrete Bases

- 2. American Plywood Association (APA):

- Ref. 1 APA Design/Construction Guide, Residential and Commercial

- 3. American Society for Testing and Materials (ASTM):

- A 36 Structural Steel

A 123	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
A 185	Welded Steel Wire Fabric for Concrete Reinforcement
A 307	Carbon Steel Externally Threaded Standard Fasteners
A 386	Zinc Coating (Hot-Dip) on Assembled Steel Products
A510	General Requirements for Wire Rods and Course Round Wire, Carbon Steel
A 569	Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C 33	Concrete Aggregates
C 94	Ready-Mixed Concrete
C 143	Slump of Portland Cement Concrete
C 150	Portland Cement
C 171	Sheet Materials for Curing Concrete
C 494	Chemical Admixtures for Concrete
D 1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

4. New York State Department of Transportation (NYSDOT):

Specifications	Standard Specifications - Construction and Materials

1.4 SUBMITTALS

- A. Shop drawings of reinforcing steel shall be submitted. Drawings shall indicate bar sizes, locations, spacings, quantity required, bending and cutting schedules, and supporting and spacing devices.
- B. Samples of the following shall be submitted:

<u>Item</u>	<u>Sample Size</u>
Preformed joint filler	Two pieces, full depth and width, 12 in. length
Form	12 in. x 12 in.
Form ties	1 each, complete

- C. Submit manufacturer's product data for forms and accessories.

- D. Submit concrete design mix for Engineer's approval.
- E. Prior to start of concrete work, Contractor shall submit to the Engineer for review a schedule for execution of the work of this section and a shop drawing location plan indicating sequence of concrete placement and location of proposed control joints, construction joints, and expansion joints if required.

1.5 DESIGN OF CONCRETE MIX

- A. Mix design shall be certified by independent testing laboratory. Statement of materials constituting design of mixes (as required by referenced standards) shall be submitted for Engineer's approval within one week following award of Contract.
- B. Concrete mix design shall include the following information:
 - 1. Proportions of cement, fine and coarse aggregates, and water.
 - 2. Water-cement ratio, design strength, slump, and air content.
 - 3. Type of cement and aggregates.
 - 4. Type and dosage of all admixtures.
 - 5. Special requirements for pumping.
 - 6. Range of ambient temperature and humidity for which the design is valid.
 - 7. Any special characteristics of the mix which require precautions in the mixing, placing, finishing, or curing methods to achieve the finished product specified.
- C. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.

1.6 QUALITY ASSURANCE

- A. Unless otherwise specified, cast-in-place concrete work shall conform to ACI 301. Construction of concrete walks and subbases shall conform to ACI 325.9R
- B. Dimensions, locations, and details of equipment pads, anchors, supports, and similar features indicated on the Drawings are approximate. Manufacturer's approved shop drawings of equipment to be supported, anchored, or contained thereby shall be consulted for exact location, size, and details.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- D. Preinstallation Conference: Conduct conference at Project site.

1.7 QUALITY CONTROL

- A. Unless otherwise specified herein, or indicated on the Drawings, concrete formwork construction and materials shall conform to ACI 301, 318, and 347, and the following:

1. Variation from plumb
 - a. In lines and surfaces of
arrises: In any 10 ft. of length 1/4 in.
Maximum for the entire length 1 in.
 - b. For exposed conspicuous lines:
In any 20 ft. length 1/4 in.
Maximum for the entire length 1/2 in.
 2. Variation in sizes and location of sleeves, wall openings: 1/4 in. (+, -)
 3. Variation in cross sectional dimensions of beams and in thickness of slabs:

Minus	1/4 in.
Plus	1/2 in.
 4. Variation in location of anchor bolts unless provided with sleeves or other means of adjustment: 1/4 in.
- B. Maximum deflection of form facing materials at concrete surfaces exposed to view shall be 1/240 of span between structural members.
- C. Reinforcing steel shall be fabricated to conform to the required shapes, dimensions, and tolerances specified in CRSI Manual.
- D. Allowable Tolerances:
1. Fabricating:
 - a. Sheared length: Plus or minus 1 in.
 - b. Stirrups and ties: Plus or minus 1/2 in.
 - c. Members more than 8 in., but not over 2 ft. - 0 in. deep: Plus or minus 1/2 in.
 - d. Members more than 2 ft. - 0 in. deep: Plus or minus 1 in.
 - e. Crosswise of members: Space evenly within 2 in. of stated separation
 - f. Lengthwise of members: Plus or minus 2 in.
 2. Maximum bar relocation to avoid interference with other reinforcing steel, conduits, or other embedded item: 1 bar diameter.
- 1.8 TESTING
- A. Inspection and testing shall be conducted and paid for in accordance with the Contract Documents.
 - B. Inspection and testing of the concrete mix will be performed by an independent testing laboratory approved by the Engineer. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel.
 - C. Concrete materials and operations will be tested and inspected as work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Engineer to final acceptance.

- D. The following testing services shall be provided by the Owner, at no cost to the Contractor:
1. Review and test of the Contractor's proposed materials for compliance with the specifications.
 2. Review of the Contractor's proposed mix design.
 3. Sampling and testing of materials at plants or stockpiles during the course of the work for compliance with the specifications.
 4. Strength tests of concrete specimens.
 5. Inspection of concrete batching, mixing, and delivery.
- E. The following testing services shall be provided, at the Contractor's expenses:
1. Additional testing and inspection required because of changes in materials or proportions, requested by the Contractor.
 2. Additional testing of materials or concrete occasioned by their failure by testing or inspection to meet specification requirements.
- F. At least four standard compression test cylinders shall be made and tested from each day's placement of concrete. Four concrete test cylinders will be taken for every 50 cubic yards of each type and design strength of concrete placed. Two cylinders shall be tested at seven days, and two at 28 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.
- G. One slump test will be taken for each set of test cylinders taken.
- H. Submit to the Owner, for forwarding to the testing laboratory, proposed concrete mix design for review, before beginning work.
- I. Provide free access to work and full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed for testing agency to take samples for required tests. Notify testing agency and Engineer of intent to place concrete at least 24 hours before placement.

PART 2 PRODUCTS

2.1 FORMS

- A. Recycled Content: Minimum 25 percent post-consumer recycled content, plus one-half pre-consumer recycled content.
- B. Forms for Unexposed Finish: Plywood, lumber or metal, with lumber dressed on at least two edges and one side.
- C. Form Ties: Provide prefabricated, adjustable length galvanized steel snap-off ties, with brackets, cones, cornerlocks and other accessories as necessary.
- D. Form Coatings: Commercial formulation compounds that will not bond with, stain or adversely affect concrete.

- E. Forms shall be true to line and free from warp, and shall be of sufficient strength, when staked, to resist the pressure of the concrete without springing. Formwork shall be designed so that sections may be fastened together to prevent vertical or horizontal movement of ends.
- F. Concrete Column Forms: Sonotube Concrete Forms, manufactured by Sonoco, 1 North Second Street, Hartsville, South Carolina 29550. Toll Free (888) 875-8754. Website www.sonotube.com. E-mail terry.mckee@sonoco.com.
 - 1. Description: Multiple layers of 100 percent recycled paperboard, spirally wound, and laminated with adhesive.
 - 2. Interior Surface: Smooth with spiral seam. Moisture barrier plastic coating.
 - 3. Exterior Surface:
 - a. Sonotube RainGuard – 100 percent recycled paper,
 - b. Sonotube Commercial - Moisture Barrier outer label.
 - 4. Forms will impart visible spiral mark on concrete columns.
 - 5. 1-piece, 1-time-use forms.
 - 6. Recyclable.
 - 7. Inside Diameter: As indicated on the Drawings.

2.2 AGGREGATE BASE

- A. Material for aggregate base course shall be a graded, granular, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.
 - 1. Material shall conform to NYSDOT Specifications Section 304, Type 2.

2.3 CONCRETE

- A. Concrete shall be air-entrained type, conforming to ASTM C 94.
- B. Unless otherwise indicated on the Drawings, minimum 28 day compressive strength shall be 4,000 psi.
- C. Concrete slump shall be no less than 2 in. nor greater than 5 in., determined in accordance with ASTM C 143.
- D. Cement shall be Portland cement, conforming to ASTM C 150, Type I or II.
- E. Aggregates shall conform to ASTM C 33.
- F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M Type B.
 - 3. Air-Entraining Admixture: ASTM C 260.

- G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without the specific written permission of the Engineer in each case.

2.4 CONCRETE REINFORCING

- A. Recycled Content: Minimum 25 percent post-consumer recycled content, plus one-half pre-consumer recycled content.
- B. Steel reinforcing bars shall conform to ASTM A 615.
 - 1. Bars employed as reinforcement shall be deformed type.
 - 2. Bars employed as dowels shall be hot-rolled plain rounds.
 - 3. Unless otherwise indicated on the Drawings, reinforcing bars shall be Grade 60.
- C. Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A 185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.5 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.6 CURING MATERIALS

- A. Curing shall be by moist curing or by use of curing compound.
- B. Curing paper shall be a nonstaining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.
- C. Curing compound shall be a wax or resin-base, clear or white pigmented compound conforming to ASTM C 309, Type 1, Class B, dissipating.

2.7 EXPANSION JOINTS

- A. Expansion joints shall be located as indicated on the submitted shop drawing location plan.
- B. Where indicated, expansion joints shall be 1/2 in. wide. Expansion joint filler shall be preformed, nonbituminous type joint filler conforming to ASTM D 1752, Type II, similar to Sealtight Cork Expansion Joint Filler, manufactured by W.R. Meadows, Inc., or approved equal.
 - 1. Premolded filler shall be one piece for the full depth and width of the joint.

2. Use of multiple pieces of lesser dimensions to make up required depth and width of joint will not be permitted.
 3. Except as otherwise noted on the Drawings, joint filler shall be 1/2 in. thick.
- C. Where indicated, concrete slab-on-grade shall be doweled at each expansion joint. One end of the dowel shall be greased.
- 2.8 CONTROL JOINTS
- A. Control joints indicated on the submitted shop drawing location plan to be sawn shall be made by saw cutting concrete slab after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab. Saw blade shall cut into slab at least 1 in., but in no case less than 25% of slab depth.
- 2.9 CONCRETE MIXTURES
- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- 2.10 CONCRETE MIXING
- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- 2.11 BOLTS
- A. Anchor bolts shall conform to ASTM A 307.

PART 3 EXECUTION

3.1 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.2 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:
1. NYSDOT Specifications Section 304.
- B. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

- C. Aggregate shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density.
 - 1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
 - 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 - 3. Surface irregularities which exceed 1/2 in. as measured by means of a 10 ft. long straightedge, shall be replaced and properly recompact.
- D. Base course shall be compacted at optimum moisture content to not less than 95% of maximum density as determined by ASTM D 1557.
- E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise injured, shall be cleaned, replaced, or otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.3 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.4 REINFORCING

- A. Before being placed in position, reinforcing shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.
- B. Any bar showing cracks after bending shall be discarded.
- C. Unless otherwise indicated on the Drawings, reinforcing shall extend within 2 in. of formwork and expansion joints. Reinforcing shall continue through control joints. Adjacent sheets of fabric reinforcing shall lap 6 in.
- D. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel and anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Engineer.

3.5 FORMWORK

- A. Formwork shall be so constructed, braced, and tied that the formed surfaces of the

concrete will be perfectly true, smooth, and to the dimensions shown on the Drawings, within the tolerances for formed surfaces as specified in ACI 301.

- B. Forms shall be sufficiently tight to prevent leakage of mortar, and where necessary shall have temporary openings as required for thorough cleaning and as required for the introduction of concrete to avoid excessive free fall.

3.6 PLACING CONCRETE

- A. Before placing concrete, forms and space to be occupied by concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint, and other material which might tend to reduce bond.
- B. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall be thoroughly damp when concrete is placed. There shall be no free water on surface.
- C. Concrete which has set or partially set before placing shall not be employed. Retempering of concrete will not be permitted.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 2. If concrete can not be mechanically consolidated, concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.
- E. Cold-Weather Placement: Comply with ACI 306.1.
- F. Hot-Weather Placement: Comply with ACI 301.
- G. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.7 FINISHING BELOW GRADE SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
 - 1. Concrete slabs and pads shall be screeded off and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.
 - 2. Finished concrete surface for subbases shall be wood-floated to a slightly rough surface. Surface shall not deviate more than 1/4 in. in 10 ft.

- B. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.8 PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot- weather protection during curing.
- B. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.
- C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3.9 EXPANSION JOINTS

- A. Expansion joints shall be 1/2 in. wide and shall be as located on the submitted shop drawing location plan. Expansion joint shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab. Joint filler shall extend the full length of the expansion joint.
 - 1. Joint filler shall extend above concrete slab. Depth of filler shall be as required to form a 1-1/4 in. deep sealant and backer rod recess below finished grade of paved surface.
 - 2. Depth of joint filler shall be as required to form a 1-1/4 in. deep sealant and backer rod recess below finished concrete surface.
- B. Expansion joints of slab-on-grade shall be doweled. Dowel shall be centered over the joint prior to concrete placement. The end of the dowel at the side of joint which will be poured second shall be greased immediately before concrete placement.

3.10 CONTROL JOINTS

- A. Control joints indicated on the submitted shop drawing location plan shall be sawn by using a diamond blade concrete power saw. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab. Saw shall cut into slab at least 1 in., but in no case less than 25% of slab depth.

3.11 CONTROL JOINTS/CONTRACTION JOINTS

- A. General: Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab, but before slab has achieved its final set. Saw cut joints shall be straight and accurate to line.
- B. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least 1 in., but in no case less than one-fourth of the concrete thickness, as follows[to match jointing of existing adjacent concrete pavement]:
 - 1. Saw cut joints shall be sawn flush to vertical surfaces.
 - 2. Unless otherwise indicated on the Drawings, control joints in pedestrian pavements shall be located 10 ft. o.c. maximum.
 - 3. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - 4. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

END OF SECTION

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- C. Samples for Verification: For each type and color of exposed masonry unit and colored mortar.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include data on material properties.
- B. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within **20 feet (6 m)** vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **2800 psi (19.3 MPa)**.
 - 2. Density Classification: Normal weight.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.

- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- F. Aggregate for Mortar: ASTM C144.
 - 1. For joints less than **1/4 inch (6 mm)** thick, use aggregate graded with 100 percent passing the **No. 16 (1.18-mm)** sieve.
 - 2. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C404.
- H. Water: Potable.

2.4 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, **Grade 60 (Grade 420)**.
- B. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Wire Size for Side Rods: **0.187-inch (4.76-mm)** diameter.
 - 3. Wire Size for Cross Rods: **0.187-inch (4.76-mm)** diameter.
 - 4. Wire Size for Veneer Ties: **0.187-inch (4.76-mm)** diameter.
 - 5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than **16 inches (407 mm)** o.c.
 - 6. Provide in lengths of not less than **10 feet (3 m)**.
- C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.
- D. Masonry-Joint Reinforcement for Multiwythe Masonry:
 - 1. Ladder type with one side rod at each face shell of hollow masonry units more than **4 inches (100 mm)** wide, plus two side rods at each wythe of masonry **4 inches (100 mm)** wide or less.
 - 2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least **5/8-inch (16-mm)** cover on outside face.
 - 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of **1/16 inch (1.5 mm)** and maximum vertical adjustment of **1-1/4 inches (32 mm)**. Size ties to extend at least halfway through facing wythe but with at least **5/8-inch (16-mm)** cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

- E. Masonry-Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single **0.187-inch- (4.76-mm-)** diameter, hot-dip galvanized carbon steel continuous wire.

2.5 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least **1-1/2 inches (38 mm)** into veneer but with at least a **5/8-inch (16-mm)** cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than **4 inches (100 mm)** wide.
1. Wire: Fabricate from **3/16-inch- (4.76-mm-)** diameter, hot-dip galvanized-steel wire.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped **1/4-inch- (6.35-mm-)** diameter, hot-dip galvanized-steel wire.
 2. Tie Section: Triangular-shaped wire tie made from **0.25-inch- (6.35-mm-)** diameter, hot-dip galvanized-steel wire.
- E. Partition Top Anchors: **0.105-inch- (2.66-mm-)** thick metal plate with a **3/8-inch- (9.5-mm-)** diameter metal rod **6 inches (152 mm)** long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- F. Rigid Anchors: Fabricate from steel bars **1-1/2 inches (38 mm)** wide by **1/4 inch (6.35 mm)** thick by **24 inches (610 mm)** long, with ends turned up **2 inches (51 mm)** or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from urethane or PVC.

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.7 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 - 3. For reinforced masonry, use portland cement-lime or masonry cement mortar.
 - 4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type S.
 - 3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 4. For interior nonload-bearing partitions, Type O may be used instead of Type N.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Fill cores in hollow CMUs with grout **24 inches (600 mm)** under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for **2.67 sq. ft. (0.25 sq. m)** of wall area spaced not to exceed **24 inches (610 mm)** o.c. horizontally and **16 inches (406 mm)** o.c. vertically. Stagger ties in alternate courses. Provide additional ties within **12 inches (305 mm)** of openings and space not more than **36 inches (914 mm)** apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than **24 inches (610 mm)** o.c. vertically.
 - 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
- B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

- C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
- D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide individual metal ties not more than 16 inches (406 mm) o.c.
 - 2. Provide continuity with masonry-joint reinforcement by using prefabricated T-shaped units.
 - 3. Provide rigid metal anchors not more than 48 inches (1220 mm) o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.9 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 3. Protect adjacent surfaces from contact with cleaner.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.10 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 057300 - METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel railings for existing egress stairs.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's product lines of metal railings assembled from standard components.
 - 2. Handrail brackets.
 - 3. Shop primer.
 - 4. Metal finishes.
- B. Shop Drawings: Include plans, elevations, sections, and attachment details.
- C. Samples: For each type of exposed finish required.
- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.
- C. Preconstruction test reports.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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

1. Handrails and Top Rails of Guards:

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

2. Infill of Guards:

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

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.3 STEEL RAILINGS

- A. Tubing: ASTM A500/A500M (cold formed).
- B. Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

A. Fastener Materials:

1. Ungalvanized-Steel Railing Components: Plated-steel fasteners complying with ASTM F1941/F1941M, Class Fe/Zn 5 for electrodeposited zinc coating where concealed; Type 304 stainless steel fasteners where exposed.
2. Dissimilar Metal Railing Components: Type 304 stainless steel fasteners.

- B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

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

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Cast-iron center of handrail **2-1/4 inches** from wall.
- B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Intermediate Coats and Topcoats: Provide products that comply with Section 099123 "Interior Painting."

2.6 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Connections: Fabricate railings with welded connections unless otherwise indicated.
- C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- D. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.
- E. Form changes in direction as follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
- F. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- G. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- H. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is **1/4 inch (6 mm)** or less.
- I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.

2.7 STEEL FINISHES

- A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 7/NACE No. 4.
- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 5. Set posts plumb within a tolerance of **1/16 inch in 3 feet (2 mm in 1 m)**.
 - 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed **1/4 inch in 12 feet (6 mm in 3 m)**.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

3.2 ATTACHING RAILINGS

- A. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with **1-1/2-inch (38-mm)** clearance from inside face of handrail and finished wall surface.
- B. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.
6. For steel-framed partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

C. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.3 CLEANING

- A. Clean railing components by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

END OF SECTION 057300

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood blocking and nailers.
 - 2. Utility shelving.
 - 3. Plywood backing panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Power-driven fasteners.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841. Retain option in first paragraph below if required for plywood backing panels.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

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

1. Blocking.
 2. Utility shelving.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Utility Shelving: Lumber with 19 percent maximum moisture content of eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWP.
- D. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:
1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
 2. Eastern softwoods, No. 2 Common grade; NELMA.
 3. Northern species, No. 2 Common grade; NLGA.
 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWP.

2.5 PLYWOOD BACKING PANELS

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

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Screws for Fastening to Metal Framing: ASTM C954, length as recommended by screw manufacturer for material being fastened.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.

3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Mineral-wool blanket insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Mineral-wool blanket insulation.

1.3 INFORMATIONAL SUBMITTALS

- A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
 - 1. Sign, date, and post the certification in a conspicuous location on Project site.
- B. Product test reports.

PART 2 - PRODUCTS

2.1 MINERAL-WOOL BLANKET INSULATION

- A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.
 - 1. List of manufacturers:
 - a. ROCKWOOL Safe'n' Sound R-Wall Unfaced Stone Wool Batt Insulation
 - b. Johns Manville SAFB Unfaced Mineral Wool Insulation Batts
 - c. Rockwool RXCB351525 Unfaced Insulation Batt
 - 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 - 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.
- B. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.

- C. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.
- D. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements: As indicated on drawings

END OF SECTION 072100

SECTION 078100 - APPLIED FIRE PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sprayed fire-resistive materials.

B. Related Requirements:

1. Section 078400 "Firestopping" for mastic and intumescent fire-resistive coatings.

1.2 DEFINITIONS

- A. SFRM: Sprayed fire-resistive materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Sprayed fire-resistive material.

1.5 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Evaluation reports.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Equipment: Use mixing and application equipment recommended by the fireproofing manufacturer

- C. Certifications: Furnish the following for the fireproofing:
1. UL fire resistance rating certificate.
 2. UL fire hazard classification certificate.
 3. Affidavit by fireproofing manufacturer (or confirming independent test reports) certifying that fireproofing meets the performance requirements and physical properties.
- D. Field Tests and Inspections: The Owner may engage an independent testing agency to sample and test completed work for density and thickness in compliance with ASTM E605 and ASTM E736.
- E. Field Examples:
1. Apply 100 sq ft of fireproofing on representative substrates, including a 10 foot long section of a typical beam or column, in an area selected by an Independent Testing Agency. Match finish texture of approved samples. Apply additional field examples as necessary for approval of workmanship.
 2. Do not proceed with the fireproofing in other areas until a field example has been approved by the Independent Testing Agency.
 3. Approved field example shall serve as the standard of quality for the remainder of the Work. Completely remove disapproved field examples.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fire protection, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Fire-Resistance Design: Indicated on Drawings, tested according to **ASTM E119 or UL 263** testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- C. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
1. List of manufacturers and products:
 - a. Monokote MK6; W.R. Grace & CO.
 - b. Pyrolite 15, Carbolite CO.
 - c. Cafco 300, Isolatek International Corp.

2. Application: Designated for interior use by a qualified testing agency acceptable to authorities having jurisdiction.
3. Bond Strength: Minimum **150-lbf/sq. ft. (7.18-kPa)** cohesive and adhesive strength based on field testing according to ASTM E736.
4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E605, whichever is thicker, but not less than **0.375 inch (9 mm)**.
5. Combustion Characteristics: ASTM E136.
6. Surface-Burning Characteristics: Comply with ASTM E84.
 - a. Flame-Spread Index: **10** or less.
 - b. Smoke-Developed Index: **10** or less.
7. Compressive Strength: Minimum **10 lbf/sq. in. (68.9 kPa)** according to ASTM E761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E760.
11. Air Erosion: Maximum weight loss of **0.025 g/sq. ft. (0.270 g/sq. m)** in 24 hours according to ASTM E859.
12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G21.

2.3 AUXILIARY MATERIALS

- A. Provide auxiliary materials that are compatible with sprayed fire-resistive material and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by sprayed fire-resistive material manufacturer for the required fire-resistance design.
- C. Bonding Agent: Product approved by sprayed fire-resistive material manufacturer.
- D. Topcoat: Suitable for application over sprayed fire-resistive material; of type recommended in writing by sprayed fire-resistive material manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire protection materials during application.
- B. Prime substrates where included in fire-resistance design and where recommended in writing by sprayed fire-resistive material manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fire protection.

3.3 APPLICATION

- A. Construct fire protection assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fire protection Work.
- B. Comply with sprayed fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fire protection; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Spray apply fire protection to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by sprayed fire-resistive material manufacturer.
- D. Do not install enclosing or concealing construction until after sprayed fire-resistive material has been applied, inspected, and tested and corrections have been made to deficient applications.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, Chapter 17, "Sprayed Fire-Resistant Materials."
- B. Fire protection will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fire protection that does not pass tests and inspections, and retest.
 - 2. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- C. Prepare test and inspection reports.

3.5 CLEANING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

3.6 REPAIRS

- A. Repair fire protection damaged by other work before concealing it with other construction.
- B. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

3.7 SCHEDULE OF FIRE PROOFING REQUIREMENTS:

- A. Columns – 2 hours (UL design #X764 for steel wide flange columns, X768 for steel tube columns).
- B. Floor construction including beams and girders – 2 hours (UL design #D902).

END OF SECTION 078100

SECTION 07 84 00 - FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the Work of this Section.

1.2 DESCRIPTION OF WORK:

- A. Provide fire stopping systems to prevent the passage of flame and the products of combustion through concealed spaces and openings as required by code including, but is not limited to, the following:
 - 1. Penetrations in fire-resistance-rated walls, including open penetrations.
 - 2. Penetrations in horizontal assemblies.
 - 3. Joint firestopping.

1.3 RELATED WORK:

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that relate directly to work of this Section include, but are not limited to:
 - 1. Section 07 92 00, Joint Sealants

1.4 REFERENCES:

- A. UL 263 Fire Tests of Building Construction and Materials
- B. UL 1479 Fire Tests of Through-Penetration Fire stops
- C. UL2079 Standard for Safety Tests for Fire Resistance of Building Joint Systems
- D. ASTM E 119 Methods of Fire Tests of Building Construction and Materials
- E. ASTM E 814 Method of Fire Tests of Through-Penetration Fire Stops

1.5 DEFINITIONS:

- A. UL Fire Resistance Directory: Product directory published yearly, with supplements, by Underwriters Laboratories Inc., containing listings and classifications in effect as of the published date for product categories covered by UL.
- B. Factory Mutual Approval Guide: Product directory published yearly, with supplements, by Factory Mutual Research Corp., containing listed building products, materials, and assemblies which have been tested by Factory Mutual Research Corp., to recognized governing standards.

- C. F Rating: Prohibits flame passage through the system and requires acceptable hose stream test performance.
- D. T Rating: Prohibits flame passage through the system and requires the maximum temperature rise on the unexposed surface of the wall or floor assembly, on the penetrating item and on the fill material not to exceed 325 degrees F above ambient, and requires acceptable hose stream test performance.
- E. Company Field Advisor: An employee of the Company which lists and markets the primary components of the system under their name who is certified in writing by the Company to be technically qualified in design, installation, and servicing of the required products or an employee of an organization certified by the foregoing Company to be technically qualified in design, installation and servicing of the required products. Personnel involved solely in sales do not qualify.

1.6 DESIGN REQUIREMENTS:

- A. Devices and materials shall meet the hourly fire resistance ratings required by the Project as determined by UL 1479, or ASTM E 814 and be listed and detailed in the UL Fire Resistance Directory or the Factory Mutual Approval Guide.
 - 1. Exception: Where no listed designs exist that meet the requirements of a specific project condition, submit details and manufacturer's written recommendations for a design meeting the requirements. Include evidence of engineering judgment and extrapolation from listed designs.

1.7 SUBMITTALS:

- A. Submittals Package: Submit the following items specified below the same time as a package:
 - 1. Product Data
 - 2. Samples
 - 3. Quality Control Submittals
 - 4. Fire stop Schedule
- B. Product Data: Catalog sheets, specifications and installation instructions for each fire stop device and material.
 - 1. Indicate design number for each fire stop proposed to be used which is detailed in the UL Fire Resistance Directory, or the Factory Mutual Approval Guide.
 - 2. State the specific locations where each fire stop system is proposed to be installed.
- C. Samples: One of each product if requested.
- D. Quality Control Submittals:
 - 1. Design Data: Show details and include engineering information and manufacturer's written recommendations required under Design Requirements Article for each proposed fire stop if other than a design detailed in the UL Fire Resistance Directory, or the Factory Mutual Approval Guide.

- a. State the specific locations where each fire stop is proposed to be installed.
 2. Installer's Qualifications Data:
 - a. Name of each person who will be performing the Work and their employer's name, business address and telephone number.
 - b. Names and addresses of 3 similar projects that each person has worked on during the past 5 years.
 3. Company Field Advisor Data:
 - a. Name, business address and telephone number of Company Field Advisor secured for the required services.
 - b. Certified statement from the Company listing the qualifications of the Company Field Advisor, and listing of services and each product specifically listed for this Project for which Company Field Advisor is given authorization by the Company to render advice.
- E. Fire stop Schedule: Submit schedule itemizing the following:
 1. Manufacturer's product reference numbers and/or drawing numbers
 2. UL or Factory Mutual Research Corp. Design Number
 3. Location of fire stop material
 4. Penetrating Item Description/Limits: Material, size, insulated or un-insulated, and combustibility
 5. Maximum allowable annular space or maximum size opening
 6. Wall type construction
 7. Floor type construction
 8. Hourly Fire resistance rating of wall or floor
 9. F rating
 10. T rating, if available

1.8 QUALITY ASSURANCE:

- A. Installer Qualifications: The persons installing the fire stopping and their supervisor shall be personally experienced in fire stop work and shall have been regularly employed by a company installing fire stopping for a minimum of 3 years.
- B. Pre-Installation Conference: Before the fire stop work is scheduled to commence, a conference will be called by the Construction Manager at the Site for the purpose of reviewing the Contract Documents and discussing requirements for the Work. The conference shall be attended by related trade Contractors (if any), their qualified fire stopping installers, and associated fire stopping manufacturer's Company Field Advisors.
- C. Container/Package Labels: Include manufacturer's name and identifying product number, date of manufacturer, lot number, shelf life (if applicable), qualified testing and inspecting agency classification marking, curing time, and mixing instructions for multi-component materials.
- D. Company Field Advisor: Secure the services of a Company Field Advisor for the following:
 1. Render advice regarding suitability of fire stopping materials and methods.
 2. Assist in completing fire stop schedule.

3. Attend pre-installation conference.
- E. Asbestos-Free Products: Provide fire stopping products containing no detectable asbestos as determined by method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- F. Fire Resistance: Provide materials and construction which are identical to assemblies whose fire-resistance rating has been tested in compliance with ASTM E 119, UL 263, ANSI A2.1 or NFPA 251 by independent agencies acceptable to the Architect and authorities having jurisdiction.
- G. Burning Characteristics: Provide materials whose surface burning characteristics, when tested in compliance with ASTM E84 are as follows:
 1. Flame Spread: Not more than 25.
 2. Smoke Developed: Not more than 25.

1.9 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver fire stopping materials to the Site in original, new unopened containers or packages bearing manufacturer's printed labels.
- B. Store and handle fire stopping materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, etc.

1.10 PROJECT CONDITIONS:

- A. Environmental Requirements:
 1. Temperature: Do not install fire stopping materials when ambient or substrate temperatures are outside limits permitted by manufacturer of fire stopping materials.
 2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.
 3. Ventilation: Provide sufficient ventilation wherever fire stopping materials are installed in enclosed spaces. Follow manufacturer's recommendations.

1.11 SEQUENCING AND SCHEDULING:

- A. Perform work of this section and other sections in proper sequence so that this work will not be damaged and will be installed prior to installation of enclosing or concealing work.

PART 2 - PRODUCTS

2.1 FIRE STOPPING-GENERAL:

- A. Through-Penetration Fire Stop Devices, Forming Materials, And Fill, Void or Cavity Materials: As listed in the UL Fire Resistance Directory, or the Factory Mutual Approval Guide.
 - 1. For fire stopping exposed to moisture, furnish products that do not deteriorate when exposed to this condition.
 - 2. For fire stopping systems exposed to view, furnish products with flame-spread values of less than 25 and smoke developed values less than 50, as determined per ASTM E 84.
 - 3. For penetrations for piping services below ambient temperature, furnish moisture-resistant through-penetration fire stop systems.
 - 4. For penetrations involving insulated piping, furnish through-penetration fire stop systems not requiring removal of insulation.
- B. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- C. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.
- D. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- E. Accessories: Components required to install fill materials as recommended by the fire stopping manufacturer for particular approved fire rated system.
- F. Identification Labels:
 - 1. Furnished by fire stopping manufacturer of suitable material for permanent field identification of through-penetration fire stops.
 - 2. Identify the following:
 - a. "WARNING – FIRE STOP MATERIAL"
 - b. Company Name
 - c. Product Catalog number
 - d. F rating
 - e. T rating, if available
 - 3. Field fabricated labels are not acceptable.
- G. Compatibility: Provide fire stopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the fire stopping under conditions of service and application, as demonstrated by fire stopping manufacturer based on testing and field experience.

2.2 MINERAL WOOL:

- A. Provide loose mineral wool, rated noncombustible when tested in accordance with ASTM E 136, free of asbestos and glass fiber, and suitable for in-place density of 6 pcf to 12 pcf.

2.3 CAULK AND PUTTY:

- A. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:
 - 1. USG Fire Code Compound
 - 2. Bio Therm; Bio Fireshield.
 - 3. Fire-Barrier Series; 3M Fire Protection Products.
 - 4. Silicone Fire stop Foam 2001, and Sealant 2000; Dow Corning Corp.
 - 5. Hilti; Fire Protection Products

2.4 FIRE STOP MORTAR:

- A. 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, homogenous mortar.
- B. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:
 - 1. Novasit K-10; Bio Fireshield
 - 2. KBS Mortar Seal; International Protective Coatings Corp.
 - 3. CMP Fire stop Compound; Nelson Fire stop.
 - 4. STI SpecSeal Mortar.

2.5 FIRE STOP COLLARS:

- A. Provide pre-manufactured fire protective pipe sleeves equal to one of the following products, or Architect approved equal, that meet or exceed specified requirements:
 - 1. Bio-Fireshield Fire Stop Collars.
 - 2. STI SpecSeal Fire Stop Collars.
 - 3. Hilti CP 642 Fire Stop Collar.

2.6 FIRE STOP BAGS/PILLOWS:

- A. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- B. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:
 - 1. Fire stop Pillows; Bio Fireshield.
 - 2. KBS Sealbags; International Protective Coatings Corp.
 - 3. PLW Fire stop Pillow; Nelson Fire stop.
 - 4. STI SpecSeal Pillows.
 - 5. Hilti; Fire Protection Products

2.7 WRAP STRIPS:

- A. Single-component, elastomeric sheet with aluminum foil on one side. Provide one of the following products, or Architect approved equal, that meet or exceed specified requirements:
 - 1. SpecSeal Wrap Strip; STI.
 - 2. Fire Barrier FS195 Wrap Strip; 3M.
 - 3. CS2420 Intumescent Wrap, Hilti Construction Chemicals, Inc.

2.8 DUCT WRAPS:

- A. A foil-encapsulated, non-combustible, inorganic, flexible fireproofing wrap used in combination with silicone sealant for use at duct assemblies. Provide the following products:
 - 1. FireMaster Duct Wrap and Fire Barrier 2000+ Silicone Sealant; 3M.

2.9 MIXING:

- A. For those products requiring mixing prior to application, comply with fire stopping 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 fire stopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. The Installer shall examine substrates, supports, and conditions under which this work is to be performed and notify Contractor, in writing, of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning Work means Installer accepts substrates and conditions.

3.2 PREPARATION:

- A. Clean out openings immediately before installation of through-penetration fire stopping. Comply with recommendations of fire stopping manufacturer and the following requirements:
 - 1. Remove foreign materials from surfaces of openings, and from penetrating items that could interfere with adhesion of fire stopping.
 - 2. Clean opening and penetrating items to produce clean, sound surfaces capable of developing optimum bond with fire stopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form release agents from concrete.

- B. Protection:
 - 1. Protect surfaces adjacent to through-penetration fire stops with non-staining removable masking tape or other suitable covering to prevent fire stopping 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 that would be caused by cleaning methods used to remove smears from fire stopping materials.
- C. Substrate Priming:
 - 1. Prime substrates in accordance with the fire stopping manufacturer's printed installation instructions using recommended products and methods.
 - 2. Do not allow primer to spill or migrate onto adjoining exposed surfaces.

3.3 INSTALLATION OF THROUGH PENETRATION FIRE STOPS:

- A. Use through-penetration fire stop devices, forming materials, and fill, void or cavity materials to form through-penetration fire stops to prevent the passage of flame, and limit temperature rise of the unexposed surface as detailed in the UL Fire Resistance Directory, or the Factory Mutual Approval Guide.
 - 1. Where applicable design is not detailed in the Directories, use forming materials and fill, void or cavity material to form through-penetration fire stop in accordance with approved printed details and installation instructions from the company producing the forming materials and fill, void or cavity material.
- B. Provide through-penetration fire stop systems with F ratings which shall equal or exceed the fire resistance rating of the penetrated building construction.
- C. Provide through-penetration fire stop systems with T ratings, in addition to F ratings, at floors where the following conditions exist:
 - 1. Where fire stop systems protect penetrations located outside the wall cavities.
 - 2. Where fire stop systems protect penetrations located outside fire resistive shaft enclosures.
 - 3. Through-penetration fire stop systems protecting floor penetrations require a T-rating of at least 1 hour, but not less than the required floor fire-resistance rating.
- D. Fire stop through-penetrations of floors, walls, partitions, ceilings, and roofs.
- E. Fire stop through-penetration of partitions identified on the Construction Drawings as smoke partitions and fire rated assemblies.
- F. Fire stop through-penetrations of floors, walls, partitions, ceilings, and roofs in accordance with the fire resistance rating assigned to the walls, partitions, floors, ceilings, and roofs on the Construction Drawings.
- G. Provide fire stopping material and thickness as required to provide indicated ratings. Where not otherwise indicated, comply with UL standard designs. In multiple layer work, offset joints by at least 6". Anchor fire stopping using manufacturers' recommended system and in compliance with UL standard designs.

- H. All sleeves installed to accommodate future work are to be sealed with properly supported safing insulation. Oversized box-outs, sleeves, and cores are to be filled with grout full depth of concrete with reinforcing, and other support as necessary to secure grout.
- I. Permanently affix label at each fire stop. Use adhesive compatible with surface construction at fire stop location.

3.4 INSTALLATION OF JUNCTION, CONTROL, AND EXPANSION JOINT FIRE STOPS:

- A. Use joint treatment materials to form fire stop to prevent the passage of flame and limit temperature rise of the unexposed surface, as detailed in the UL Fire Resistance Directory or the Factory Mutual Approval Guide.
 - 1. Where applicable design is not detailed in the Directories, use forming materials and fill, void or cavity material to form fire stop in accordance with approved printed details and installation instructions from the company producing the forming materials and fill, void or cavity material.
- B. Fire stop junctures, control joints, and expansion joints.
- C. Fire stop junctures, control joints, and expansion joints associated with smoke partitions and fire rated construction.
- D. Permanently affix labels every 10 feet along each fire stop. Use adhesive compatible with surface construction at fire stop location.

3.5 CLEANING:

- A. Clean off excess fill materials and sealants adjacent to penetrations by methods and cleaning materials recommended by manufacturers of fire stopping products and of products in which penetrations occur.
- B. Remove masking tape as soon as practical so as not to disturb the fire stopping's bond with substrate.
- C. Protect fire stopping during and after curing period from contact with contaminating substances, or damage resulting from adjacent Work.
- D. Cut out and remove damaged or deteriorated fire stopping immediately, and install new materials as specified in fire stop schedule.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
 2. Joint-sealant manufacturer and product name.
 3. Joint-sealant formulation.
 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Preconstruction laboratory test reports.
- C. Preconstruction field-adhesion-test reports.
- D. Field-adhesion-test reports.
- E. Sample warranties.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

1.6 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Colors of Exposed Joint Sealants: Match Architect's samples

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. List of manufacturers:
- Sikasil WS-290 Ultra-Low Modulus Silicone Sealant
 - DOWSIL 890-SL Gray Silicone Joint Sealant
 - Dow Corning 795 Silicone Building Sealant

2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
- B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. List of manufactures:
 - a. DAP Silicone Sealant
 - b. Sikasil N Plus
 - c. GE Advanced Silicone Kitchen & Bath Sealant
- C. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 - 1. List of manufactures:
 - a. Pecora Corporation: AC-20 Acrylic Latex Sealant
 - b. Tremco: Tremflex 834 Sealant
 - c. Sherwin-Williams Company: 850A Acrylic Latex Caulk

2.5 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.

- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

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 10 tests for the first of joint length for each kind of sealant and joint substrate.
 - 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.
- 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.

3.4 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in horizontal traffic surfaces .
 - 1. Joint Locations:
 - a. Control and expansion joints in tile flooring.
 - 2. Joint Sealant: Urethane, S, P, 25, T, NT by Sika Sikaflex 1A Polyurethane Sealant
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces .
 - 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of wall and partitions.
 - 2. Joint Sealant: Urethane, S, NS, 25, NT by Sikaflex + Construction Sealant (Polyurethane, NS, Class 25, NT)
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors .
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
 - 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows
 - 2. Joint Sealant: Acrylic latex by Sashco Big Stretch Acrylic Latex Sealant .
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT, by GE Supreme Silicone Caulk
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Concealed mastics .

1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
2. Joint Sealant: Butyl-rubber base by X Fasten Super Waterproof Aluminum Butyl Tape
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081213 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Interior standard hollow-metal frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each frame type.
 - 2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
- C. Product Schedule: For hollow-metal frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Field quality control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated frames, list of door numbers and applicable room name and number for frame location.

1.6 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
 1. Temperature-Rise Limit: [At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
- B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. (2.84 W/K x sq. m) when tested according to ASTM C518.

2.2 INTERIOR STANDARD HOLLOW-METAL FRAMES

- A. Hollow-Metal Frames: NAAMM-HMMA 860; ANSI/SDI A250.4, Physical Performance Level A. At locations indicated in the Door and Frame Schedule

2.3 EXTERIOR STANDARD HOLLOW-METAL FRAMES

- A. Commercial Frames: NAAMM-HMMA 861; ANSI/SDI A250.4, Physical Performance Level A. At locations indicated in the Door and Frame Schedule .

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 3. Post installed Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.5 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre consumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 088000 "Glazing."

2.6 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
 1. Reinforce frames to receive non templated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
 1. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 2. Provide fixed frame moldings on outside of exterior and on secure side of interior frames. Provide loose stops and moldings on inside of hollow-metal frames.
 3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Metallic-coated steel sheet, with minimum G60 or A60 (ZF180) coating.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap frames to receive non templated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Hollow-Metal Frames: Comply with ANSI/SDI A250.11
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 2. Fire-Rated Openings: Install frames according to NFPA 80.
 3. Floor Anchors: Secure with post installed expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.
 4. Solidly pack mineral-fiber insulation inside frames.
 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with post installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- B. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- C. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081213

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Fire-rated wood door frames.
3. Factory finishing flush wood doors
4. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Door frame construction.
7. Factory-machining criteria.
8. Factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Clearances and undercuts.
7. Requirements for veneer matching.
8. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For factory-finished doors.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.
- C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252.
 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with "Architectural Woodwork Standards."

- 1. Provide labels and certificates from AWI certification program indicating that doors comply with requirements of grades specified.

2.3 SOLID-CORE, FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Doors:

- 1. Acceptable manufactures include: VT Industries, Algoma Hardwoods, Mohawk Doors and Marshfield Door Systems.
 - 2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
 - 3. Performance Grade:
 - a. ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated on Drawings.
 - 4. Architectural Woodwork Standards Grade: Custom.
 - 5. Faces: Single-ply wood veneer not less than **1/50 inch (0.508 mm)** thick.
 - a. Species: Match existing doors.
 - b. Cut: Match existing doors.
 - c. Match between Veneer Leaves: Match existing doors.
 - d. Assembly of Veneer Leaves on Door Faces: Match existing doors.
 - e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - f. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by **20 feet (6 m)** or more.
 - g. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
 - h. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Section 064216 "Flush Wood Paneling."
 - 6. Exposed Vertical Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.

- a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
 - b. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 - c. Fire-Rated Pairs of Doors: Provide formed-steel edges and astragals with intumescent seals.
 - 1) Finish steel edges and astragals with baked enamel same color as doors.
 - 2) Finish steel edges and astragals to match door hardware (locksets or exit devices).
 - d. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - 1) Screw-Holding Capability: 475 lbf (2110 N) in accordance with WDMA T.M. 10.
7. Core for Non-Fire-Rated Doors:
- a. ANSI A208.1, Grade LD-1 particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a) 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
 - b) 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - c) 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
 - 2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087111 "Door Hardware."
 - b. Glued wood stave.
 - c. WDMA I.S. 10 structural composite lumber.
 - 1) Screw Withdrawal, Face: 475 lb (2110 N).
 - 2) Screw Withdrawal, Edge: 475 lb (2110 N).
 - d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.
8. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

- a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as follows:
 - 1) 5-inch (125-mm) top-rail blocking.
 - 2) 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
 - 3) 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
 - 4) 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
9. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES AND LOUVERS

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 1. Wood Species: Same species as door faces.
 2. Profile: Manufacturer's standard shape.
 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
- C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated on Drawings.
- D. Wood Louvers: Door manufacturer's standard solid-wood louvers unless otherwise indicated.
 1. Wood Species: Same species as door faces.
 2. Profile: Chevron.
- E. Metal Louvers:
 1. Blade Type: Vision-proof, inverted V
 2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, with baked-enamel- or powder-coated finish.
 3. Metal and Finish: Extruded aluminum with Class II, clear anodic finish, AA-M12C22A31.
- F. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.
 1. Metal and Finish: Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, with baked-enamel- or powder-coated finish.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 - 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 - 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 - 5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.
- D. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed but before factory finishing.
 - 1. Flash top of out swinging doors with manufacturer's standard metal flashing.

2.6 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 - 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 2. Finish faces, all four edges, edges of cutouts, and mortises.
 - 3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors
- C. Factory finish doors that are indicated on Drawings to receive transparent finish.
- D. Factory finish doors where indicated in schedules or on Drawings as factory finished.
- E. Transparent Finish:

1. Architectural Woodwork Standards Grade: Custom.
2. Finish: Architectural Woodwork Standards System-11, Polyurethane, Catalyzed.
3. Staining: Match existing doors.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087111 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Job-Fitted Doors:
 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
 2. Machine doors for hardware.
 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 4. Clearances:
 - a. Provide **1/8 inch (3.2 mm)** at heads, jambs, and between pairs of doors.
 - b. Provide **1/8 inch (3.2 mm)** from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide **1/4 inch (6.4 mm)** from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
 5. Bevel non-fire-rated doors **1/8 inch in 2 inches (3-1/2 degrees)** at lock and hinge edges.
 6. Bevel fire-rated doors **1/8 inch in 2 inches (3-1/2 degrees)** at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 FIELD QUALITY CONTROL

- A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Provide inspection of installed Work through AWI's Quality Certification Program, certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WT's "Architectural Woodwork Standards" for the specified grade.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 - 3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
2. Include point-to-point wiring diagrams.

- C. Samples: For each type of exposed finish required.

- D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

1.4 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

- B. Product test reports.

- C. Source quality-control reports.

- D. Field quality-control reports.

- E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated and acceptable to Owner and Architect.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked-enamel, powder-coat, or organic finishes within specified warranty period.
 - 1. Warranty Period: 10years from date of Substantial Completion.
- C. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 - 1. Warranty Period: 10years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, 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.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
- D. 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 1/175 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 (19.1 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm)
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
- E. Structural: Test according to ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceed specified limits.
 2. When tested at 150percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa) .
- G. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor):

- a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.38 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) as determined according to NFRC 100.
 - b. Entrance Doors: U-factor of not more than 0.77 Btu/sq. ft. x h x deg F (4.37 W/sq. m x K) as determined according to NFRC 100.
2. Solar Heat-Gain Coefficient (SHGC):
 - a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.36 as determined according to NFRC 200.
3. Air Leakage:
 - a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. (0.30 L/s per sq. m at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa) when tested according to ASTM E283.
 - b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
4. Condensation Resistance Factor (CRF):
 - a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined according to AAMA 1503.
 - b. Entrance Doors: CRF of not less than 63 as determined according to AAMA 1503.
- H. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 4 for basic protection.
 1. Large-Missile Test: For glazing located within 30 feet (9.1 m) of grade.
 2. Small-Missile Test: For glazing located between 30 feet (9.1 m) and 60 feet (18.3 m) above grade.
- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STOREFRONT SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Manufacturer: basis of design – KAWNEER TRIFAB 451
 1. Exterior Framing Construction: Thermally broken
 2. Interior Vestibule Framing Construction: Nonthermal
 3. Glazing System: Retained mechanically with gaskets on four sides.
 4. Finish: High-performance organic finish.
 5. Fabrication Method: Field-fabricated stick system.

6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 7. Steel Reinforcement: As required by manufacturer.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.3 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
- B. Manufacturer: basis of design – KAWNEER 500 Series.
1. Door Construction: as indicated on Door Schedule thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior
 2. Door Design: As indicated on drawings
 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.4 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: as indicated on drawings.

2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.6 MATERIALS

- A. Sheet and Plate: ASTM B209 (ASTM B209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

- C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
- D. Structural Profiles: ASTM B308/B308M.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- F. Steel Reinforcement Primer: 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.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. 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.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from interior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments
 - 2. Color and Gloss: Match existing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.
- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.
- I. Install joint filler behind sealant as recommended by sealant manufacturer.
- J. Install components plumb and true in alignment with established lines and grades.

3.2 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 088000 "Glazing."

3.3 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

- A. Install entrance doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

1.1 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.
2. Cylinders for door hardware specified in other Sections.
3. Electrified door hardware.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product in each finish specified.
- C. Door hardware schedule.
- D. Keying schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers. and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
 1. Scheduling Responsibility: Preparation of door hardware and keying schedule.

- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with] ICC A117.1.
- D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 HINGES see Door / Hardware schedule

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.3 SELF-CLOSING HINGES AND PIVOTS

- A. Self-Closing Hinges and Pivots: BHMA A156.17. see Door / hardware schedule

2.4 CENTER-HUNG AND OFFSET PIVOTS

- A. Center-Hung and Offset Pivots: BHMA A156.4. see Door / hardware schedule

2.5 CONTINUOUS HINGES

- A. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

2.6 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch (13-mm) latchbolt throw.
 - 2. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
 - 3. Deadbolts: Minimum 1-inch (25-mm) bolt throw.
- C. Lock Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: As indicated on door hardware schedule.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 - 4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- F. Bored Locks: BHMA A156.2; Grade 1
- G. Mortise Locks: BHMA A156.13; Operational Grade 2, Security Grade 2; stamped steel case with steel or brass parts.

2.7 MANUAL FLUSH BOLTS see Door / Hardware schedule

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

2.8 EXIT DEVICES AND AUXILIARY ITEMS see architectural drawings

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
 - 1. Provide touch bars for door stile width as indicated on drawings. Finish stainless steel.

2.9 LOCK CYLINDERS see Door / Hardware schedule

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Compatible with existing cylinders
- B. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.10 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock
 - 1. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
 - 2. Keyed Alike: Key all cylinders to same change key.
- B. Keys: **Nickel silver**
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: **"DO NOT DUPLICATE."**

2.11 OPERATING TRIM see Door / Hardware schedule

- A. Operating Trim: BHMA A156.6; stainless steel on exterior unless otherwise indicated. US26 D on interior operating trim

2.12 SURFACE CLOSERS see Door / Hardware schedule

Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.13 MECHANICAL STOPS AND HOLDERS see Door / Hardware schedule

2.14 DOOR GASKETING see Door / Hardware schedule

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:
 - 1. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
 - 2. Gasketing on Double Doors: 0.50 cfm per foot (0.000774 cu. m/s per m) of door opening.

2.15 THRESHOLDS see Door / Hardware schedule

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.16 METAL PROTECTIVE TRIM UNITS see Door / Hardware schedule

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- (1.3-mm-) thick aluminum unless otherwise indicated on drawings; with manufacturer's standard machine or self-tapping screw fasteners.

2.17 AUXILIARY DOOR HARDWARE see Door / Hardware schedule

2.18 FINISHES see Door / Hardware schedule

2.19 MAINTENANCE SERVICE

- A. Full-Maintenance Service: Six months.

2.20 FIELD QUALITY CONTROL

- A. Occupancy Adjustment: After three months.

PART 3 - EXECUTION

3.1 INSTALLATION as indicated on drawings

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Furnish permanent cores to Owner for installation.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- H. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.2 ADJUSTING

Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

END OF SECTION 087100

Hardware sets below represent required products, and key catalog numbers.
THE FULL CATALOG NUMBER IS NOT PROVIDED, NOT ALL ACCESSORIES ARE LISTED
Hardware contractor is required to provide submittals with the full information correct handing, and all accessories proposed for the installation

Set 1		213.1:				
Exterior - double door						
Function: Entry and exit						
Aluminum and glass entry door						
Item	Description	Manufacturer	Cat No	Finish	Number	Notes
		Sargent Narrow style				
Securing and operating device - Int	Concealed Vertical Rod exit device	Concealed vertical rod Exit devise	Sargent AD 8410	US32D	2	with dogging
Securing device - Ext.	Cylinder	Medeco (after construction 7 pin, SFIC		US32D	1	Coordinate with clients keing system
				Brushed stainless steel		
Operating trim - Ext	Pull Handle	CRL	24LPSMBL	Dark Bronze	2	
Closing device	Closer	LCN	4040XP	anodized	2	
Hanging device	Fully mortised concealed cont. hinge	Hager	780-224HD with TIPIT	Bronze anodized alum	2	
Weatherstripping	Head, jamb and sill sweep	Zero	188S and 254A sweep	Black	1 set	
Threshold	Alum treshold 5"W x 6' L	PEMCO	255X5AFG-36	Clear anodized alum		accessible
Set1A		Door 213.2				
Same as Set 1 except omit CYLINDER						
Function: exist ONLY						
Set 2		door 201.1 , 123				
Interior - double door		Fire rated wood door				
Function: passage with magnetic hold open						
Item	Description	Manufacturer	Cat No	Finish	Number	Notes
		Sargent wide style				
	Wide style Concealed Vertical Rod exit device	Concealed vertical rod Exit devise				
Securing and operating device - Int			Sargent 8813 -F CVR	US26D	2	fire rated with hold open
Operating trim - Ext	Lever trim with no cylinder	Sargent	Sargent 28-LL	Satin Chrome	2	
Closing device	Closer	LCN	4040XP	GREY	2	
Hanging device	Fully mortised HD Ball bearing hinges	Hager	BB1199	US26D	2 pairs per leaf	
	Magnets mounted on wall, releases autimatically on FA	Sargent	Sargent 351 series	US26D	2	Mfr standard
Magnetic Hold Open		LCN	LCN CO series coordinator		2	
overhead door COncealed coordinator						
Accessories	Silencers			Grey	3	Adhesive mounted
	Kickplate; 10" high on push side only			SS	1	Only on door 136

Set 3
 Interior - double door
 Function: Entry and exit
 Aluminum and glass door

door 206

Item	Description	Manufacturer	Cat No	Finish	Number	Notes
Securing and operating device - Int Securing device - Ext.	Concealed Vertical Rod exit device Cylinder	Sargent Narrow style Concealed vertical rod Exit devise	Sargent AD 8410 Medico (after construction) 7 pin, SFIC	US26D	2	with dogging function
				US26D Brushed stainless	1	Coordinate with clients keing system
Operating trim - Ext Closing device	Pull Handle Closer	CRL	24LPSMBL	steel	2	with drop plate
		LCN	4040XP	Gray	2	
Hanging device	Fully mortised concealled cont. hinge	Hager	780-224HD with TIPIT	Clear anodized alum	2	
Concealed coordinator		LCN	LCN 4040SEH-H		2	
Perimeter accoustical seal at head and jamb			Pemco S773 (or S44/S442)	Grey	2	Cont
Accoustical meeting stile seal	accoustical grade pile/fin	Pemco	Pemco 303AS	Grey	1	full height on one leaf cont
Bottom seal	Autimatic door bottom	PEMCO	Pemco STC411-PK14-1	Clear anodized alum	2	

Set 4
 Interior - Single door
 Function: Entry and exit
 Aluminum and glass door

door 106, 107.2

Item	Description	Manufacturer	Cat No	Finish	Number	Notes
Securing and operating device - Int Securing device - Ext.	Rim exit device Cylinder	Sargent Narrow style rim Exit devise	Sargent AD 8810 Medico (after construction) 7 pin, SFIC	US26D	1	with dogging function
				US26D Brushed stainless	1	Coordinate with clients keing system
Operating trim - Ext Closing device	Pull Handle Closer	CRL	24LPSMBL	steel	2	with drop plate
		LCN	4040XP	Gray	2	
Hanging device	Fully mortised concealled cont. hinge	Hager	780-224HD with TIPIT	Clear anodized alum	2	
Perimeter accoustical seal at head and jamb			Pemco S773 (or S44/S442)	Grey	2	Cont
Bottom seal	Autimatic door bottom	PEMCO	Pemco STC411-PK14-1	Clear anodized alum	2	

Set 5
 Interior - Single door
 Function: Classroom
 Aluminum and glass door

door 108, 111

Item	Description	Manufacturer	Cat No	Finish	Number	Notes
Securing and operating device - Int	Classroom Mortice Lockset	Sargent	Sargent 8237	US26D	1	

Operating trim	Lever Handle	Sargent	LL-Series	US26D	1	
Closing device	Closer	LCN	4040XP	Gray	1	with drop plate
Hanging device	Offset pivot hinges	Kawneer		Clear anodized alum	1	top, bottom and intermediate hinge
Perimeter accoustical seal at head and jamb		Pemco	Pemco S773 (or S44/S442)	Grey	1	Cont
Bottom seal	Automatic door bottom	PEMCO	Pemco STC411-PK14-1	Clear anodized alum	1	

Set 6
Interior - single wood door
door 209, 113,114
Fire rated wood doors
Function: Passage
F-05 -always free from both sides

Item	Description	Manufacturer	Cat No	Finish	Number	
Securing device	always free	Sargent,	Sargent 8200 mortise lock trim with LNA lever handle	US26D	1	
Operating trim	Lever	Sargent LNA lever		US26D standard plastic cover	1	
Closing device	Closer	LCN	4040XP		1	
Hanging device	Fully mortised HD Ball bearing hinges	Hager	BB1199	US26D	2 pairs	
Accessories	Silencers			Grey	3	Adhesive mounted
	Kickplate; 10" high on push side only			SS	1	Only on door 136

Set 6A
same as Hardware Set #6, except NOT fire rate opening
door 210,

Set 7	door 123.1					
Interior - double door -one leaf active	Fire rated wood door					
Function: store room	F-70					
Wood Door						
Accessories	Silencers			Grey	3	Adhesive mounted
	Kickplate; 10" high on push side only			SS	1	Only on door 136

Item	Description	Manufacturer	Cat No	Finish	Number	Notes
Securing and operating device - Int: active leaf;	mortise Lockset with handle room function	Store Sargent	Sargent 8200 mortise lock trim with LNA lever handle	US26D	1	
Operating trim	Lever trim	Sargent	LNALever	Brushed stainless steel	1	
Securing and operating device - Int: inactive leaf	Automatic flash bolts T&B	Rockwood 2942	Rockwood 2942	US26D	2	
Closing device	Closer	LCN	4040XP	GREY	2	
Hanging device	Fully mortised HD Ball bearing hinges	Hager	BB1199	US26D	2 pairs	
overhead Coordinator		Rockwood 2672	Rockwood 1700		1	

Set 8
Closet doors

Interior - double door -one leaf active
Function: Classroom

Wood double door

Item	Description	Manufacturer	Cat No	Finish	Number	Notes
Securing and operating device - active leaf;	Cylindrical Lockset with handle	Sargent	Sargent 10XG37-LNA	US26D	1	
Operating trim	Lever trim	Sargent	cylindrical lock trim LNA Lever	US26D	1	
Securing and operating device - Int: inactive leaf	Automatic flash bolts T&B	Rockwood 2942	Rockwood 2942	US26D	1	
Operating trim	Dummy Lever trim to match trim on active leaf -	Sargent	LNA Lever	US26D	1	
Hanging device	Self closing ball bearing hinges	Hager	Hager 1155 - spring hinge	US26D	2 pairs	

Set 9
Interior - Sincle door -Closet
Function: Classroom

Closet doors
Wood single door

Item	Description	Manufacturer	Cat No	Finish	Number	Notes
Securing and operating device -	Cylindrical Lockset with handle	Sargent	Sargent 10XG37-LNA	US26D	1	
Operating trim	Store room function	Sargent	cylindrical lock	US26D	1	
Hanging device	Lever trim	Sargent	LNA Lever	US26D	1	
	Self closing ball bearing hinges	Hager	Hager 1155 - spring hinge	US26D	2 pairs	

Set 10
Interior - single wood door

112, 117, 218
Fire rated wood doors

Function: Classroom
F-03 - Key outside locks/unlocks, inside always free

Item	Description	Manufacturer	Cat No	Finish	Number	Notes
Securing device	Key outside locks/unlocks, inside always free	Sargent,	Sargent 8200 mortise lock trim with LNA lever	US26D	1	
Operating trim	Lever	Sargent	LNA lever	US26D	1	
Closing device	Closer	LCN	4040XP	standard plastic cover	1	
Hanging device	Fully mortised HD Ball bearing hinges	Hager	BB1199	US26D	2 pairs	
Accessories	Silencers			grey	6	Adhesive mounted
	Kickplate; 10" high on push side only			Grey	3	Adhesive mounted
				SS	1	

Set 10A
same as Hardware Set #10, except NOT fire rate opening

202, 217 , 107.1

Set 11

Interior - single wood door

125.1 125.2, 203,121

Function: Store room

F-07 - Key retracets latch;exterior lever always locked

Item	Description	Manufacturer	Cat No	Finish	Number	
Securing device		Sargent,	Sargent 8200 mortise lock trim with LNA lever handle 7 pin, SFIC	US26D	1	
Operating trim	Lever	Sargent LNA lever		US26D standard plastic	1	
Closing device	Closer	LCN	4040XP	cover	1	
Hanging device	Fully mortised HD Ball bearing hinges	Hager	BB1199	US26D	2 pairs	
Accessories	Silencers			Grey	3	Adhesive mounted
	Kickplate; 10" high on push side only			SS	1	
	Silencers			grey	6	Adhesive mounted

Set 12

Interior - single wood door

Function: entry and exit

205.2 , 211

Fire rated wood doors

Item	Description	Manufacturer	Cat No	Finish	Number	
Securing device	Rim exist device	Sargent, narrow style	Sargent 8810 mortise lock trim with LNA lever handle 7 pin, SFIC	US26D	1	
Operating trim	Lever	Sargent LNA lever		US26D standard plastic	1	
Closing device	Closer	LCN	4040XP	cover	1	
Hanging device	Fully mortised concealed cont. hinge	Hager	780-224HD with TIPIT	Clear anodized alum	2	
Accessories	Silencers			Grey	3	Adhesive mounted
	Kickplate; 10" high on push side only			SS	1	
	Silencers			grey	6	Adhesive mounted

Set 12A

same as Hardware Set #12, except NOT fire rate opening

205.1

Set 13

Multi pass sliding

Hanging device	Multi Pass Sliding Door Hardware	Johnson	Johnston #111 MD	Clear anodized alum	2	
Trim	Flush Pull		Rockwood 872	US 626 D		
	Silencers			Grey	3	

Set 14

Exterior - existing single door

Function: Exit only

213.9; 216; 206.1

Retrofit existing exit door with Sargent 8800 series rim exit device and trim and LCN closers and weather stripping US26D

Set 14 A Door EF-1
Same as Set 14 except Exit and Entry Function

Fire rated

Set 15 door 200.1 ,
Exterior - double door
Function: Entry and exit
Aluminum and glass entry door

Item	Description	Manufacturer	Cat No	Finish	Number	Notes
Active leaf - Securing and operating device - Int	Concealed Vertical Rod exit device	Sargent Narrow style Concealed vertical rod Exit devise with electric latch retraction (ELR) 24 VDC	Sargent 56-AD 8410	US32D	1	Controlled at desk in Office #218 . Both leaves always free egress
Inactive leaf - Securing and operating device - Int	Concealed Vertical Rod exit device	Sargent Narrow style Concealed vertical rod Exit devise-Non Electrified	Sargent AD 8410	US32D	1	
Operating trim - Ext	Pull Handle	CRL	24LPSMBL	Brushed stainless steel	2	
Consealled power transfer	Active leaf only				1	
Power supply					1	with FA interface, sized for
Closing device	Closer	LCN	4040XP	Dark Bronze anodized	2	
Hanging device	Fully mortised concealed cont. hinge	Hager	780-224HD with TIPIT	Bronze anodized alum	2	
Weatherstripping	Head, jamb and sill sweep	Zero	188S and 254A sweep	Black	1 set	
Threshold	Alum treshold 5"W x 6' L	PEMCO	255X5AFG-36	Clear anodized alum		accessible

Set 15 A Door 200.2
Same as Set 1 5 except omit weather stripping

Set 15B 101.1
Same as Set 15, except that concealed vertical ro in active leaf is control is by card

Set 16 201
Interior - single wood door Fire rated wood doors

Function: Classroom F-03 - Key outside locks/unlocks, inside always free

Item	Description	Manufacturer	Cat No	Finish	Number

Securing device	Key outside locks/unlocks, inside always free	Sargent,	Sargent 8200 mortise lock trim with LNA lever	US26D	1	
Strike	Electric	HES	4500C	630	1	Controlled by card reader; Fail-safe
Operating trim	Lever	Sargent LNA lever		US26D	1	
Closing device	Closer	LCN	4040XP	standard plastic cover	1	
Hanging device	Fully mortised HD Ball bearing hinges	Hager	BB1199	US26D	2 pairs	
Accessories	Silencers			grey	6	Adhesive mounted
	Silencers			Grey	3	Adhesive mounted
	Kickplate; 10" high on push side only			SS	1	

GENERAL NOTES:

- 1.Finish for all hardware shall be US 626D-Satin Chrome U.O.N.
- 2.Provide master and sub-master key system, coordinate w/ owner.
- 3.Submit shop drawings for approval.
- 4.Adjust interior door closers to maximum 5 lbs closing force.
- 5.Provide type of arm required for closer to be located on non-public side of door. U.O.N.
- 6.Coordinate closer arm types.
- 7.Provide kick plate on the push side of wood doors as indicated in the hardware sets. 8 Provide door stops to protect the walls

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Insulating glass.
3. Glazing sealants.
4. Glazing tapes.
5. Miscellaneous glazing materials.

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.
- C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass.
- B. Product test reports.
- C. Preconstruction adhesion and compatibility test report.
- D. Sample warranties.

1.6 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

- 1. Warranty Period: 10years from date of Substantial Completion.

- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

- 1. Warranty Period: 10years from date of Substantial Completion.

- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.

- 1. Warranty Period: 10years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:

- 1. Design Wind Pressures: As indicated on Drawings.

- C. Windborne-Debris-Impact Resistance: Exterior glazing shall pass ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 4 for basic protection.

- 1. Large-Missile Test: For glazing located within 30 feet (9.1 m) of grade.

2. Small-Missile Test: For glazing located between 30 feet (9.1 m) and 60 feet (18.3 m) above grade.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on LBL's WINDOW 7 computer program expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 2. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on LBL's WINDOW 7 computer program.
 3. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

2.2 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. NGA Publications: "Glazing Manual."
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.

2.3 Thickness: Where glass thickness is indicated, it is a minimum

2.4 GLASS PRODUCTS – as indicated on drawings

2.5 INSULATING GLASS as indicated on drawings

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- 3.
4. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations

- B. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks:

1. Type recommended in writing by sealant or glass manufacturer.

- C. Spacers:
 - 1. Type recommended in writing by sealant or glass manufacturer.
- D. Edge Blocks:
 - 1. Type recommended in writing by sealant or glass manufacturer.
- E. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction 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.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- 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 in accordance with requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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. Apply heel bead of elastomeric sealant.
- F. 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.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 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.
- 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.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.6 MONOLITHIC GLASS SCHEDULE

- A. Clear Glass Type as indicated on drawings
 - 1. Minimum Thickness: as indicated on drawings
 - 2. Safety glazing required. as indicated on drawings

3.7 INSULATING GLASS SCHEDULE as indicated on drawings

END OF SECTION 088000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members shall comply with AISI S100, AISI S200, (unless more stringent requirements are indicated) and the following"

1. Wall Studs: AISI S211
2. Header: AISI S212
3. Lateral Design AISI S213

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
 2. Protective Coating: ASTM A653/A653M, G40 (Z120) hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C645.
1. Minimum Base-Steel Thickness: As indicated on Drawings As required by performance requirements for horizontal deflection
 2. Depth: As indicated on Drawings
- C. Slip-Type Head Joints: Where indicated, provide the following:
1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Steel Thickness: As indicated on Drawings
- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: As indicated on Drawings
 2. Clip Angle: As indicated on Drawings
- F. Z-Shaped Furring: As indicated on Drawings

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Z-Shaped Furring Members: As indicated on Drawings
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.3 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated on Drawings, but not greater than spacings required by referenced installation standards for assembly types.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows as indicated on Drawings
1. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 2. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 3. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.
 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum wallboard.
2. Gypsum board, Type X.
3. Gypsum ceiling board.
4. Glass-mat, water-resistant backing board.
5. Interior trim.
6. Exterior trim.
7. Joint treatment materials.

B. Samples: For each texture finish indicated on same backing indicated for Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. List of manufacturers:
 - a. USG Corporation Sheetrock® Brand Gypsum Panels
 - b. National Gypsum Company – Gold Bond® Products
 - c. Georgia-Pacific Gypsum LLC (ToughRock) - ToughRock Lite-Weight Gypsum Board
2. Thickness: as indicated on drawings
3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

B. Gypsum Board, Type X: ASTM C1396/C1396M.

1. List of manufacturers:
 - a. USG – Sheetrock® Brand Fire code ® X
 - b. Tough Rock Fireguard X Gypsum Panel
 - c. American Gypsum Fire Bloc Gypsum Wallboard
2. Thickness: as indicated on drawings
3. Long Edges: Tapered or Tapered and featured (rounded or beveled) for prefilling

C. Gypsum Ceiling Board: ASTM C1396/C1396M.

1. List of manufacturers:
 - a. USG Corporation – Sheetrock® Gypsum Ceiling Board
 - b. National Gypsum (Gold Bond®)
 - c. American Gypsum
2. Thickness: as indicated on drawings
3. Long Edges: Tapered.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.

1. List of manufacturers:
 - a. USG (United States Gypsum Company) – Durock™ Brand
 - b. Georgia-Pacific – Dens Shield® Tile Backer
 - c. CertainTeed – Glas Roc® Tile Backer
2. Core: thickness as indicated on Drawings
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. List of manufacturers:
 - a. USG Durock Brand Cement Board
 - b. Hardie Backer Cement Board
 - c. Perma Base Cement Backer Board
2. Thickness: As indicated on drawings.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use [drying-type, all-purpose compound].
3. Fill Coat: For second coat, use drying-type, all purpose compound.
4. Finish Coat: For third coat, use drying-type, all purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound].

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2. Cementitious Backer Units: As recommended by backer unit manufacturer.
3. Products:
 - a. Schluter ALL-SET Modified Thin-Set Mortar
 - b. Custom Versa Bond Thin-Set Mortar
 - c. Mapei Keraflex Plus Thinset Mortar

2.7 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 INSTALLATION AND FINISHING OF PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C840.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- E. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile
3. Level 3: Walls or ceiling to receive light texture or flat paints
4. Level 4: Walls and ceilings to receive light texture or eggshell and semi-gloss paints

H. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.2 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093013 - CERAMIC & PORCELAIN TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic mosaic tile.
2. Porcelain tile.
3. Stone thresholds.
4. Waterproof membrane for thin set applications.

1.2 REFERENCES

- A. Tile Manufacturing Standard: Comply with the requirements of ANSI "American National Standard Specifications for Ceramic Tile" (ANSI A137.1)
- B. Installation Standards: Comply with the requirements of ANSI "American Standard Specifications for the Installation of Ceramic Tile" (ANSI A108, A118 and A136), and correlating Tile Council of America (TCA) details except as shown or specified otherwise.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Each type and composition of tile and trim units and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.
3. Stone thresholds.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of gauged porcelain tile / gauged porcelain tile panels and slabs

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Requirements: Do not install tile until construction in spaces is completed. Set and grout tile when ambient temperature is 50 degrees F (10 degrees C) or higher and humidity conditions are being maintained. Substrate must be free of ice. All work to meet material manufacturer's recommendations.

1.9 MAINTENANCE

- A. Extra Materials: Furnish extra tile, equal to 3 percent of the tile installed, of each type, composition, pattern, size and color of tile required. Also furnish a proportionate number of trim units. Place extra materials packaged with protective covering in storage at the site where directed.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

- A. Ceramic / Porcelain Tile Type T1: Refer to Finish plans and Finish Legend
- B. Ceramic / Porcelain Tile Type T-2: Refer to Finish plans and Finish Legend

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 12 according to ASTM C1353 or ASTM C241/C241M and with honed finish.

2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325
 - 1. Refer to 092900 paragraph 2.4 B for List of manufacturers
 - 2. Thickness: As indicated on drawings.

2.5 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.6 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
- B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
 - 1. List of manufacturers:
 - a. Mapei Ultraflex LFT Large-Format Tile Mortar – Mapei
 - b. Schluter ALL-SET Modified Thin-Set Mortar – Schluter
 - c. Custom Versa Bond Thin-Set Mortar

2. For wall applications, provide non sagging mortar.

2.7 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated. Joint widths 1/8 inch or wider.

2.8 MISCELLANEOUS MATERIALS

- A. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; as per architect exposed-edge material.
- B. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- G. Joint Widths: as per manufacturer requirements
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
- K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile
- L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- M. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated

- N. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- O. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

3.4 INTERIOR CERAMIC & PORCELAIN TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor: As indicted on drawings
- B. Interior Wall Installations, Masonry:
 - 1. Ceramic / Porcelain Tile Installation TCNA W211 and ANSI A108.1A; cement mortar bed (thickset) bonded to substrate.
 - a. Ceramic / Porcelain Tile Type: as indicated on Finish Schedule
- C. Interior Wall Installations, or Metal Studs or Furring:
 - 1. Ceramic / Porcelain Tile Installation: TCNA W221 and ANSI A108.1A; cement mortar bed (thickset) over cleavage over waterproof membrane on solid backing.
 - a. Ceramic / Porcelain Tile Type: as indicated on Finish Schedule

END OF SECTION 093013

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical tiles for interior ceilings.
2. Fully concealed, direct-hung, suspension systems.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, and coordinated with each other, using input from installers of the items involved.
- B. Product test reports.
- C. Research reports.
- D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical units and suspension system components to the Project Site in original, unopened packages and store them in a fully enclosed space protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Open ends of acoustical unit packages 24 hours before installation to stabilize moisture content and temperature.

C. Handle acoustical units carefully to avoid shipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Requirements: Comply with acoustical tile manufacturer's printed temperature and ventilation requirements before, during, and after installation.

B. Space Enclosure: Do not install interior acoustical units until space is enclosed and weather-proof, wet work in spaces is completed, and work above ceilings is complete.

1.8 MAINTENANCE

A. Furnish quantities equal to 2 percent of acoustical units and exposed suspension system components to match products installed. Package with protective covering for storage, and identify with appropriate labels.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL TILES as indicated on RCP's

A. List of manufacturers:

- a. Armstrong World Industries
- b. Rockfon (by ROCKWOOL)
- c. USG (United States Gypsum Company)

B. Acoustical Tile Standard: Manufacturer's standard tiles of configuration indicated that comply with ASTM E1264.

C. Color: As indicated in a schedule.

D. Edge/Joint Detail: As indicated by manufacturer's designation.

E. Thickness: As indicated in a schedule.

F. Modular Size: As indicated in a schedule.

2.3 METAL SUSPENSION SYSTEM as indicated on drawings

- A. List of manufacturers:
 - a. Armstrong World Industries, Inc.
 - b. USG Corporation
 - c. Chicago Metallic Corporation (Rockfon)
- B. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, fully concealed, metal suspension system that complies with applicable requirements in ASTM C635/C635M.

2.4 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Carrying Channels: 1-1/2 inches high, 16 gage galvanized steel.
- C. Tie Wire: Galvanized steel wire, not less than 18 gage (0.0475 inch diameter).
- D. Wire Clips: Galvanized steel wire, not less than 10 gage (0.1345 inch diameter).

2.5 METAL EDGE MOLDINGS AND TRIM

PART 3 - Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for of suspension-system runners.

EXECUTION

3.1 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated.
- B. Layout openings for penetrations centered on the penetrating items.

3.2 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. Install suspended acoustical tile ceilings according to ASTM C636/C636M and manufacturer's written instructions.
- B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- C. Arrange directionally patterned acoustical tiles as indicated on reflected ceiling plans.

END OF SECTION 095123

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vinyl base.
 - 2. Rubber stair accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 VINYL BASE

- A. See Finish plans and Legend for more details
- B. Lengths: Coils in manufacturer's standard length.
- C. Outside Corners: Preformed.
- D. Inside Corners: Preformed.

2.2 RUBBER STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
- B. See Finish plans for more details.
 - 1. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 2. Tightly adhere to substrates throughout length of each piece.
 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.
1. Apply two coat(s).
- C. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luxury Vinyl Tile (LVT).
2. Rubber floor tile.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and pattern specified.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL TILE

- A. For size, color and pattern refer to Finish Plans and Legend.
- B. Tile Standard: ASTM F1700.
 1. Class: As indicated by product designations.

2.3 RUBBER FLOOR TILE

- A. For size, color and pattern refer to Finish Plan and Finish Legend.
- B. Tile Standard: ASTM F1344.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Cleaner: Mop clean after installation with cleaner recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.

- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coat(s).

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular carpet tile.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.
11. Adhesives as recommended by the manufacturer.

- C. Samples: For each exposed product and for each color and texture required.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

- B. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by the manufacturer for carpet tile installation.

1.7 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. For size, color and pattern refer to Finish Plans and Finish Legends.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Concrete Slabs: Comply with manufacturer's written instructions for installation of carpet tile.
- B. Metal Subfloors: Verify that underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- C. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer.

3.2 PREPARATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions **1/8 inch (3 mm)** wide or wider, and protrusions more than **1/32 inch (0.8 mm)** unless more stringent requirements are required by manufacturer's written instructions.

- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated on Drawings.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.
- I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.
- J. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl wall covering.
2. Textile wall covering.
3. Acoustical panels.
4. Panel fabric / tackboards

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch- (914-mm-) long in size.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 265.

2.2 VINYL WALL COVERING

- A. Description: Provide mildew-resistant products in rolls from same production run and complying with the following as indicated on drawings

2.3 TEXTILE WALL COVERING

- A. Description: Provide wall coverings in rolls from same production run and that comply with ASTM F793 and as indicated on drawings

2.4 ACOUSTIC PANELS

- A. Description: Provide acoustical panel wall covering in 9.67' sheets from same production run that comply with ASTM C423-17. Type A as indicated on drawing, ASTM E-84 Class A Fire rating.

2.5 PANEL FABRIC / TACKBOARDS

- A. Description: Provide wall coverings in rolls from same production run and that comply with ASTM F793 and as indicated on drawings

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 3. Metals: If not factory primed, clean and apply primer recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 - 5. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.2 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.

END OF SECTION 097200

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior the following interior substrates:
 - 1. Concrete masonry units (CMUs).
 - 2. Brick
 - 3. Gypsum board.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

- a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. CMU:
 1. Primer (if needed):
 - a.. Loxon Concrete & Masonry Primer, Sherwin-Williams
 - b. Zinsser Block Filler 2X Acrylic Primer
 - c. KILZ Premium Primer
 2. Paint:
 - a. Benjamin Moore Regal Select Interior Acrylic Latex paint
 - b. Sherwin-Williams Emerald Acrylic latex paint
 - c. Sherwin-Williams Loxon XP
- B. Gypsum Wallboard:
 1. Paint as indicated on Finish Legend
- C. Products: Subject to compliance with requirements, provide product listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As indicated in Finish Legend

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMUs): 12 percent.
 - 2. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.4 INTERIOR PAINTING SCHEDULE

- A. See Finish Schedule on Finish Legend

END OF SECTION 099123

SECTION 102239 - FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated, acoustical panel partitions.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.
2. Section 092900 "Gypsum Board" for fire-rated assemblies and sound barrier construction above the ceiling at track.

1.2 DEFINITIONS

- A. NIC: Noise Isolation Class.
- B. NRC: Noise Reduction Coefficient.
- C. STC: Sound Transmission Class.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For operable panel partitions.
 1. Include plans, elevations, sections, attachment details, and numbered panel installation sequence.
 2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
- C. Samples: For each type of exposed material, finish, covering, or facing.
- D. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:

1. Textile Facing Material: Full width by not less than **36-inch- (914-mm-)** long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
 2. Panel Edge Material: Not less than **3 inches (75 mm)** long.
 3. Hardware: One of each exposed door-operating device.
- E. Delegated-Design Submittal: For operable panel partitions.
1. Include design calculations for seismic restraints that brace tracks to structure above.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinated with each other, using input from installers of the items involved.
1. Partition track, track supports and bracing, switches, turning space, and storage layout.
 2. Suspended ceiling components.
 3. Structural members to which suspension systems will be attached.
 4. Size and location of initial access modules for acoustical tile.
 5. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. HVAC ductwork, outlets, and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Smoke detectors.
 - f. Access panels.
- B. Setting Drawings: For embedded items and cutouts required in other work..
- C. Qualification Certificates: For operable panel partitions, tracks, accessories, and components, from manufacturer.
- D. Seismic Qualification Certificates: For operable panel partitions, tracks, accessories, and components, from manufacturer. Include seismic capacity of partition assemblies to remain in vertical position during a seismic event and the following:
1. Basis for Certification: Indicate whether certification is based on analysis, testing, or experience data, in accordance with ASCE/SEI 7.
 2. Detailed description of partition anchorage devices on which the certification is based and their installation requirements.
- E. Product Certificates: For each type of operable panel partition.
1. Include approval letter signed by manufacturer acknowledging Owner-furnished panel facing material complies with requirements.
- F. Product test reports. For each operable panel partition, for tests performed by a qualified testing agency.

- G. Field quality-control reports.
- H. Sample warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data: For operable panel partitions to include in maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - b. Seals, hardware, track, carriers, and other operating components.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Panel Finish-Facing Material: Furnish full width in quantity to cover both sides of two panels when installed.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- E. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- F. Buy American: Products to be manufactured in the United States in compliance with applicable U.S. Federal Trade Commission (FTC) and U.S. Customs and Border Protection regulations, and be labeled "Made in America."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions 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 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic bracing of tracks to structure above.
- B. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7
 - 1. The term "withstand" means "the partition panels will remain in place without separation of any parts when subjected to the seismic forces specified."
- C. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E90, determined by ASTM E413, and rated for not less than the STC indicated.
 - 2. Noise-Reduction Requirements: Operable panel partition assembly, identical to partition tested for STC, tested for sound-absorption performance in accordance with ASTM C423, and rated for not less than the NRC indicated.
 - 3. Noise-Reduction Requirements: Operable panel partition assembly, identical to partition tested for STC, tested for sound-absorption performance according to ASTM C423, and rated for not less than the NRC indicated.
- D. Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by a testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency.
 - a. Flame-Spread Index: **25** or less.
 - b. Smoke-Developed Index: **450** or less.

2. Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.2 AVAILABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide basis-of-design products indicated by Modernfold, Inc. or comparable products by one of the following:
 1. Hufcor, Inc.
 2. KWIK-WALL Company

2.3 OPERABLE ACOUSTICAL PANELS

- A. Operable Acoustical Panels: Partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Modernfold, Inc.; Acousti-Seal Premier (932) or comparable product.
- B. Panel Operation: Manually operated, paired panels.
- C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
- E. STC: Not less than 50
- F. NRC: Not less than 0.65
- G. Panel Weight: **8 lb/sq. ft. (40 kg/sq. m) to 12 lb/sq. ft. (59 kg/sq. m)** maximum.
- H. Panel Height: as indicated on drawings.
- I. Panel Thickness: Nominal dimension of **3 inches (75 mm)**
- J. Panel Materials:
 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
 2. Adhesives: Do not use adhesives that contain urea formaldehyde.
 3. Composite Wood Products: Products to be made without urea formaldehyde.
 4. Composite Wood Products: Products to comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and

Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

5. Composite Wood Products: Products to be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or to be made with no added formaldehyde.
 6. Composite Wood Products: Formaldehyde emission rates to not be greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 - a. MDF More Than **5/16 Inch (8 mm)** Thick: 0.11 ppm.
 - b. MDF **5/16 Inch (8 mm)** or Less in Thickness: 0.13 ppm.
 7. Steel Frame: Steel sheet, **0.0635-inch (1.61-mm)** nominal minimum thickness for uncoated steel.
- K. Panel Edge: Manufacturers standard.
1. Steel Face/Liner Sheets: Tension-leveled steel sheet, manufacturer's standard thickness required based on STC and partition performance requirements.
 2. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; **ASTM B221 (ASTM B221M)** for extrusions; manufacturer's standard strengths and thicknesses for type of use.
 - a. Frame Reinforcement: Manufacturer's standard steel or aluminum.
 3. Gypsum Board: ASTM C1396/C1396M.
 4. Medium-Density Fiberboard: ANSI A208.2.
- L. Panel Closure: Manufacturer's standard.
1. Final Closure for Manual Panels: Horizontally expanding panel edge with removable crank.
- M. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.
1. Hinges for Closure Panels, Pass Doors, and Pocket Doors: Manufacturer's standard, concealed (invisible).
 2. Handle: Lever, both sides; ADA.
 3. Automatic Door Closer: Manufacturer's standard.
 4. Hardware Finish: To be specified from standard finishes.
- N. Finish Facing: Acrylic backed fabric wall covering.

2.4 SEALS

- A. Description: Seals that produce operable panel partitions complying with performance requirements and the following:
 - 1. Seals made from materials and in profiles that minimize sound leakage.
 - 2. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
- B. Vertical Seals: Deep-nesting, interlocking steel astragals mounted on each edge of panel, with continuous, resilient acoustical seal.
- C. Horizontal Bottom Seals: Manufacturer's standard continuous-contact seal exerting uniform constant pressure on floor.
- D. Horizontal Bottom Seals: Resilient, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
 - 1. Automatically Operated for Acoustical Panels: Extension and retraction of bottom seal automatically operated by movement of partition, with operating range not less than **1-1/2 inches (38 mm)** between retracted seal and floor finish.
 - a. Basis-of-Design: Modernfold, Inc.; A2 - Automatic operable seals

2.5 PANEL FINISH FACINGS

- A. Description: Finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
 - 1. Apply seamless facings free of air bubbles, wrinkles, blisters, and other defects, with no gaps or overlaps. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
 - 2. Where facings with directional, or matching grain are indicated, mark facing top and attach facing in same direction.
- B. Fabric Wall Covering: 100% Xorel from same dye lot.
 - 1. Color/Pattern: As indicated in drawings.
- C. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.

2.6 SUSPENSION SYSTEMS

- A. Tracks: Steel or aluminum with adjustable steel hanger rods for overhead support, designed for operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than **0.10 inch (2.54 mm)** between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
 - 1. Basis of Design Product: Subject to compliance with requirements provide Modernfold, Inc.; 17 - Smart Track or comparable product.
 - a. Exposed Track Soffit: Steel, integral to track, pre painted Off-White finish.
 - 2. Panel Guide: Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.
 - 3. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
 - 1. Multidirectional Carriers: Capable of negotiating intersections without track switches.
 - 2. Basis of Design Product: Subject to compliance with requirements provide Modernfold, Inc #17 or comparable product.
- C. Track Intersections, Switches, and Accessories: As required for operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.
 - 1. Curve-and-Diverter Switches: Allow radius turns to divert panels to an auxiliary track.
 - 2. L Intersections: Allow panels to change 90 degrees in direction of travel.
 - 3. T Intersections: Allow panels to pass through or change 90 degrees to another direction of travel.
 - 4. X Intersections: Allow panels to pass through or change travel direction full circle in 90-degree increments, and allow one partition to cross track of another.
 - 5. Multidirectional Switches: Adjustable switch configuring track into L, T, or X intersections and allowing panels to be moved in all pass-through, 90-degree change, and cross-over travel direction combinations.
 - 6. Center carrier stop.
- D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

- E. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

2.7 ACCESSORIES

- A. Pass Doors: Swinging door built into and matching panel materials, construction, acoustical qualities, finish and thickness, complete with frames and operating hardware. Hinges finished to match other exposed hardware.
 - 1. Accessibility Standard: Fabricate doors to comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1
 - 2. Single Pass Door: **36 by 84 inches (914 by 2134 mm)**
 - 3. Pass-Door Hardware: Equip pass door with the following:
 - a. Door Seals: Mechanically operated floor seal on panels containing pass doors
 - b. Panic hardware.
 - c. Concealed door closer.
 - d. Exit Sign: Recessed, self-illuminated.
- B. Storage Pocket Door: Full height at end of partition runs to conceal stacked partition; of same materials, finish, construction, thickness, and acoustical qualities as panels; complete with operating hardware and acoustical seals at soffit, floor, and jambs. Hinges in finish to match other exposed hardware.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Modernfold, Inc.; Acousti-Seal pocket door or a comparable product.
 - a. Pocket Door Configuration: Manually operated, Type III, double doors hinged to a jamb on each side and closing in the center. One of the door panels is equipped with a smaller hinged panel that folds back when the operable partition is extended into the pocket
 - 2. Lock: Key-operated lock cylinder, to secure storage pocket door in closed position. Include two keys per lock.
 - 3. Lock: Deadlock to receive cylinder, to secure storage pocket door in closed position.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine flooring, floor levelness, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.
- B. Install panels in numbered sequence indicated on Shop Drawings.
- C. Install floor-supported operable panel truss system in accordance with manufacturer's written recommendations.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.
- F. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals.

3.3 A FIELD QUALITY CONTROL

- A. NCR Testing: Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing Extent: Testing agency to randomly select one operable panel partition installation(s) for testing.
 - 2. Testing Methodology: Perform testing of installed operable panel partition for noise isolation in accordance with ASTM E336, determined by ASTM E413, and rated for not less than NIC indicated. Adjust and fit partitions to comply with NIC test method requirements.
- B. An operable panel partition installation will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust pass doors and storage pocket doors to operate smoothly and easily, without binding or warping.
- C. Verify that safety devices are properly functioning.

3.5 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service to include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operable-partition operation. Parts and supplies to be manufacturer's authorized replacement parts and supplies.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 102239

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Hand dryers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each finish specified, full size.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Delegated-Design Submittal: For grab bars as indicated on drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.
 - 2. Shower Seats: Installed units are able to resist 250 lbf (1112 N) applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Tissue (Roll) Dispenser as indicated on Drawings
- B. Paper Towel (Roll) Dispenser as indicated on Drawings
- C. Waste Receptacle as indicated on Drawings
- D. Combination Towel (Roll) Dispenser/Waste Receptacle as indicated on Drawings
- E. Soap Dispenser as indicated on Drawings
- F. Automatic Soap Dispenser as indicated on Drawings
- G. Grab Bar as indicated on Drawings
- H. Sanitary-Napkin Disposal Unit as indicated on Drawings
- I. Seat-Cover Dispenser as indicated on Drawings
- J. Mirror Unit as indicated on Drawings
- K. Hook as indicated on Drawings

2.3 HAND DRYERS

- A. Hand Dryer as indicated on Drawings

2.4 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for portable fire extinguishers.

1.2 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.
- C. Samples: For each type of exposed finish required.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET - see architectural drawings

- A. Cabinet Type: see architectural drawings

- B. Cabinet Construction: see architectural drawings
- C. Cabinet Material: see architectural drawings
- D. Cabinet: see architectural drawings
- E. Materials: see architectural drawings

2.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare recesses for recessed and semi recessed fire-protection cabinets as required by type and size of cabinet and trim style. see architectural drawings
- B. Install fire-protection cabinets in locations and at mounting heights indicated.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Identification: see architectural drawings
- E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each indicated on architectural drawings.
 - 1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B

2.3 MOUNTING BRACKETS as indicated on architectural drawings

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: Top of fire extinguisher to be at 42 inches (1067 mm) above finished floor.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 116816

PLAY EQUIPMENT/ SAFETY SURFACE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions included in the Contract Documents.
- B. Related Work Specified Elsewhere:
 - 1. Section 310000 - Earthwork
 - 2. Section 030000 - Cast-in-place Concrete

1.2 DESCRIPTION OF WORK

- A. Install concrete footings as shown on the shop drawings provided by Kompan Inc.
- B. Concrete work as specified in Section 030000. All concrete for play equipment and accessory footings shall be 4000 psi.
- C. Install Rubber Safety Surface as manufactured and supplied by Kompan.

1.3 QUALITY ASSURANCE

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.
 - 1. American Society for Testing and Materials (ASTM):
 - A 36 Structural Steel
 - A 325 High-Strength Bolts for Structural Steel Joints
 - F 1487 Standard Consumer Safety Performance Specifications for Playground Equipment for Public Use
 - 2. American with Disabilities Act (ADA)
 - Accessibility Guidelines for Buildings and Facilities; Play Areas, amended November 20, 2000.
 - 3. U.S. Consumer Product Safety Commission (CPSC): Technical Guidelines for Play Equipment
- B. Installer Qualifications: An experienced installer familiar with local building codes and with the latest safety guidelines, who has completed installation of playground structures similar in material, design, and extent to that indicated for this project, and whose work has resulted in construction with a record of successful in-service performance.
- C. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project Site during times that construction is in progress.
- D. Standards: All play equipment design and construction shall meet or exceed the

requirements as published in the Handbook for Public Playground Safety issued by the U.S Consumer Product Safety Commission, the Consumer Product Safety Improvement Act (CPSIA) of 2008, and ASTM Designation F1487- Latest Rev., "Standard Consumer Safety Performance Specification for Playground Equipment for Public Use." Play Equipment design and construction shall also comply with "Guide to ADA Accessibility Guidelines for Play Areas", Final Ruling (ADA).

- E. Field Inspection: An authorized manufacturer's representative shall inspect and approve the installation of the play equipment prior to final acceptance by the Owner. The play equipment representative shall certify that the play equipment was correctly installed in accordance with the manufacturer's written instructions, all fastenings are securely installed meeting the manufacturer's maximum torque value, and meeting all requirements set forth in ASTM F1487- Latest Rev. A Document of Acceptance shall be provided by the manufacturer's representative stating that a field inspection was conducted, and the installation is accepted by the manufacturer's representative. Contractor to coordinate this effort.
- F. Playground installer / contractor shall provide certification that playground equipment is compliant with all ASTM, CPSC and Federal laws. Certification shall be provided by a Certified Playground Safety Inspector (CPSI).
- G. Contractor to provide an audit and final playground inspection by a Certified Playground Inspector (CPSI) which certifies that the entire playground (equipment and surfacing) is in compliance with ASTM, CPSC, ANSI and all Federal laws and regulations for playground safety. The CPSI shall be a third party and retained by the Contractor as part of the LUMP SUM for Play Equipment: Section 116816.

1.4 SUBMITTALS

- A. Submit to Engineer manufacturer's literature on all equipment to be provided.
- B. Submit manufacturer's product data and sample of rubberized safety surface.
- C. Shop Drawings of play structures, and music play panels, and fastening hardware shall be submitted. Show assembly and installation details.
- D. Manufacturer's written guarantee for minimum period of one year from date of installation. Guarantee shall cover replacement of any damaged components, not including vandalism or improper use.
- E. Product Data: Include physical characteristics such as materials, dimensions and finish.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Inspect all components on delivery to ensure that no damage occurred during shipping or handling. Materials shall be stored in original undamaged packaging in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft until ready for installation. Inspect components prior to installation.
- B. Play equipment consists of climbing rope apparatus and a music play panel. See drawings for model numbers and color finishes.
- C. Safety surface shall be a poured-in-place rubber system as provided by Kompan. Provide sample for approval.

PART 2 - PRODUCTS

2.1 PLAY EQUIPMENT/ SAFETY SURFACE

- A. Play equipment and accessories as supplied by Kompan.
Contact Danicka Russo
DanRus@kompan.com
914-714-8396
605 West Howard Lane, Suite 101, Austin TX 78753.

PART 3 - EXECUTION

3.1 INSTALLATION INSTRUCTIONS AND AIDS

- A. To guide installation, each structure shall be accompanied by bills of materials, written instructions, an erection plan view drawing, and a footing plan location drawing to be furnished prior to or with the delivery of the play structure. To facilitate assembly, each part shall be indelibly stenciled with an easily-read identification number keyed to the bills of materials and erection drawings. All components shall be shipped unitized, protectively wrapped, banded for mechanical handling and ready for assembly.

3.2 INSTALLATION

- A. Playground equipment shall be assembled and installed in strict accordance with manufacturer's printed instructions, true to the dimensions, layout, and details shown on the Drawings.
 - 1. Install play structure in compliance with manufacturer's written instructions.
 - 2. Install components in sequence as recommended by manufacturer.
 - 3. Install play structure as indicated on the drawings provided.
 - 4. Variations from the installation indicated must be approved.
 - 5. Variations from the installation indicated and all costs for removal and replacement will be the responsibility of the contractor.
 - 6. Installation Contractor will warranty the replacement of any warranty item for the entire manufacturer's warranty period at no cost to the Owner.
- B. Locate positions of all play equipment support posts with proper clearances as dimensioned on the Drawings, and as called for on manufacturer's shop drawings.
- C. Provide layout of all play structures in the field for Professional's approval prior to installation of concrete base and playground safety surfacing.
- D. Concrete footings shall be to depth and dimension indicated on the Drawings. All concrete for play equipment and accessories to be 4000 psi.
- E. Install all members at proper heights, levels, in plumb or horizontal relationships as required. Assemble all structures in conformance with approved shop drawings. Final installations shall be stable, secure and free from any hazardous projections.
- F. Touch up finishes damaged during installation with finish kits provided by manufacturer.

3.3 MANUFACTURER'S CERTIFICATION

- A. Contractor shall provide written certification by a certified Playground Inspector that all play equipment has been installed in strict accordance with manufacturer's guidelines and standards and meets all playground safety requirements.

3.4 CLEANING

- A. Debris, rubbish, and other material shall be removed and disposed of on a daily basis.

3.4 DEMONSTRATION

- A. Instruct the Owner's personnel on proper operation and maintenance of playground components.

END OF SECTION 116816

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-as indicated on drawings
 1. As indicated on Finish Legend

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 1. Grade: Custom
- B. Configuration: as indicated on drawings
- C. Countertops: as indicated on drawings
- D. Backsplashes: as indicated on drawings.
- E. Joints: Fabricate countertops without joints where a full sheet fills space needed.
- F. Joints: Fabricate countertops in sections for joining in field where a full sheet is not sufficient to span length needed. Keep joints to an absolute minimum.
- G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer.
- B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions.
- D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.
- F. Install aprons to backing and countertops with adhesive.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 129300

SITE FURNISHINGS

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. Provide all materials and equipment and do all work necessary to furnish and install the site furnishings, as indicated on the Drawings and as specified.
 - 1. Benches
 - 2. Table and chairs
 - 3. Pergola
 - 4. Storage shed
 - 5. Fence
 - 6. Raised Garden
 - 7. Steel Trellis
 - 8. Steel Edge

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 033001, CAST-IN-PLACE CONCRETE – SITEWORK.

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1.5 SUBMITTALS

- A. Complete shop drawings of each item specified shall be submitted.
- B. Where appropriate, and when approved by the Engineer, manufacturer's catalogue cuts may be substituted for shop drawings.
- C. Certificate of wood treatment shall be submitted upon delivery of treated wood items.
- D. Submit assembly instruction drawings showing layout(s), connections, bolting and anchoring details as per manufacturer's standards.
- E. A report of site furnishing parts consisting of recycled materials. Product specification data, providing test information for deflection and creep in accordance with ASTM D 648 and

ASTM D 2990 for site furnishings which use plastic lumber as a component, shall be submitted. The data shall provide a comparison of deflection and creep measurements to other comparable materials.

- F. Furnish evidence indicating that source of wood used for bench construction is a plantation farm or other designated source practicing sustain yield concept in forestry, and regulated by governing authorities regarding the growing, harvesting, and replanting of tropical hardwood trees.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory usage for at least 2 years.
- B. Benches, Tables and Chairs as manufactured by: Maglin
999 18th Street Suite #300 Denver, Co 80202
1-800-716-5506
Barbara Ritter
Barbara.Ritter@maglin.com
1-800-716-5506 70
- (a) Iconic Backed Bench
Count: 1
Model #: MBE-2300-00015
Color: yellow Ral 1018
- (b) 2700 Series - ALUM Chair: Aluminum, Laser Design 3 - Fusion Pattern, Surface Mount
Count: 20
Model: MCH-2700-00023
Color: yellow Ral 1018
- (c) 2700 Series - ALUM Café table - Fusion Pattern, Surface Mount
Count: 5
Model: MCH-2700-00021
Color: yellow Ral 1018
- C. Pergola as manufactured by STURDESIGN INC.
41 Woodslee Ave, Paris, Ontario, Canada. N3L 3V1
1-855-207-9669
info@sturdesign.com
- Arco Pergola: Cedar purlins with chisel ends mounted on top of beam
Product code: 2009(2)-cp-ab-240x120-ovw26ch-cv
Color: Black - Smooth powder coat finish
Material of Structural components: Aluminum 6061-T6
- D. Storage Shed and Raised beds as manufactured by EARTH EASY
605-55 E Cordova St., Vancouver, BC, V6A0A5,

1-88-451-6752
service@eartheasy.com

- (a) Space Saver Storage Shed: double doors and cedar shingle roof
Material: Western Red Cedar
Model #: KIT-SS84-D-METAL-AK

- (b) Natural cedar garden beds - 3 quantity
Width: 4'0"
Length: 8'0"
Height: 22"
Material: cedar wood

- (c) Natural cedar raised garden beds - 3 quantity
Width: 2'2"
Length: 11'10"
Height: 33 5/8"
Material: cedar wood

- E. Screen Fence as manufactured by SLEEK FENCE™
1017A MacArthur Rd, Reading, PA, USA, 19605
1-855-875-0855
franciz@sleekfence.com

Style: Privacy Fence
Fastner: Stainless steel
Color: Black matte powder coating post and warm cedar color panels
Material: Aluminum 6063-T6

- F. Cable Trellis System as manufactured by SECOSOUTH
2111 34th Way N, Largo, FL 33771
727-539-6314
SALES@SECOSOUTH.COM

Cable Trellis System
Product: System-2000-60
Material: Stainless Steel

- G. Steel Edge – see drawings
Coats rust-inhibiting primer and Black paint

PART 3 EXECUTION

3.1 GENERAL

- A. Contractor shall mark location of each site furnishing for review and approval by Owner prior to installation.
- B. The Contractor shall verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true, at locations indicated, in accordance with the approved manufacturer's instructions.

3.2 ASSEMBLY AND ERECTION OF COMPONENTS

- A. Items shall be shipped knocked-down (KD) ready for site assembly. Packaged components shall be complete including all accessories and hardware. New parts shall be acquired from the manufacturer; substitute parts will not be accepted unless approved by the manufacturer. When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

3.3 ANCHORAGE, FASTENINGS AND CONNECTIONS

- A. Furnish metal work, mounting bolts or hardware in ample time for securing into concrete or masonry as the work progresses. Provide anchorage where necessary for fastening furniture or furnishings securely in place. Provide, for anchorage not otherwise specified or indicated, slotted inserts, expansion shields, and power-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish the fastenings to which they are applied. Conceal fastenings where practicable.

3.4 TESTING

- A. Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: The Contractor shall measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. A written report describing the results of the testing shall be provided.

3.5 BENCHES, TABLES AND CHAIRS

- A. Examine areas to receive furnishing.
- B. Notify Engineer of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.
- D. Installation
 - 1. Install bench with concrete base in accordance with manufacturer's instructions at locations indicated on the Drawings.
 - 2. Install all furnishings level and plumb.
- A. Adjusting
 - 1. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Engineer.
 - 2. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Engineer.

A. Cleaning

1. Clean furnishing promptly after installation in accordance with manufacturer's instructions.
2. Do not use harsh cleaning materials or methods that could damage finish.

A. Protection

1. Protect furnishing to ensure that, except for normal weathering, receptacles will be without damage or deterioration at time of Substantial Completion.

3.6 Pergola

A. Work shall be executed only by workmen experienced in the trade.

B. Examine areas to receive pergola.

C. Notify Engineer of conditions that would adversely affect installation or subsequent use.

D. Do not begin installation until unacceptable conditions are corrected.

E. Coordinate pergola installation with installation of the surrounding surface at grade beneath the pergola.

F. Installation

1. Install concrete footings. Provide shop drawings for footing signed and sealed by a New York state licensed Engineer.
2. Provide a signed and sealed engineered shop drawings for the pergola structure supplied by the manufacturer.
3. Install pergola in accordance with manufacturer's instructions at locations indicated on the Drawings.
4. Install pergola level and plumb.

G. Adjusting

1. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Engineer.
2. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Engineer.

H. Cleaning

1. Clean pergola promptly after installation in accordance with manufacturer's instructions.
2. Do not use harsh cleaning materials or method's that could damage finish.

I. Protection

1. Protect pergola from paint spatter, splashed concrete, and other construction damage by wrapping and taping in place plastic sheeting or heavy kraft paper around the bicycle racks until adjacent work is completed.

3.7 Raised Planter and Storage Shed

- A. Examine areas to receive raised planter and storage shed.
- B. Notify Engineer of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.
- D. Installation
 - 1. Install Planter in accordance with manufacturer's instructions at locations indicated on the Drawings.
 - 2. Install Planter level and plumb.
 - 3. Install Storage Shed on concrete slab. Follow manufacturer's installation specifications. Secure shed to slab with stainless steel anchoring devices. Provide sample for approval.
- E. Adjusting
 - 1. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Engineer.
 - 2. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Engineer.

3.8 Screen Fence

- A. Work shall be executed only by workmen experienced in the trade.
- B. Examine areas to receive Fence.
- C. Notify Engineer of conditions that would adversely affect installation or subsequent use.
- D. Adjust for stepping the fence in areas where there are grade changes.
- E. Do not begin installation until unacceptable conditions are corrected.
- F. Installation
 - 1. Install Fencing and Gates in accordance with manufacturer's instructions at locations indicated on the Drawings.
 - 2. Install Fencing and Gates level and plumb.
- G. Adjusting
 - 1. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Engineer.
 - 2. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Engineer.
- H. Cleaning

1. Clean Fencing promptly after installation in accordance with manufacturer's instructions.
2. Do not use harsh cleaning materials or method's that could damage finish.

I. Protection

1. Protect Fencing and gates from paint spatter, splashed concrete, and other construction damage by wrapping and taping in place plastic sheeting or heavy kraft paper around the Fencing until adjacent work is completed.
2. Protect installed fencing and gates to ensure that, except for normal weathering, fencing will be without damage or deterioration at time of Substantial Completion.

3.9 Cable trellis system

- A. Cable trellis system shall be located as indicated on the drawings. System building shall be fastened to building as indicated on the drawings and in accordance with manufacturer's printed instructions.
- B. Provide a mark out of the trellis on the building façade for review and approval.

3.9 CLEAN UP

- A. Surplus construction and demolition material shall be handled in accordance with construction documents.
- B. Debris, rubbish, and other material shall be removed and disposed of on a daily basis in accordance with the construction documents.

END OF SECTION

SECTION 220401
GENERAL PROVISIONS FOR PLUMBING AND DRAINAGE WORK

PART-1

1.01 SCOPE AND INTERPRETATION

- A. These Specifications and accompanying Drawings provide for the furnishing, setting and connection of sanitary fixtures, the installation of drainage, and water supply systems.
- B. The specifications and Drawings require the Contractor to provide all labor, materials, equipment and appliances to perform of all Work pertaining or incidental thereto, which is needed to complete the Work shown on the Drawings and called for in the Specifications.
- C. The complete systems and the Work shall be so installed as to give proper and continuous service under all conditions, and shall be in accordance with the requirements of all public authorities having jurisdiction and to the complete satisfaction of the Authority. Any Work shown on the Drawings and not particularly described in the specifications, or vice versa or any Work which may be deemed necessary to complete the Contract shall be provided by the Contractor as part of its Contract.
- D. For purposes of clearness and legibility, plumbing Drawings are essentially diagrammatic and size and location of equipment are drawn to scale wherever possible. The Drawings indicate size, connection points and routes of pipe. It is not intended, however, that all offsets, rises and drops are shown. Provide piping as required to fit structure, avoid obstruction, and retain clearances, headroom openings and passageways. Piping installed over any means of egress and access passageways must be 7'-6" clear inclusive of insulation.
 - 1. Location of items passing through roofing/ waterproofing membranes shall be in strict accordance with recommendations of the NRCA (National Roof Contractors Association) Manual to allow for proper flashing of items, including, but not limited to, the following:
 - a. No penetrations shall be made within 12" of any walls, parapets, roof curbs, expansion joints or any other projections (clear distance between penetration or equipment curb face shall be 12" minimum). Clearances for certain items (such has drains) may be specified elsewhere in the specifications and are to be followed, as the 12" indicated above is a minimum for items not specifically indicated.
 - b. Provide manufactured curb chases where multiple small pipes enter at one location.
 - c. Piping/equipment supports that penetrate membranes shall be round or square/rectangular to allow proper flashing. Use of "kindorf" type supports is not permitted to penetrate membranes.
 - 2. Piping at equipment must be done in a manner such that access around equipment is not impeded, such as at equipment platforms.

- E. Fixtures shown and described on the Drawings shall be connected with waste, vent and water supply piping in accordance with the requirements of New-York City Building Code, despite the omission of indication of such piping on the plans. Any question involving the installation of such piping shall be referred to the Authority for resolution.
- F. Fixtures, piping and other plumbing items which are shown and described on the Drawings and are not specifically labeled "Future" or "N.I.C." shall be provided by the Contractor. Related Work necessary for the proper installation shall be performed by the Contractor.
- G. Testing of plumbing systems shall be completed prior to commencement of the commissioning process, as written tests results and sign-offs by the Authority must be submitted to the Commissioning Agent prior to starting the commissioning process.
- H. Scope of Work: The plumbing and drainage work of this contract shall include but shall not be limited to the following systems, equipment and services:
 - 1. Cold Water Service Piping: Not Used.
 - 2. Fire Service Piping: Not Used.
 - 3. Cold Water Distribution Piping: Complete piping system including water pressure booster system, controls, mains, risers, and branches from connection to cold water service piping to all fixtures and equipment.
 - 4. Hot Water/Hot Water Circulating Piping: Complete piping systems; mains, risers, and branches to and from all fixtures and equipment including gas fired and/or electric water heaters, in-line circulating pumps, aquastats and controls.
 - 5. Gas Piping: Not Used.
 - 6. Sanitary Drainage/Vent piping: Complete piping system; soil, waste, drain and vent piping, building house drain and building house sewer including sewage ejector, sump pumps, floor drains, from all fixtures and equipment to connection into public sewer, and vent extensions through roofs. Vent piping shall include required roof openings, pipe sleeves and flashing.
 - 7. Acid Waste/Vent Piping: Not Used.
 - 8. Storm Water Drainage Piping: Complete piping system including roof drains, area drains, catch basins, piping and connection to detention basins and from detention basins to public sewer.
 - 9. Plumbing Fixtures: Including water closets, urinals, lavatories, combination sink and drinking fountains, electric water coolers, wash centers, drinking fountains, service sinks, showers (complete with all accessories), mixing valves, supports and carriers.
 - 10. Water Service Meter Assembly: For the main water service to building - complete with approved compound water meter, backflow preventer device, strainer, valves, pipe, fitting, foundation pad.

11. Fire Service Double Detector Check Valve Assembly: Not Used.
12. Reduced Pressure Zone Backflow Preventers (RPZ): Not Used.
13. Gas (Flue) Venting: Not Used.
14. Equipment furnished under other Sections of this Contract: Including kitchen equipment and Heating, Ventilating and Air Conditioning equipment shall be piped for gas, hot and cold water, waste and vent.
15. Piping, Equipment Supports, and seismic restraints: To comprise all restraints, hangers, pipe guides, rods, beam clamps, brackets, pipe anchors, other attachments, floor flanges, masonry anchors, bolts, nuts, washers, and other items as required to fully support all piping, gas venting, and equipment installed under this contract inclusive of spring hangers, seismic restraints, and vibration mounts where recommended by equipment manufacturers, where required to meet noise abatement regulations and as necessary to prevent piping and equipment vibrations being transmitted to structure. Supports for pipes/etc. supported by the roof deck shall utilize manufactured supports or pipes that will permit effective roofing. Use of irregular shaped units such as strut channels is not permitted.
16. Provide unions and stop valves at all equipment connections and where required for service, repairs and draining.
17. Piping - General: Piping, piping installation or hook-up shall mean a complete installation in all respects including pipe, fittings, valves, unions, traps, strainers, specialties and other miscellaneous items to make piping systems and equipment operational.
18. Instrumentation: Provide thermometers, pressure gauges and other items for all piping and equipment installed under this contract, as indicated on contract drawings and as necessary for operation, maintenance and adjustments.
19. Insulation, Painting and Identification: As specified in their respective sections of this Contract.
20. Miscellaneous Work: Included shall be all items of materials, piping, controls, wiring and other miscellaneous items not specifically shown on Contract Drawings or called for herein but which are normally furnished and required for a complete installation of this type.
21. Tests: The Contractor shall perform pressure, performance and operating tests and other tests as hereinafter specified, as directed by the Authority and as required by agencies having jurisdiction.
22. Sealing of Openings: Openings left in walls, floors, ceilings or partitions shall be sealed. Finish shall match existing adjoining finish in all respects.
23. Seismic requirements of the Building code apply to New Buildings, Additions, and retrofit work on Existing Buildings constructed after LL 17/1995 became effective.

- a. Refer to HVAC specifications 230503 and 230504 for Vibration Isolation and Seismic requirements.
- b. Calculations (including the combining of tensile and shear loadings) to seismic bracing designs shall be stamped by Contractor's Registered Professional Engineer with at least five years of seismic design experience in non-structural building components in New York State. The Contractor shall retain a registered professional engineer who shall provide all required shop drawings (signed and sealed). Contractor's engineer shall also field inspect all installations of vibration isolators and seismic bracing and shall submit affidavit that all isolators/bracing have been installed in accordance with the signed/sealed coordinated shop drawings.

24. Pre-installation Conferences

- a. Before the P&D Work is scheduled to commence, a conference will be called by the Authority's Representative at the site for the purpose of reviewing the Drawings and the Specifications and discussing requirements for the Work. The conference shall include, at a minimum, the Contractor, the P&D Contractor, the Architect and the Authority's Construction Inspection Division (CID) Inspector. Contractors/installers of other trades may also be required to attend to discuss coordination with their work. The Contractor shall send a conference agenda to all attendees prior to the scheduled date of the conference.
- b. The P&D Contractor shall attend pre-installation conferences of other trades for coordination of the work.

25. Coordination Drawings: The plumbing contractor shall cooperate with the HVAC, Fire Protection Systems, and Electrical contractors in the development of the coordination drawings. The drawings, indicating ductwork, steam, hydronic and fuel piping, etc. shall be generated by the HVAC contractor, who in turn is to provide them to the Plumbing & Drainage contractor for inclusion of sanitary, storm, gas, and domestic piping in this coordination set, and subsequently to the Fire Protection Systems and Electrical contractors. Ensure that access for commissioning and replacement/maintenance of equipment, valves, gauges, dampers, controls, etc. is accounted for in the preparation of the drawings. The specified order in which the various trade contractors impose their work on the coordination drawings is not intended to grant priority to any one trade contractor in the allocation of space. At the completion of this phase, hold a coordination meeting to eliminate any interference among the trades that the drawings indicate and to avoid any conflicts in installing the Work.

26. All penetrations made into other trades work are to be sealed to air tight/watertight condition. Penetrations through insulated systems, such as refrigerated rooms/equipment, etc. shall be insulated and sealed on both sides of penetration. Sealant on interior side of such insulated spaces/equipment shall be silicone recommended by manufacturer.

1.02 CODES AND STANDARDS

- A. It shall be unlawful for any person to perform the work referred to under this Plumbing and Drainage Specifications and/or shown on the Plumbing and Drainage Contract Drawings unless such person is a licensed master plumber, partnership, corporation or other business association as permitted by the NY Building Code and unless such work is performed under the direct and continuing supervision of a licensed master plumber.
- B. Where requirements for products, materials, systems, equipment, methods and other portion of the work specified herein exceed minimum requirements of regulatory agencies having jurisdiction over the construction work, contractor shall comply with such requirements specified herein, unless specifically approved otherwise by the Authority.

1.03 TORCH BURNING OPERATION

- A. The storing and use of oxygen and combustible gases in conjunction with torch burning apparatus is subject to the Rules and Regulations of the Division of Fire Prevention of the Fire Department of the City, latest Fire Prevention (F.P.) Directive. Fire watches shall be provided during all operations using torches for burning, cutting or welding.
- B. Contractor shall apply for and obtain permits for the use and storage of such equipment on school premises. The operator of such equipment shall have a certificate of fitness issued by the Fire Department.
- C. The cost of permits, certificates, fire watches, apparatus and other items required in the torch burning operation shall be borne by the Contractor at no additional cost to the Authority.

1.04 PROTECTION OF MATERIALS AND WORK

- A. New Building
 - 1. Open ends of piping shall be temporarily closed by a proper fitting, until piping is approved and ready for service. The use of water closets and other plumbing fixtures during the progress of the Work is strictly prohibited.
 - 2. Motors and appurtenances shall be covered and protected during the progress of the Work.
 - 3. Plumbing fixtures and other items shall be protected during the progress of the Work. When the building is practically complete and ready for use the fixtures and other items shall be cleaned and all metal work polished and the entire installation put in perfect working order.

1.05 GUARANTEES AND WARRANTIES

- A. Contractor's Guarantees: The Contractor guarantees that all Work of this Contract is free from all defects, and is as specified, and that should any defects, which cannot be proven to have been caused by improper use, develop within the space of one year from the date of substantial completion of the Work, such defects shall be made good by the Contractor, free of cost to the School Construction Authority.
- B. Manufacturer's Warranty: Hermetically sealed compressor units for water coolers, or any other equipment mechanically refrigerated, shall have a five-year warranty. This

warranty shall cover the replacing the hermetically sealed compressor unit if it shall become defective within 5 years from the date as defined in the General Conditions. It shall be replaced free of charge, by the manufacturer, to the Authority.

1.06 GAGES

- A. Wherever thickness of metals are designated on the Drawings or in the Specifications by gage number, and the type of gage, or thickness in decimals of an inch, is not stated, the following gages shall apply.

Material	Gage
Aluminum Sheet	Brown & Sharpe or American Wire
Wire Aluminum, Brass and Copper	Brown & Sharpe or American Wire
Sheet Brass and Copper	Brown & Sharpe or American Wire
Brazed Brass and Copper Tubing	Brown & Sharpe or American Wire
Seamless Brass and Copper Tubing	Birmingham Wire (Stubs Iron)
Seamless Steel Tubing	Birmingham Wire (Stubs Iron)
Stainless Steel Sheets.....	U.S. Standard
Monel Metal Tubing	Birmingham Wire (Stubs Iron)
Monel Metal Sheets	U.S. Standard
Sheet Steel and Iron	U.S. Standard
Steel Wire	American Steel and Wire
Zinc	Zinc

1.07 OPENINGS AND CHASES

- A. In addition to the requirements in the Article entitled Cutting, Patching and Removals, the following shall also apply:

Openings through exterior foundation walls shall be made watertight by the Contractor after pipes, conduits and other items passing through the wall have been installed. This building is planned and detailed, and is the intent of these specifications to provide a structure that will prevent the penetration by rodents and vermin of any vacant space where they might find a harborage. The Contractor will be held responsible for securing this condition by the closing of all points of access to such spaces, including the passage of piping and conduits, through all walls, partitions, ceilings and furred out spaces, the

closing of access to voids in hollow tile or cinder blocks. There shall be a special inspection of the building with regard to this matter before final acceptance.

1.08 INSTRUCTION OF CUSTODIAN

- A. After the plumbing, and drainage systems have been tested, and fixtures, apparatus and all other items adjusted and operating properly to the satisfaction of the Authority, Contractor shall furnish a competent person to instruct the Custodial staff in the operation and maintenance of the systems. Determination of the date and time of such instruction shall be under the direction of the Authority's Representative.

1.09 TEMPORARY FIELD OFFICE (IF APPLICABLE)

- A. In addition to the requirements in the Article entitled Temporary Field Offices, the following shall also apply:
 - 1. Each trailer shall be provided with plumbing fixtures, soil, waste, vent and supply piping. Provide underground temporary soil and water piping for all temporary plumbing facilities, making connections to outlets provided at bottom of each trailer and completing all other outside plumbing Work required for proper and continuous functioning of these trailers. Provide a temporary wood trap pit where required.
 - 2. Temporary drainage pipe and fittings shall be service weight cast iron. Trap shall have two hand holes with cast-brass screw plugs. All joints shall be caulked with oakum and lead.
 - 3. Exposed water and drainage piping, including traps and fittings, subject to frost shall be insulated with two 1" thick layers of molded fiberglass pipe insulation. The outer layer shall have a vapor barrier jacket. The vapor barrier jacket shall then be covered with a weatherproof jacket of asphalt saturated roofing felt having a nominal weight of 15 lbs. per square. The weatherproof jacket shall be applied with all joints lapped at least 3". Horizontal joints shall be lapped downward to shed water. The jacket shall be secured in place with No. 20 gage galvanized annealed steel wire.
 - 4. Provide adequate water to toilet fixtures and connect water supply line in the street in accordance with the requirements of the Bureau of Water Supply or Private Water Company.
 - 5. Provide 1" branch water supply line from temporary lines if necessary into boiler room; Provide a valved outlet where directed and connect from said outlet to boilers for temporary heat.
 - 6. When the temporary field offices are removed, all temporary plumbing Work including supply line for temporary heat shall be removed and all necessary work such as plugging mains, sewers, and other miscellaneous items shall be done by the Contractor.
 - 7. After the temporary toilet facilities have been removed from the site, the Contractor will assign a toilet room within the building for the use by the workmen

and a toilet for the use by the Authority's Inspectors. The Contractor shall complete the work in and make these rooms available.

1.10 SUBMITTALS

- A. Formal submission for approval of manufacturer is not required if the Contractor provides equipment as per manufacturer/model number or series listed in the specification. Formal submissions are also not required for materials and appurtenances (ex. sheet metal, pipes, etc.) if the Contractor provides items as defined in the specification. In this case, Contractor must submit affidavit (for record purposes only) stating that listed equipment and/or items as defined in the specification will be provided. Submittals are mandatory for certain critical items and will be so noted in the respective specifications. Submittals are always required to verify capacity. Schedules, installation instructions, startup manuals, operation and maintenance manuals, and shop drawings are always required to be submitted.

1.11 CLEANING AND REPAIR

- A. At the completion of the Work and before the final inspection is made the Contractor shall thoroughly clean all fixtures, apparatus, appurtenances, piping, brass and chrome and nickel-plated work, marble and stone work, and leave these items free from all marks, scratches, stains, and other damage. All pumps, filters, heaters, and other equipment shall be cleaned and left in condition to operate, and the work, as a whole, left in perfect working order. Remove all tools, debris and excess materials from the premises.
- B. Contractor shall not leave sharp exposed metal edges (bottom of threaded rods, P&D equipment supports, etc.) that could otherwise present safety hazards to the building's occupants/work staff.

1.12 BMS/DDC COORDINATION

- A. Refer to the Article entitled "BMS/DDC Coordination" of Section S01010 for the coordination of work related to P&D and TCC Contractor. Coordinate with General Contractor as to actual scope to be included in the P&D and Temperature Control Work and delineation with the Electrical subcontractor's work.

END OF SECTION

SECTION 220410
PLUMBING PIPING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of plumbing piping work is indicated on Drawings and by the requirements of this Section including but is not limited to the following:
 - 1. Pipe
 - 2. Fittings
 - 3. Piping Joints
 - 4. Sleeves for Pipes
 - 5. Unions
 - 6. Cleanouts and Cleaning Screw Plugs
 - 7. Escutcheon Plates
 - 8. Traps
 - 9. Drain Bibbs
 - 10. Hose Bibbs
- B. All pipe and pipe fittings that convey water for human consumption must be certified for meeting the requirements of the federally mandated Reduction of Lead in Drinking Water Act of 2014 (not more than a weighted average of .25% lead). Regardless of the pipe manufacturer listed in these specifications, provide pipe and pipe fittings that meet the requirements of the act. All solder used during installation of piping associated with the potable water system designed for human consumption must also meet the requirements.

1.02 RELATED SECTIONS

- A. Division 01, 22, 23, 26, Architectural, Structural and Civil Specifications

1.03 CODES AND STANDARDS

- A. Comply with applicable portions of the NY Building Code. Where requirements for products, materials, equipment, methods and other portion of the work specified herein exceed minimum requirements of the NY Building Code, contractor shall comply with such requirements specified herein, unless specifically approved otherwise by the Authority.
- B. Standards listed below are referenced in this section.
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American Standards Association (ASA)
 - 3. American National Standards Institute (ANSI)

4. United States of America Standards Institute (USASI)
 5. Cast Iron Soil Pipe Institute (CISPI)
 6. American Water Works Association (AWWA)
 7. NSF International
- C. Brazing: Certify brazing procedures and brazers.
- D. Approved Agency Certification: Certification and listing by an Approved Agency in accordance with NY Dept. of Buildings rules, indicating that the materials and assemblies as regulated by the NY Building Code are acceptable for the intended use. When test methods are stipulated in the NY Building Code, the tests utilized shall be stated in the Certification.
- E. Reduction of Lead in Drinking Water Act: Beginning on January 4, 2014, a federal law known as "Reduction of Lead in Drinking Water Act" takes effect. This law requires that faucet, plumbing fixtures, pipe and pipe fittings must conform to "lead free" criteria level whenever these plumbing related products are employed for delivery of potable water for human consumption.
1. The law makes it unlawful for any person, including a contractor, to introduce into commerce any pipe, pipe fitting, plumbing fixture, faucet that is not lead free.
 - a. "Lead free" content is intended to mean not more than 0.2% lead when applied in connection to solder and flux and not more than 0.25 percent of the weighted average of lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fixtures and faucets.
 - b. The section of the federal act that applies to solder and flux, 0.2% lead content, went into effect back in August of 1998; and for the most part soldering product being sold in today's market complies with the law.
 - c. The requirement for .25% weighted average of lead when applied to the wetted surfaces of pipes, pipe fittings, plumbing fixtures and faucet is the new section of the law that requires special attention from a contractor.
 2. To ensure compliance with "Reduction of Lead in Drinking Water Act", a procedure for determining lead content was developed. The calculation procedure works as follows:
 - a. "For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product. The lead content of the material used to produce wetted components shall be used to determine compliance with paragraph (1)(B) [Paragraph 1B Describes 0.25% Requirement for 0.25 % Lead Content]"
 - b. As an alternative to implementing the lead content calculation, the contractor may choose to demonstrate compliance with the act by requiring from manufacturer documentation certifying that products are lead free based on either calculation or tests or third party certification.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipe materials properly protected, and undamaged.
- B. Properly protect all piping so as to prevent damage to the pipe or the introduction of foreign material into the pipe. For the purpose of protecting piping from pre-installation contamination, all piping shall be shipped to job site with suitable caps, sheet metal covers or plugs. Pipe caps shall not be removed until just before installation.
- C. Examine all pipe and fittings before laying. Do not install any piece that is found to be defective.

1.05 SUBMITTALS

A. Product Data

- 1. Clean-outs
- 2. Escutcheons
- 3. Pipes & fittings
- 4. Thermo-well

OR

Submit a compliance affidavit, if pipe and fittings match contract documents. Manufacturer's technical product data submission will be required if a substitution is proposed.

- B. Submit Shop Drawings for all piping installations.
- C. Pipe Schedule: Itemize pipe and fitting materials for each specified application.
- D. Sample: Polypropylene pipe & fittings with the required marking.
- E. Certifications
 - 1. Brazing Certifications: Submit as required for piping work.
 - 2. Lead-free Certifications: Provide manufacturer's certification that pipe and fittings in contact with potable water meet the requirements of the Reduction of Lead in Drinking Water Act effective Jan 4, 2014.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Piping shall conform to the following:

- 1. Cast-iron Pipe
 - a. Bell and Spigot ends:

Evenly coated, cylindrical, smooth, free from all defects, of uniform thickness and of the weights, and shall be of the grade known in commerce as "service weight". Each length of pipe and each fitting shall be plainly

marked with the manufacturer's name or registered trademark and with the letters "SV" to indicate "Service weight". The marking may be cast, stenciled, or otherwise applied on the pipe so as to be clear and legible at the time of installation. The marking shall be cast on fittings and shall be located away from the spigot end so as not to interfere with proper joining upon installation. Cast-iron soil pipe and fittings shall comply with ASTM A74;

b. No-Hub:

Evenly coated, cylindrical, smooth, free from all defects, of uniform thickness and of the weights. Each length of pipe and each fitting shall be plainly marked with the manufacturer's name or registered trademark. The marking may be cast, stenciled, or otherwise applied on the pipe, and cast on fittings so as to be clear and legible at the time of installation. Cast-iron soil pipe and fittings for hubless cast iron sanitary system shall comply with CISPI Standard 301, and ASTM A888, latest edition.

2. Precast Reinforced Concrete Pipe

- a. Pipe shall conform to all requirements of ASTM C76, Class III, Wall B of that standard.
- b. The pipe shall be made by a manufacturer experienced in the manufacturing of precast reinforced concrete pipe. Inside surface of pipe shall be smooth.

3. Steel Pipe

- a. Black steel pipe and galvanized steel pipe shall be Grade A, seamless, electric resistance welded pipe, or type F furnace butt-welded, and shall be made in accordance with the current Edition of the ASTM A53. Pipe shall be free from scale, and rust, injurious sand marks, blisters, scale pits, laminations, imperfect welds, or other defects that might affect its strength, appearance or ability to resist corrosion. The maker's name shall be rolled or stamped in the metal at intervals of each length of pipe 2" and larger, and stamped on a metal tag secured to each bundle of pipe 1 $\frac{1}{2}$ " and smaller.
- b. Unless otherwise specified or indicated on Drawings, black steel pipe shall be standard weight and galvanized steel pipe shall be Schedule 40 galv. pipe.
- c. Available Manufacturers:

U.S. Steel Co.
Sawhill Tubular Co.
North Star Steel
Sharon Tube Co.
Koppel Steel Corp.
Wheatland Tube Company
Nucor Tubular

4. Brass Pipe

- a. Seamless drawn red-brass pipe made in accordance with the current edition of ASTM B43 and of an alloy containing not less than eighty-five

(85%) copper and not more than 0.05% lead, semi-annealed, regular weight. Pipe to be threaded on both ends with NPT (Taper Pipe Threads) conforming to ANSI B2.1. The maker's name shall be stamped at intervals on each length of pipe and the pipe shall be color-coded White in accordance with The Copper and Brass Research Association standards.

b. Manufacturers:

Chase Brass & Copper Co.
Phelps Dodge Copper Products Corp.
Revere Copper & Brass Inc.
Merit Brass Company.

5. Copper Tubing Type "K": Tubing shall be hard drawn seamless tubing manufactured in 20 foot lengths, in accordance with the Copper Development Association and ASTM B88, for below ground use only. Each tube shall be identified by means of color bars, green, running full length of each tube.
6. Copper Tubing Type "L": Tubing shall be hard drawn seamless tubing manufactured in 20 foot lengths, in accordance with the Copper Development Association and ASTM B88, for above ground use only. Each tube shall be identified by means of color bars, blue, running full length of each tube.
7. Polypropylene Plastic Pipe:
 - a. Pipe shall be similar to a product manufactured by GF Piping Systems LLC, Enfield "Enfusion", Orion BlueLine, Zurn Chemical Drainage or other approved pipe manufacturers, having flame retardant pattern, Schedule 40 polypropylene. Materials shall be in accordance with ASTM D4101 and shall be flame retardant in accordance with ASTM D635. All piping shall be compatible with the Coil Fusion method. Each length of pipe shall be plainly marked with manufacturer's name, pipe size, schedule, type and ASTM information. The marking may be stenciled or otherwise applied on the pipe so as to be clear and legible at the time of installation. The sample of pipe showing required markings shall be submitted for approval.
8. High Density Polyethylene (HDPE) Piping:
 - a. Manufactured pipe shall be of smooth interior, annular exterior, corrugated polyethylene complying with the requirements for test methods, dimensions, and markings found in AASHTO M294 Type S or ASTM-D3350 for 12" – 60" diameters.
 - b. Virgin material for 12"- 60" Pipe and fitting production shall meet the requirements of AASHTO M294 or ASTM F2306, which is a slow crack resistant material, evaluated using the constant ligament-stress (NCLS) test according to the procedure described in Section 9.5 of AASHTO M294 or Section 7.8 of ASTM F2306.
 - c. Pipe shall be joined with a bell-and-spigot joint and shall be watertight. Pipe shall be Hancor BLUESEAL, ADS N12 WT, or pre-approved equal.
 - d. The bell-and-spigot HDPE piping network shall be joined using watertight connections in accordance with the requirements of ASTM D3212. Elastomeric seals (gaskets) made of polyisoprene and meeting the requirements of ASTM F477 shall show no visible water leaks when tested

under 10 feet hydrostatic water test. A joint lubricant recommended by the manufacturer shall be used on the gasket and bell during assembly.

- e. To preclude crumbling and provide better joint performance of the HDPE pipe, the bell and spigot ends shall be reinforced, including a bell tolerance device. The bell tolerance device must be installed by the pipe manufacturer.
- f. Approved Manufacturers:
Hancor Inc., ADS Inc.

9. Ductile Iron Pipe

- a. Ductile iron pipe shall have an outer coating of coal tar and shall comply with the requirements of the latest Standard Specifications of AWWA C151.
- b. Thickness class of pipe shall be as follows:
 - 1) Yard Drainage: thickness class 51 for all sizes
 - 2) House Sewers: thickness class 56 for all sizes
 - 3) Water Service piping: thickness class 52 for three (3) & four (4) inch diameter pipe and thickness class 56 for pipe size greater than four (4) inch.
- c. Ductile iron pipe shall also comply with the following requirements:
 - 1) Marking: the weight and class and other designated markings required by ANSI specifications shall be stenciled at the foundry on all ductile iron pipe, fittings and specials.

Markings shall be painted conspicuously in white on the outside of each pipe length, fitting and special casting after the shop coat has hardened.
 - 2) Cement Lining: Pipe to be cement lined, except when used in association with sewer piping, in accordance with AWWA C104 with thickness of lining to be 1/8" minimum. A plus tolerance of 1/8" shall be permitted on all sizes of pipe.
- d. Manufacturers:
 - 1. U.S.Pipe and Foundry
 - 2. American Cast Iron Foundry
 - 3. Amsted Industries/Griffin Pipe Products Co.

10. Vacuum and Air Piping: Risers and branches to be black steel pipe or type L copper tubing.

11. Polyvinylidene Fluoride Plastic Pipe (PVDF):

- a. Chemical and acid resistant pipe material with developed smoke rating less than 50 and flame spread index less than 25. All piping and fittings must meet the requirements of ASTM F1673, ASTM E84 and UL 723.

- 1) Schedule 40 PVDF pipe, including fittings for drainage of wastes laden with corrosive substances or chemicals shall be joined by the use of the heat fusion method.
- 2) Each length of pipe shall be plainly marked with manufacturer's name, pipe size, schedule, ASTM and UL. The marking may be stenciled or otherwise applied on the pipe so as to be clear and legible at the time of installation.

B. Fittings and Joints

1. Cast-iron Hub and Spigot Piping:

- a. Fitting shall be service weight pattern, evenly coated, manufactured in accordance with the current ASTM A74 and shall correspond with the pipe in all particulars.
- b. Material used for Hub and Spigot caulked joints shall be molten lead and packed oakum.

2. Cast-iron No-Hub Piping (Hubless Coupling)

- a. Cast iron No-Hub pipe fittings shall be made up to comply with CISPI Standard 301 and ASTM A888. No-Hub coupling gaskets shall conform to ASTM C564. Each approved coupling shall be permanently marked on its external surface with: manufacturer's name or trade mark, nominal pipe size, and shall meet pressure testing standards set in ASTM C1540.
- b. Stainless steel couplings shall be heavy duty with shield of 28 gauge 304, 18-8 chromium nickel stainless steel, neoprene gasket and stainless steel bolts and bands and shall conform to ASTM C1540.

Couplings shall be HI-Torque 80 by Clamp-All Corp., with two (2) clamps for pipe sizes up to and including 4" and four (4) clamps for pipe 5" to 10"; or Husky HD-2000 by Husky Technologies Division of ANACO with four (4) clamps for pipe sizes up to and including 4" and six (6) clamps for sizes 5" to 10" or Mission HW Series by Mission Rubber Company, with four (4) clamps for pipes up to and including 4" and six (6) clamps for pipes 5" to 10"; or POC coupling by Thermafit Industries.

3. Fittings and Joints for Ductile Iron Pipe

- a. Jointing for water carrying pipe shall be mechanical type consisting of bell end with cast flange, cast iron gland, rubber gasket and necessary bolts and nuts. Mechanical joints shall conform to AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern and gaskets to AWWA C111. Bolts shall be high-strength, low-alloy steel with minimum 45,000 psi yield strength and comply with AWWA C111. Unless otherwise specified, gasket material shall be rubber.
- b. Push-on joints shall conform to AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern and gaskets to AWWA C111. Push-on joints shall also be restrained using Field- Flange 350 fitting and Field-Lok 350 gasket assembly as manufactured by U.S. Pipe or other approved equal. Unless otherwise specified, gasket material shall be

rubber. Push-on Joints shall be similar to Tyton Joint of U.S. Pipe and Foundry or Fastite Joint of American Cast Iron Pipe Company. Push-on joints manufactured by Griffin Pipe Product Co. will also be acceptable.

- c. Fittings, joints and accessories for ductile iron shall comply with the requirements of the latest Standard Specifications of AWWA C115; C153; C151 & C110
4. Fittings for Galvanized Pipe:
- a. Fittings and couplings shall be galvanized cast-iron, recessed and threaded drainage fittings conforming to ASTM A126, Class B, with smooth interior waterway and with threads tapped so as to give a uniform grade to branches of not less than 1/4" to the foot and keep the vertical lines plumb.
 - b. Fittings for screwed vent piping shall be maleable iron recessed and threaded drainage fittings.
 - c. Roll Grooved Ends:
 - 1) Housing: Ductile iron: ASTM A536 Grade 65-45-12 with factory grooved ends designed to accept manufacturer's couplings; EPDM gaskets.
 - 2) Manufacturers: Victaulic, Anvil International Inc, TYCO Grinnell Mechanical Products, Shurjoint Piping Products.
5. Fittings for brass water supply piping shall be cast bronze threaded fittings, Class 125 working steam pressure, conforming to ASME/ANSI B16.15. They shall be made of cast bronze containing not less than eighty-five percent (85%) copper and five percent (5%) each of lead, tin and zinc. All connecting threads of pipes and fittings shall be NPT conforming to the requirements of ASME/ANSI B2.1. Exposed fittings for fixture connections shall be rough, plain, polished or chromium plated as specified.
6. Fittings for Type "K" copper tubing shall be cast bronze solder joint fittings suitable for soft-soldering and shall be in accordance with ASSE 1061; ASME/ANSI B16.15; ASME/ANSI B16.18; ASME/ANSI B16.22; ASME/ANSI B16.23; ASME/ANSI B16.26; ASME/ANSI B16.29 Fittings for Type "L" copper tubing shall be wrought copper solder joint fittings suitable for soft-soldering and shall be in accordance with ASSE 1061; ASME/ANSI B16.15; ASME/ANSI B16.18; ASME/ANSI B16.22; ASME/ANSI B16.23; ASME/ANSI B16.26; ASME/ANSI B16.29. Type "K" and Type "L" fittings shall have a minimum working water pressure of 150 p.s.i. and shall be as manufactured by Nibco Inc., Stanley G. Flagg & Co., Smith-Cooper International or Elkhart Products Corporation.
- Alternately, fittings for Type K or L may be press fittings (pressure-sealed joints) by Viega ProPress; Elkhart Xpress, Elkhart Products Corporation; NIBCO Press System; Tyco/Grinnell G-PRESS, Mueller Copper Press (or approved equal) up to and including 4 inches in diameter. O-rings for copper press-connect fittings shall be EPDM. Use special tools recommended and approved by the manufacturer.
- Solder shall be lead-free solder as per ASTM B32.
- Liquid and paste fluxes for copper joining by soldering shall comply with ASTM B813 for mitigation of flux-induced corrosion.

Mechanically formed extruded tee-branch outlet is permitted on copper tubing running overhead. Extruded-tee outlets shall be made according to ASTM F2014. All joints formed in this manner shall be brazed in compliance with Code and manufacturer's recommendations. Soft soldered joints shall not be permitted.

- a. Manufacturers:
T-DRILL Industries, Inc.
7. Grooved Joints-Copper Piping: Rolled grooves, EPDM center legged gaskets, Ductile Iron housing, wrought copper or cast bronze fittings, rated for 300 psi working pressure. System shall be designed for rigid installation. Brazed flanges must be used at equipment connections, and for maintenance removal sections. Manufacturers: Victaulic, Grinnell by Tyco, Anvil International, Shurjoint Piping Products.
8. Fittings for polypropylene plastic pipe shall be DWV pattern flame retardant schedule 40 polypropylene fittings. Materials shall be in accordance with ASTM D4101 and shall be fire retardant in accordance to ASTM D635. Fittings shall be legibly marked with molded on letters showing manufacturer's trademark, pipe size of each socket, manufacturer's part number, and symbol PPFR. Joints and fittings shall be DWV electric fusion made of the same material as the piping. Submit samples of fitting, showing required markings, for approval.
9. Fittings for High Density Polyethylene (HDPE) Piping shall be watertight bell and spigot assemblies. The gasket material shall be polyisoprene and shall meet ASTM F477. Pipe joints shall meet AASHTO M294 or AASHTO MP7. In addition, the gaskets shall be free of visible cracks when tested according to ASTM D1149: 72 hours exposure in 50 PPHM ozone at 104°F. The fittings/joints shall be manufactured by Hancor Blue Seal or approved equal. Hancor's Sure-Lok F477 fittings/joints are not acceptable as they are not water-tight. High Density Polyethylene (HDPE) piping shall only be used for underground yard drainage and storm water piping within the property line but outside of the foundation walls of the building.
10. Fittings for Polyvinylidene Fluoride Plastic Pipe (PVDF) shall be DWV pattern fittings flame retardant manufactured to Schedule 40 dimensions. Materials shall be in accordance with ASTM F1673 and shall be fire retardant in accordance to ASTM D635. Fittings shall be legibly marked with molded on letters showing manufacturer's trademark, pipe size of each fitting, manufacturer's part number, and symbol PVDF. Fittings shall be joined to the PVDF pipe by means of a fusion method.
11. Fittings for vacuum and air piping shall be malleable iron.
- C. Water service pipe, water distribution pipe and all pipe fittings utilized in water supply systems shall conform to NSF 61
- D. Pipe Nipples
 1. All pipe nipples shall be of the same materials as the connecting piping.
 2. The use of close nipples is prohibited
- E. Unions
 1. Unions 2" and smaller shall be threaded. Unions 2½" and larger shall be flanged.

2. Threaded unions on copper or brass pipe shall be brass, ground joint suitable for 300 pounds W.S.P.
3. Threaded unions on steel pipe, unless otherwise specified, shall be of malleable iron with bronze ground seats suitable for 300 pounds W.S.P.
4. Flanged unions shall be cast iron for steel pipe, and brass for copper or brass pipe, gasket type suitable for 150 pounds W.S.P.
5. Flanged unions shall be provided with the necessary steel bolts, nuts and gaskets.
6. All unions used on galvanized piping shall be galvanized.
7. All unions used on chromium plated piping shall be chromium plated.
8. Unions shall be as manufactured by

Anvil International
NIBCO Inc.
Ward Manufacturing LLC
The Viking Corporation

F. Dielectric Fittings/Unions

1. Unions shall be rated at 250 psi at 180°F and shall meet the requirements of ASME/ANSI B16.39. Pipe threads shall be in accordance with ASME/ ANSI B2.1 and solder ends shall be suitable for brazing.
2. Flange fittings shall have a minimum rating of 175 psi and shall conform to ASME/ANSI B16.24 (Bronze), ASME/B16.42 (Iron).
3. Manufacturers:

Mueller Industries
Capitol Mfg. Co.; Division of Harsco Copr.
Eclipse, Inc.
Perfection

G. Thermo-wells

1. Thermo-wells are required for all temperature sensors in fluids transported within piping such as, but not limited to, water and steam.
2. Thermo-wells shall be supplied as a complete assembly including the sensor, separable well, wellhead and Greenfield fitting.
3. Thermo-wells shall be pressure-rated and constructed in accordance with the system working pressure.
4. Thermo-wells and sensors shall be mounted in a thread-o-let or 1/2" NPT saddle and allow easy access to the sensor for repair or replacement.

5. Thermo-wells shall be filled with heat-conductive compound that is specifically manufactured for the application. The compound shall be suitable for the temperature range being sensed.
6. Thermo-wells shall be constructed of the following materials:
 - a. Chilled and Hot Water; brass.
 - b. Steam; 316 stainless steel.
 - c. Brine (salt solutions): marine grade stainless steel.
- H. Gaskets: Gaskets for cold and hot water services shall be full face gaskets. The retaining gasket shall be made of 1175 fabric inserted rubber sheeting and shall be pre-cut at the factory for standard 125 pound cast iron flanges and fittings and for 150 pound raised face steel flanges and fittings.
- I. Cleanouts and Cleaning Screw Plugs
 1. Cleanouts shall conform to the features of the cleanouts contained in the schedule below. The manufacturer's numbers are for the purpose of type only. The contractor shall submit manufacturer product technical data for each type required before installation for approval.
 - a. Gasket seal plugs will not be accepted in place of taper thread plugs.
 2. Cleanout plugs shall be bronze and countersunk type with taper screw threads.
 3. Cleanouts for cast iron pipe and galvanized steel pipe in exposed horizontal runs and accessible hung ceilings shall be as follows:
 - a. Cleanouts for membrane waterproof floors shall be provided with an integrally cast flashing flange with flashing clamp.
 - b. Cleanouts in unfinished areas shall have cast iron tops and covers and in finished areas shall have nickel bronze tops and covers.

Cleanout Schedule:

Location	Piping	Figure Number
Wall	Exposed Cast Iron	Smith 4420 Wade W-8550E w/8480R MIFAB C1450 Zurn Z1440-BP w/ZS-1469 WATTS CO-380-RD
Cleanout: Cast iron spigot ferrule with cast bronze taper thread plug and S/S cover.		
Wall	Exposed Steel	Smith 4470 Wade W-8590E MIFAB C1430 Zurn Z1470 WATTS CO-590

Cleanout Plug: Cast bronze taper thread plug.

Wall	Concealed Cast Iron	Smith 4532-U Wade W-8560E w/8480R-75 MIFAB C1460-RD-6 Zurn Z1446-BP-VP WATTS CO-460-RD

Cleanout: Cast iron cleanout tee, taper thread, bronze plug with stainless steel round cover and vandal-proof screw.

Wall	Concealed Steel	Smith 4472-U Wade W-8590E w/8480R MIFAB C1430-RD-6 Zurn ZS1468-VP WATTS CO-590-RD

Cleanout: Cast bronze taper thread plug with stainless steel round cover and screw.

Floor-Concrete	Steel or Cast Iron	Smith 4248-U Wade W-6000Z,75 MIFAB C1100-XR Zurn ZN1400-BP-VP WATTS CO-200-RX-4

Cleanout: Cast iron floor level cleanout assembly with heavy duty, round, adjustable, scoriated cast iron top, non-tilt tractor cover, and an inside caulk outlet; taper thread, bronze plug and vandal-proof screw.

Floor-Asphalt Tile	Cast Iron	Smith 4168-U Wade W-6000TS,75 MIFAB C1100-TS Zurn ZN1400-TX-BP-VP WATTS CO-200-TS

Cleanout: Cast iron floor level cleanout assembly with a square adjustable nickel bronze top recessed for 1/8" tile and an inside caulk outlet; taper thread, bronze plug and vandal-proof screw.

Floor-Terrazzo	Cast Iron	Smith 4188-U Wade W-6000U,75 MIFAB C1100-UR Zurn ZN1400-Z-BP-VP WATTS CO-200-U

Cleanout: Cast iron floor level cleanout assembly with round adjustable nickel bronze top recessed for terrazzo and an inside caulk outlet; taper thread, bronze plug and vandal-proof screw.

Floor-General Finished Area	Cast Iron	Smith 4028-U Wade W-6000-1,75 MIFAB C1100 Zurn ZN1400-BP-VP WATTS CO-200-R

Cleanout: Cast iron floor level cleanout assembly with round, adjustable, scoriated, nickel bronze top, and no-hub outlet; taper thread, bronze plug and vandal-proof screw.

Outside Grade Cast		Smith 4258 Wade W-8300MF w/6000,75 MIFAB C1300MF w/C1230-6

Zurn Z1474-N w/Z1440-BP
WATTS CO-300-MF W/CO-380

Cleanout: Cast iron cleanout and double flanged housing with heavy duty, secured, scoriated cast iron cover with lifting device and an inside caulk outlet; taper thread, bronze plug and vandal-proof screw.

5. Cleanouts and Cleaning Screw Plugs for Acid Drainage Piping:
 - a. Cleanouts flush with floor shall be silicon iron. All other cleanouts shall be of the same materials and by the same manufacturer as the piping to which they are connected.
 - b. Wall access covers shall be chrome plated bronze square frame and secured flush-with-wall cover with anchoring lugs: Jay R. Smith Fig. 4735-NB-U, Wade W-8480S, Zurn ZANB1462-VP, WATTS CO-300-S-1-6 or MIFAB C1400-S-1. Floor access cleanout covers shall be square nickel bronze frame and secured scoriated cover: Jay R. Smith Fig. 4930-U, Wade W-8300-S, Zurn ZAB1460-VP, WATTS CO-300-S-6 or MIFAB C1300-S-1. Provide spanner type vandal proof screws for access covers.
- J. Pipe Sleeves: Provide pipe sleeves of one of the following. Pipe sleeve must be appropriate type and thickness for the UL firestopping assembly selected:
 1. Sleeves and materials for sealing sleeves for gas piping: Not Used.
 2. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge minimum; 4" to 6", 16 gauge minimum; over 6", 14 gauge minimum.
 3. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 4. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 5. Firestop penetration materials for sealing sleeves shall be listed by Underwriters Laboratories. For pipes passing through fire-rated floor, cast-in place firestop device with Underwriters Laboratories listing. The cast-in place device is a one-step firestopping process that does not require additional firestop penetration materials for sealing the sleeves. The device shall be installed where required for sleeving purposes. The cast-in place firestop device shall not be used for wall applications.
 6. Material for sealing spaces between pipe and sleeve through foundation walls below grade shall be Link-Seal Type "C" as manufactured by Thunderline Corp; Belleville, Mich. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. Links shall be loosely assembled with bolts to form a continuous rubber bolt around the pipe with a pressure plate under each bolt head and nut. Link-Seal pressure plates shall be Type "C" (insulating type) to provide for electrical insulation and cathodic protection.
 7. Materials for sealing space between each pipe and sleeve through non-fire rated exterior walls above grade shall be Non-shrinking cement. Materials for sealing space between each pipe and sleeve through non-rated interior walls shall consist of mineral wool and sealant.

8. Waterproof sleeves shall be Link-Seal Wall Sleeve as manufactured by Thunderline Corp, or MetraSeal wall sleeve by the Metraflex Co.

K. Traps

1. Brass traps shall be heavy pattern cast brass New York regulation traps conforming to the NY Building Code. All cast brass visible traps shall be chrome plated.
2. Cast-iron and silicon iron traps shall be extra heavy pattern, manufactured in accordance with the current ASTM Standard Specifications.
3. Traps associated with drains placed in slab on grade shall be deep seal type with floor cleanout as J.R. Smith Fig 7231S, Zurn Z-1012-1406-BP with adjustable housing ferrule and cover or approved equal.

L. Pipe escutcheons shall have 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 extension, if any. Escutcheon plate types shall be as follows:

1. Galvanized cast-iron with set screw as manufactured by Anvil International, Fig. No. 395 or Carpenter & Paterson, Inc. Submit manufacturer product technical data.
2. Chrome-plated cast or sheet brass, solid or split-hinged, with brass set screws as manufactured by Kohler, Zurn or McGuire Mfg. Co. Submit manufacturer product technical data.
3. Cast or sheet brass, solid or split-hinged, with brass set screws as manufactured by Kohler, Zurn or McGuire Mfg. Co. Submit manufacturer product technical data.

M. Drain Bibbs

1. Drain Bibbs shall be 1/2" heavy brass compression faucets with plain end.
2. Drain Bibbs in the supply connections under the lavatories and wash sinks shall have lock shields and loose keys. Exposed drain bibbs and lock shields shall be chrome plated.
3. Approved model: T & S Brass and Bronze B-703 modified with B-127 lockshield and key.

N. Hose bibbs shall be 3/4" brass with integral vacuum breakers and nickel plated finish and shall be Woodford Manufacturing Co. Model 24 or MIFAB MHY-90.

O. Chromium: All metal parts including tubular shapes, castings, etc., shall be finely ground and polished to a smooth satin finish. Every particle of scale, rough or foreign matter shall be removed.

PART 3 - EXECUTION

3.01 PIPE AND FITTING SCHEDULE

A. Acid Waste

1. Inside the building:

- a. For non-plenum ceiling system: Polypropylene plastic pipe and fittings, schedule 40
- OR
- b. For ceiling used as air plenum: Polyvinylidene Fluoride, PVDF, pipe and fittings joined by a fusing method, and meeting smoke and flame rating indexes, 50 and 25 respectively.
2. Acid vent extensions above roof: Polypropylene plastic pipe, schedule 40, joined by heat fusion.
- B. Compressed Air: Above Ground-Interior

Black steel pipe with malleable iron fittings; Type L copper tubing with wrought copper solder joint fittings. Mechanically formed tee fittings may be used in lieu of solder-joint tee fittings.
- C. Domestic Hot & Cold Water: Above Ground-Interior
 1. Type L (blue color bar) copper tubing with wrought copper solder joint fittings suitable for soft soldering; Brass, seamless drawn pipe, regular weight with cast bronze fitting; Groove copper pipe and grooved fittings for 2" and above. Copper tubing for short branch connection to plumbing fixture. Mechanically formed tee fittings may be used in lieu of solder-joint tee fittings. Pressure-Seal fittings and Pressure-sealed joints in lieu of soldering are acceptable.
 2. Exposed Piping Serving Laboratory, and Food Service Equipment, Except Piping Installed within Cabinets, and not Exposed to View: Polished, chrome plated brass pipe with cast brass fittings, and threaded joints.
- D. Domestic Water: Service Underground – Exterior & Interior
 1. 2½" and Less: Type K soft annealed copper tube with cast bronze solder joint fittings; Brass, seamless drawn pipe with threaded fittings.
 2. 3" and Up: Ductile iron and fittings with mechanical joints
- E. Gas Piping: Not Used.
- F. Storm Piping: Above Ground - Interior
 1. Hubless Service Weight Cast Iron (SVCI) with mechanical stainless steel couplings.
- G. Storm Piping: Underground - Interior

Service Weight Cast Iron bell and spigot with lead and oakum joints.
- H. Storm Piping: Exterior – Yard Drainage

Provide following as shown on drawings:
 1. Service Weight Cast Iron (SVCI) bell and spigot with lead & oakum joints
 2. Ductile iron for all sizes with push-on joints

3. Precast reinforced concrete pipe with rubber gasket watertight joint
4. Extra strength vitrified tile pipe made of fire clay, surface clay, shale, or a combination of these materials with heavy duty fittings & compression joints
5. High Density Polyethylene (HDPE) piping, bell and spigot, watertight joints.

I. Storm Piping: Exterior – House Drain & House Sewer

Service Weight Cast Iron bell and spigot with lead & oakum joints, Ductile iron for all sizes with push-on joints.

J. Storm Piping: Exterior – Leader

Service Weight Cast Iron bell and spigot with lead & oakum joints to point where sheet metal leader enters.

K. Sanitary Piping, Waste & Vent: Above Ground and House Drain Lines - Pump Discharge - Interior

1. Hubless Service Weight Cast Iron with mechanical stainless steel couplings.

OR

2. Galvanized steel pipe schedule 40, with threaded drainage fittings; Roll grooved ends, grooved pipe fittings in sizes 2" and above.

L. Sanitary Piping, Waste & Vent: Underground - Interior

Service Weight Cast Iron bell and spigot with lead and oakum joints.

M. Sanitary Piping, Waste & Vent: House Sewer/Underground - Exterior

Ductile iron with push-on joint

3.02 INSTALLATION

A. Piping (General)

1. The run and arrangements of all pipes shall be approximately as shown on drawings or specified and as directed during installation, and shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and neatly spaced. No pipe shall be installed where the headroom will be interfered with unless the conditions are such that it is unavoidable and permission is obtained from the Authority. Offsets will be permitted where walls reduce in thickness or beams interfere with direct runs; offsets shall be made at an angle of 45° to the vertical; in no case shall the space between the pipes, partitions, walls, etc., exceed 5". All exposed risers shall be erected plumb, standing free, close to and parallel with walls and other pipes and be uniformly spaced. All horizontal runs of piping hung from structural floor, slab or floor beams shall be erected as closely as possible to bottom of floor slabs, ceilings, or I-beams as the case may be. In no case shall the headroom, beneath the pipe, be less than (7'-0") where the pipe is installed more than (1'-0") from wall, partition, etc., except where piping is required to be installed in Boiler Room and Mechanical spaces above floor. Horizontal piping shall be so graded as to drain to the low points and water lines to drain bibbs. All

piping installed in floor shall be painted with a heavy coat of asphaltum. All piping shall be installed with ample space for pipe covering. All exposed plumbing piping in the Kitchen Areas shall be chrome plated brass pipe except for gas line. Provide threaded fittings. Chrome (silver) paints will not be accepted.

2. Roughing under ground or concealed in the floor or wall construction shall be properly installed, tested and inspected before any of the roughing is covered up. Should any work be covered up before being inspected and tested, it shall be uncovered and recovered at the expense of the Contractor. Plugged fittings shall be installed when called for. Reducer fittings shall be used in making reductions in sizes of pipes; bushings will not be allowed. Suitable air chambers or Water Hammers Arresters shall be provided as called for in other sections.
3. All lines of piping and branches for fixtures passing through or in connection with waterproofing shall be brought to the proper locations and levels so that fixtures and piping may be installed without disturbing the waterproofing.
4. For work in existing buildings the following addition requirements shall be adhered to:
 - a. Piping shall run as straight as possible with the fewest number of changes in direction, with such variations from the layout shown on the Drawings as conditions at the premises may require, as approved by the Authority at no extra cost to the Authority. Provide piping without sharp bends, quick changes of sections, pockets or bushings.
 - b. The locations of all existing piping which are indicated on the Drawings are approximate. The Contractor shall investigate and ascertain the exact locations of such piping and make whatever minor variations in runs of new piping that may be required at no extra cost to the Authority.
 - c. Contractor shall consider the location of all equipment, ductwork, piping, electric conduits, supports, steel work, etc., and all new piping shall be installed without interference therewith.
 - d. Wherever existing branch piping interfere with installation of new branch piping, the existing branch piping shall be removed and re-routed to accommodate the new work. The rerouted work shall be of new material.
 - e. All new extensions and relocations of existing piping systems shall be concealed in existing or new walls, floors, ceilings, pipe chases or as otherwise specified.
 - f. Unused dead ended soil, waste and vent piping shall be removed as far as each branch, main, stack, etc., and capped or plugged concealed in hung ceilings, below floors or behind walls.
 - g. All individual hot and cold water branches to and from new and existing mains or risers shall be valved.
5. For High Density Polyethylene (HDPE) storm drainage piping inside the property line but outside of the building walls the following addition requirements shall be adhered to:

- a. Pipe shall be installed at the line and grade shown in the contract plans following the requirements of ASTM F2306 and ASTM D2321 for trench width, embedment, and compaction.
- b. Material meeting ASTM D2321, Class 1B dense-graded, clean, manufactured or processed aggregates shall be for bedding, haunching and initial backfill.
- c. Provide a concrete access structure to inspect and clean HDPE piping used in conjunction with storm water detention systems. Connections between concrete access structure and piping shall be constructed with a joint tightness compatible with the overall system.

B. Piping Joints

1. Cast iron bell and Spigot Type

- a. Joints in cast-iron bell and spigot piping shall be caulked joints made with packed oakum and molten lead, 12 ounces of which must be used for each inch in diameter of the pipes at each joint and must be poured in at one time. The lead to be used for this purpose shall be soft "Pig" or "Bar." After cooling and shrinking, the lead shall be thoroughly caulked and the joints made impermeable to gases and liquids, and also be capable of withstanding the tests applied. The face of the lead joints shall finish flush with the face of the hub and be left without putty, paints or cement. Whenever joints are made on the floor or surface they shall be re-caulked after being placed in position.

2. Joints in cast iron No-Hub pipe shall be heavy-duty type couplings. No-Hub cast iron pipe shall be cut square.

- a. The use of No-Hub pipe and fittings for soil, waste, vent and storm piping is PERMITTED when installed above ground within buildings.
- b. The use of No-Hub pipe and fittings is NOT PERMITTED for underground applications or when embedded in concrete.

3. Joints in Ductile Iron Pipe:

- a. Push-On Joints: Assemble push-on joints using lubricant furnished by manufacturer. Guide plain end of pipe into bell until contact is made with gasket. Exert sufficient force to drive pipe home until penetration is made to depth recommended by manufacturer.
- b. Mechanical Joints: Assemble mechanical joints in accordance with Method of Installation, AWWA C111, Appendix A. Tighten all bolts by means of torque wrenches such that the follower is brought up evenly. Disassemble, clean and reassemble joint if effective sealing is not obtained at specified torques.
- c. Joints for ductile iron mechanical joint pipe shall be made by using ductile iron mechanical joint retainer glands.

4. Joints for precast reinforced concrete pipe shall be watertight and shall be made by using approved rubber gaskets. Joints, including rubber gaskets, shall conform to all the requirements of ASTM C443, Latest Edition.

5. The joints of steel and brass piping shall be screwed joints of full length and threads shall be NPT conforming to the requirements of ASME/ANSI B2.1. All pipes shall be screwed close up to their shoulders. The use of lamp wick is prohibited in threaded joints. All burrs shall be removed. Pipe joint cement or Teflon tape shall be used only on male threads.
6. Joints in type "L" copper tubing and type "K" copper tubing shall be soft-soldered joint. All surplus flux shall be wiped off immediately after completion of the soldering.
Contractor may use mechanically formed Tee connections in conjunction with copper piping. The maximum diameter of branches shall be $2\frac{1}{8}$ ".
Mechanically formed tee connection shall be formed by drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the branch wall. Forming procedures shall be in accordance with the tool manufacturer's recommendations. All joints shall be brazed.

Press Connect (Pressure Seal) Fittings: All connections shall be made in accordance with the manufacturer's installation instructions. Copper tubing shall be cut at right angles using displacement type cutter or fine-toothed saw. Burrs shall be removed from inside and outside of tubing to prevent cutting sealing element. Mark insertion depth according to manufacturer's insertion depth chart. Alignment shall be checked for correct fit. Only the manufacturer's sealing elements shall be used. Press fitting shall be slid onto tubing while turning slightly to the marked depth. Oils or lubricants shall not be used. Fitting connections shall be made with tools provided by the manufacturer.

For locations where there is insufficient access to accommodate the pressing tool (e.g. under plumbing fixtures), this type of joint is not allowed. Sufficient clearance must be left around each joint to allow room for the pressing tool and jaw to be attached without interference when repairing the system in the future.
7. Joints between galvanized steel and cast iron pipes shall be caulked joints as specified for cast iron piping.
8. Polypropylene piping:
 - a. Polypropylene pipe and fittings shall be joined by use of electrical fusion coils, energized by a variable, low voltage power supply according to the manufacturer's recommendation. Piping systems made by different manufacturers are usually not compatible.
 - b. Polypropylene shall be permitted for acid waste piping and fittings in underground application; it may also be used for strainers, overflows, outlets and traps for science sinks and science tables
10. Polyvinylidene Fluoride Plastic Pipe (PVDF) piping:
 - a. Polyvinylidene Fluoride Plastic Pipe (PVDF) and fittings shall be joined by the fusing method approved by the manufacturer. The method shall be submitted with the shop drawing. All joints shall be made with the fusion tool indicated by the manufacturer to produce a hermetically sealed joint. Polyvinylidene Fluoride Plastic Pipe (PVDF) and Polypropylene Piping (PP) will not fuse together since they are dissimilar materials. Piping systems made by different manufacturers are usually not compatible.

b. Polyvinylidene Fluoride Plastic Pipe shall be permitted for acid waste piping and fittings installed inside ceilings used as air plenum

9. Unions shall be used to connect equipment (pumps, circulators, tanks, meters, etc.) to water lines. The union shall be installed as close to the equipment as practical. Where valves are adjacent to equipment, union shall be on down stream side of valves.
10. Dielectric fittings and unions shall be installed where ferrous piping joins copper tubing or brass piping.

C. Cleanouts and Cleaning Screw Plugs

1. Install cleanouts in the following locations: on all traps (except traps integral with floor drains), at the end of and at all points in change of direction of all drain pipes and branch drains, at all offsets, at the ends of all branch soil and waste pipes, and located in runs not more than fifty (50'-0") feet on center, and at all points to make accessible all parts of the drainage system. In underground lines the cleanouts for drains, traps, or branches shall extend up to and finish flush with finished level or made accessible with brick pits with cast iron frame and covers. Cleanouts in connection with vertical cast iron pipe above the cellar, except the traps and fittings on horizontal branches, shall have tapped tee fittings, same size as pipe, closed with bronze screw plugs. All other cleanouts in connection with cast iron pipes, traps and fittings shall have heavy full size cast iron ferrules, same size as pipes or fitting, caulked into hub and closed with bronze screw plug. All cleanouts in connection with galvanized steel pipe, traps and fittings shall consist of drainage fittings closed with bronze screw plugs of heavy pattern. All cleanouts for silicon iron pipe shall be silicon iron, with silicon iron bolted covers, except cleanouts flush with floor, which shall be of the type as indicated on drawings.
2. Plugs used for cleanouts shall be same size as the fittings up to and including 4 inches. Sizes above 4" shall be reduced to allow for 4" cleanouts. For house traps 8" and larger plugs allowing for 6" cleanouts shall be used.
3. Cleanouts occurring in membrane waterproof floors shall be provided with a flashing clamp device secured with brass bolts. Cleanouts in unfinished areas shall have brass or bronze tops and cover. Cleanouts in finished areas shall have polished nickel bronze tops and cover. Provide cleanouts with spanner type vandal proof screws.
4. Provide cleanouts at the base of all soil, waste and storm water leaders, and at all changes in direction on horizontal piping.
5. The complete list of locations of access doors and frames for cleanouts located behind walls shall be furnished by the plumbing subcontractor to the prime General Contractor prior to erection of walls.
6. Cleanouts on 3" and larger pipes shall be installed so as to allow clearance of at least 18". Cleanouts on pipes less than 3" shall be installed so as to allow at least 12" of clearance.

D. Sleeves for Pipes

1. General: All plumbing pipes passing through floors, roofs, walls, partitions, furring, beams, trenches, and wherever else indicated on drawings shall be provided with sleeves installed and maintained by the Contractor. Core drilled holes shall be

provided with sleeves. Where plumbing pipes pass through potentially wet floors that do not have membrane waterproofing such as toilet rooms, cafeteria kitchens, serving areas, dish washing room, janitor's sink closet, mechanical equipment rooms, pipe chases and areas that are provided with fire protection sprinkler systems, the Contractor shall install sleeves of galvanized steel pipe with welded clips or equivalent at bottom ends for securing sleeves to form work and shall project one inch above finished floors, and shall be caulked watertight.

2. Sleeves for gas service piping: Not Used.
 3. For interior walls and floors and for pipes through roof, the space between each installed pipe and its sleeve shall be sealed with a three hour rated fire stop penetration material. Fire stop materials shall be installed in accordance with the instructions of the manufacturer.
For floors and for pipes and for pipes through roof and not in walls: Cast-in fire stop device with Underwriters Laboratories listing and Material and Equipment Acceptance (MEA) approval or Approved Agency Certification listed and/or label is permitted as an acceptable sleeve alternative to a metallic sleeve with fire rated sealing caulk. The cast-in device is a one-step fire stopping process that shall not require additional fire stop penetration materials for sealing the sleeves. The device shall be installed where required for sleeving purposes.
 4. Sheet Metal Sleeves
 - a. Sleeves for pipes passing through floors, partitions, hung or furred ceilings, shall be installed with 1/2" maximum clearance all around pipes. Each sleeve for a pipe passing through an interior floor slab shall be fitted with a one-inch flange, or equivalent, at the bottom end for the purpose of securing it to the form work or sheet metal deck.
The sleeve shall finish flush with the top of the finished floor. Sleeves for pipes passing through partitions, hung or furred ceilings shall be of one-piece construction and shall finish flush with the finished surface.
 - b. Sleeves installed for pipes passing through vent ducts shall be securely fastened, soldered and made airtight.
 5. Pipe Sleeve: Install pipe sleeves for pipes passing through roofs, concrete beams, brick walls, foundation walls and floor slabs on earth. Sleeves shall be installed with 1/2" maximum clearance all around pipe and shall finish flush with the surfaces penetrated. Pipe sleeves for pipes through roof shall be made of service weight cast iron only.
 6. Sleeves through foundation walls below grade shall be provided under General Construction Work.
- E. Traps: Install traps full size of the piping to which it connects as indicated on Drawings or as required. All traps, except integral trap with floor drains, shall have cleanout.
- F. Escutcheon Plates
1. Install galvanized cast iron or brass escutcheon plates with set screw on concealed pipes passing through walls, partitions, floors and on exposed to view piping in unfinished rooms and spaces. Material shall be appropriate for the material to prevent galvanic reaction (i.e. brass or chrome plated brass escutcheon for copper pipe)

2. Install chrome-plated brass escutcheon plates with set screw at:
 - a. All exposed to view pipes passing through walls, partitions, floors and ceilings, in finished rooms and spaces
 - b. All exposed to view finished locations and within all cabinets on waste and water supply piping at all plumbing fixtures including lavatories, drinking fountains, cabinet sinks, wash sinks, etc.
 3. Plates shall fit snugly around the pipes or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
- G. Drain Bibbs: Provide drain bibbs in the following locations:
1. At the base of all water risers.
 2. At low points of water lines.
 3. On the cold supply branch under one fixture in each room, including warming pantry and kitchen area, having a floor drain or stall urinal.
 4. Where supply piping to fixture is concealed or only Barrier Free Lavatory or Barrier Free Wash Center is installed, the drain bibb shall be wall mounted 18" above the finished floor adjacent to the fixture in each room having a floor drain.
 5. At all other points indicated on Drawings.
- H. Hose bibbs shall be installed where indicated on Drawings.

END OF SECTION

SECTION 220411
HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of hangers and support Work is indicated by the requirements of this Section.

1.02 SUBMITTALS

- A. Submit catalog cuts for each different type of hanger and rod, support and accessory.
- B. Submit method of support and hanging for Engineers approval prior to installation.
- C. Submit manufacturer technical data of insert and rod for approval.

1.03 QUALITY ASSURANCE

- A. No-Hub piping shall be installed and supported in full compliance with Local Law 100 of 1989.
- B. Cast-Iron Soil Pipe Institute (CISIP) Designation B10-1985 and Designation 301-1985.
- C. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS)
Compliance: Comply with:
MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture.
MSS SP-69 Pipe Hangers and Supports - Selection and Application.
MSS SP-89 Pipe Hangers and Supports - Fabrication and Installation Practices.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Pipe Hangers and Supports
 - 1. Hangers for horizontal piping (insulated and uninsulated) one inch and smaller, supported from above shall be of malleable iron, adjustable swivel ring type and shall comply with MSS SP-69 Type 6. Hangers shall be Anvil International Fig. 104 or the approved equal of Carpenter & Paterson, Inc, Hilti, Inc, or Cooper B-Line, Inc.
 - 2. Hangers for horizontal piping (insulated and uninsulated) and insulated copper tubing larger than one inch, shall be of carbon steel, adjustable clevis type and shall conform to MSS SP-69 Type 1. Hangers shall be Anvil International Fig. 260, Fig. 260 ISS or the approved equal of Carpenter & Paterson, Inc, Hilti, Inc, or Cooper B-Line, Inc.
 - 3. Hangers for uninsulated horizontal copper tubing one inch and smaller, supported from above shall be of malleable iron with copper finish, adjustable ring type, complying with MSS SP-69 Type 6, or with MSS SP 69 Type 15 if with Turnbuckle Adjuster. Hangers shall be Anvil International Fig. CT-109 for

adjustable ring type and Fig.114 for Turnbuckle Adjuster, or the approved equal of Carpenter & Paterson, Inc, Hilti, Inc, or Cooper B-Line, Inc.

4. Hangers for uninsulated horizontal copper tubing larger than one inch shall be of carbon steel with copper finish adjustable clevis type, complying with MSS SP 69 Type 1. Hangers shall be Anvil International Fig. CT-65 or the approved equal of Carpenter & Paterson, Inc, Hilti, Inc, or Cooper B-Line, Inc.
5. Support for horizontal pipe runs on roof shall be heavy-duty pipe rollers. Rollers assembly shall consist of galvanized steel channel track, galvanized steel fittings, washers and nuts, painted cast iron roller and locking devices to maintain pipe location. Assembly shall allow both vertical and horizontal adjustment. Heavy-duty pipe roller support shall be with integral base plate and shall be of the Pate Company, Custom Curb Inc. (Eastern Plant), Miro Industries, Cooper B-Line, Inc. or Portable Pipe Hangers. The support for the gas piping installed horizontally on the roof shall be anchored or secured to the concrete deck. The base plate of the pipe roller support shall be secured to the concrete deck using stainless steel anchors. A 12" galvanized steel with integral base plate or a pipe support base made of polycarbonate plastic with bored holes for securing same to the concrete decking are acceptable
6. Supports for vertical piping and copper tubing shall be double bolt riser clamps, complying with MSS SP 69 Type 8 with each end having equal bearing on the building structure located as hereinafter specified. Supports shall be Anvil International Fig. 261 for steel pipe and Fig. CT-121 for copper tubing or the approved equal of Carpenter & Paterson, Inc, Hilti, Inc or Cooper B-Line, Inc. If piping is insulated, riser clamp shall be placed under insulation.
7. Where piping is run near the floor and is supported from the floor, such supports except as otherwise noted shall be of pipe standards with base flange and adjustable top yoke complying with MSS-SP-69 Type 38. Support shall be similar to Carpenter & Paterson, Inc Figure 247 or the approved equal of Anvil International, Hilti, Inc or Cooper B-Line, Inc.
8. Storm drainage leader piping running exposed along the outside face of building wall shall be supported by offset pipe clamp of carbon steel; Anvil International Fig. 103 or the approved equal of Carpenter & Paterson, Inc, Hilti Inc or Cooper B-Line, Inc.
9. Trapeze type hangers shall be made of 2"x2"x1/4" carbon steel angle iron with drilled holes and 1/2" hangers rods. In lieu of an angle iron, a strut assembly may also be used for the trapeze kind of hanger support.
10. Bracing for cast iron No-Hub vertical piping (all sizes) and horizontal piping 6" and larger shall be made up of riser clamps, clevis hangers or two four bolt cast iron socket clamps Anvil International Fig. 595 with cast iron socket clamp washers, Anvil International Fig. 594, or the approved equal of Carpenter & Paterson, Inc, Hilti, Inc or Cooper B-Line, Inc.
Refer to "No-Hub Pipe BRACING" Detail
11. Sway bracing for horizontal No-Hub cast iron piping shall be made up of double bolt riser clamp, complying with MSS SP 69 Type 8, galvanized steel 12" long shields, conforming to MSS SP 69 Type 40, and 1" x 1/8" steel plate. Riser

clamp shall be Anvil International Fig. 261 and shields shall be Anvil International Fig. 167 or the approved equal of Carpenter & Paterson, Inc, or Hilti, Inc. or Cooper B-Line, Inc.
Refer to "SWAY BRACING" Detail.

12. At all points of support, a galvanized steel shield shall be provided between the hanger and pipe insulation complying with MSS SP 69 Type 40. Shields shall be Anvil International Fig. 167, Carpenter & Paterson, Inc. Figure 265P or the approved equal of Hilti, Inc or Cooper B-Line, Inc.
- B. Expansion bolts for use in existing and new reinforced concrete slabs shall be as follows:
1. "Trubolt" as manufactured by ITW Ramset/Red Head
 2. "Kwik Bolts" as manufactured by Hilti, Inc.
 3. "Power Stud" as manufactured by Powers Fasteners, Inc.
- C. Inserts for use in new conventional reinforced poured concrete slabs shall be as follows:
1. Insert No. 650 made by Carpenter & Paterson Inc.
 2. Insert Fig. 281 made by ITT Anvil International.
 3. Insert No. 100 made by C. H. Leibfried Mfg. Corp.
 4. Insert No. 96900 Series made by Hilti, Inc.
 5. Insert No. B2500 and N2500 Series made by Cooper B-Line, Inc.
- D. Inserts for use in new composite metal decks shall be as follows:
- Inserts shall be "Bang-It" steel deck insert as manufactured by Powers Fasteners or HCI-MD Cast-In Anchor for Metal Deck as manufactured by Hilti, Inc.
- Metal Deck ceiling bolts (T-bars), Carpenter & Paterson, Fig. 143 may be used in lieu of the above specified deck inserts with the approval of the Engineer of Record.
- E. Fasteners, as required, shall be as follows:
1. Lag screws or Long screws.
 2. Long Expansion bolts
 3. Bolts and nuts

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Supports shall be adequate to securely support the piping and its contents, to prevent vibration and to provide proper allowance for expansion and contraction of the piping.

- B. All piping running close to or on walls shall be supported by means of hanger suspended from heavy angle iron wall brackets. No wall hooks will be permitted.
- C. Hanger rods shall be of ample size to support the pipe and its contents and shall have machine cut American Standard V-threads. At a minimum hanger rod size shall be the same as that recommended by the hanger manufacturer for each sized hanger. Hangers shall be recessed to approved beam clamps, concrete inserts, steel plates or other approved devices. Expansion shields and bolts shall not be used in the ceilings of cinder concrete, but may be used where the shields and bolts are horizontal.
- D. Where more than two pipes run parallel, the Contractor may install trapeze type hangers, constructed of 2" x 2" x 1/4" angle iron or channel strut "kindorph" and 1/2" hanger rods. Provide holes in the trapeze angle iron as required to accommodate rods for the individual supports. Burning of holes in angle supports is not acceptable. Provide individual supports for piping, where necessary to provide proper pitch. Trapeze type hanger when used with uninsulated copper tubing shall have copper finish. Spacing of trapeze type hangers shall be as required by the smallest size pipe/tube supported by trapeze hanger.
- E. At all points of support of insulated piping and tubing a galvanized metal shield shall be installed between the hanger and pipe insulation. The use of the galvanized metal shield shall be eliminated if the Anvil Fig 260 ISS is utilized. Installation of Anvil Fig 260 ISS: position the pipe on the saddle, notch section of the insulation to fit around the saddle, square cut the adjoining insulation section and butt the mating end to the notched section, finish taping according to standard methods, No galvanized metal shield is required.
- F. No piping shall be supported from other pipes, ductwork, electric conduit, hung ceiling, cinder concrete or work of other trades.
- G. When support method is not shown on Drawings, pipes laid underground shall be firmly bedded on solid ground under the body of the pipe. Where suitable bearing cannot be obtained because the ground has been disturbed by excavating, or for any other reason, the pipe shall be supported by concrete piers or by approved brackets secured to the walls. Piers and/or steel brackets shall be installed at not more that 5'-0" intervals. New piping passing under cinder concrete areas shall be supported by hangers secured by means of beam clamps fastened to existing floor beams. Where pipe support spacing is excessive between existing steel, beam clamps shall be fastened to structural members that are installed by this Contractor and approved by the Authority. Removed fireproofing around beams shall be replaced to original condition.
- H. Overhead horizontal drains, vents, supply or other piping shall be supported by adjustable wrought iron, steel or malleable iron hangers. Double locknuts shall be installed all hangers. The metal decks shall not be used for support of piping or equipment.
- I. Intervals of supports for horizontal piping shall be as follows:
 - 1. Hub and Spigot Cast iron soil and vent pipe - At 5' intervals and 18" behind each hub or joint.
 - 2. No-Hub Cast iron soil and vent pipe: - At 5' intervals and within 12" of each joint.

3. Threaded pipe (1¼" or less) - At 8' intervals
 4. Threaded pipe (1½" or over) - At 12' intervals
 5. Copper tubing (1¼" in. or less) - At 6' intervals
 6. Copper tubing (1½" in. or over). At 10' intervals
 7. Other Materials--As required for structural stability, service and as further stipulated in specifications and Drawings.
- J. Intervals of supports for vertical piping shall be as follows:
1. All Cast iron soil and vent pipe: At base and at each story height, but in no case at intervals greater than 20'.
 2. Threaded pipe: At every other story height, but in no case at intervals greater than 25'.
 3. Copper tubing (Hard Temper): At each story height.
 4. Other materials: As for structural stability and service.
 5. Cast iron storm drainage leader piping exposed along outside face of building wall: At base and at 5' intervals and 18" behind each hub or joint.
- K. Inserts and Expansion Bolts
1. Piping and equipment, hung from ceilings shall be properly supported from the ceiling slabs by means of required number of inserts. Provide inserts before the pouring of the slabs and expansion bolts after concrete is placed and completely cured.
 2. Inserts for new conventional reinforced poured concrete slabs shall be designed for insertion of heavy nuts suitable for screwing up to and including 3/4" rods. Inserts shall not be primed. Install inserts so that hangers will appear true and uniform. Install inserts before the pouring of the concrete.
 3. For composite metal deck, consisting of metal deck and conventional poured reinforced concrete, steel deck inserts or Metal deck ceiling bolts (T-bars) shall be used. Steel deck inserts shall be of a type that is supported by the concrete slab and not by the metal deck. Inserts size shall conform to the size of the hanger rod. Install inserts before the pouring of the concrete.
 4. Expansion bolts shall be installed in snug fitting smoothly drilled holes in accordance with the manufacturer's installation instructions. Expansion bolts shall be installed so that the load acts on the bolts in shear and withdrawal. Expansion bolts shall be carefully located in order to eliminate the risk of damage to concrete, steel reinforcement, and other embedded items. Install in concrete after concrete is placed and completely cured.

5. The Contractor shall take every precaution to furnish and set all sleeves, wood boxes or other devices that are required for proper installation of his work, before concrete is poured.

The Contractor is responsible for coordination with other trades and maintaining location of sleeves and inserts during concrete pour.

- L. Methods of Fastening: The following rule, except where otherwise specified, shall be observed throughout the entire work: Where fastenings are made to wood, use long screws or lag screw; to brickwork, cement, stone and marble, approved long expansion bolts; to fire-proof block work, approved toggle bolts, and to iron work, approved bolts and nuts. The use of wood plugs and nailing will not be permitted. Sundries used in connection with galvanized iron shall be galvanized. Those in connection with brass work shall be of brass, finished to match the connecting work.
- M. Cleaning, painting and installation of hangers and supports shall be done before the application of fireproofing material. All hanger and support assemblies in their entirety shall be rust proofed and painted. For material and method of painting, refer to Section 09900 - Painting.
- N. Gas piping installed on the roof: The support shall be anchored or secured to the concrete deck.

3.02 NO-HUB PIPING - ADDITIONAL REQUIREMENTS

- A. Sway bracing shall be provided at changes in direction greater than 45° for pipe sizes 4" and larger.
- B. On horizontal piping, additional hangers shall be provided at each horizontal branch connection.
- C. Horizontal piping 6" and larger shall be braced to prevent joint separation.
- D. Vertical piping shall be braced at each joint to assure maintaining alignment.
- E. Vertical piping shall be secured at base of stack to building structure with socket clamp and rods or trapeze hangers.
Refer to "No-Hub Pipe Bracing (for vertical piping) Detail".

END OF SECTION

SECTION 220412
VALVES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of Valve Work is indicated on the Drawings and by the Requirements of this Section.
- B. All valves that convey drinking water for human consumption must be certified as "lead free" as defined in the Reduction of Lead in Drinking Water Act of 2011 (not more than a weighted average of .25% lead). Regardless of the valve manufacturer listed in these specifications, provide valves that meet the requirements of the act. All solder and flux used during installation of valves associated with the potable water system designed for human consumption must also meet the lead-free requirements of the act.

1.02 SUBMITTALS

- A. Product Data
 - 1. Manufacturer's product technical data for each valve.
 - 2. Installation Instructions
 - 3. Include list indicating valve and its application
- B. Shop Drawings indicating methods of assembly of components.
- C. Certifications
 - 1. Lead-free Certifications: Provide manufacturer's certifications that valve in contact with the potable water, except those that are exempted, meet the requirements of the Reduction of Lead in Drinking Water Act, effective Jan 4, 2014.

1.03 CODES AND STANDARDS

- A. The contractor shall install items that are certified as lead-free as defined in the 2011 Reduction of Lead in Drinking Water Act.
 - 1. The law makes it unlawful for any person, including a Contractor, to introduce into commerce any pipe, pipe fitting, plumbing fixture, faucet that is not lead free.
 - a. "Lead free" content is intended to mean not more than 0.2% lead when applied in connection to solder and flux and not more than 0.25 percent of the weighted average of lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fixtures and faucets.
 - b. The section of the federal act that applies to solder and flux, 0.2% lead content, went into effect back in August of 1998; and for the most part soldering product being sold in today's market complies with the law.
 - c. The requirement for .25% weighted average of lead when applied to the wetted surfaces of pipes, pipe fittings, plumbing fixtures and faucet is the new section of the law that requires special attention from a contractor.

2. To ensure compliance with "Reduction of Lead in Drinking Water Act", a procedure for determining lead content was developed. The calculation procedure works as follows:
 - a. "For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product. The lead content of the material used to produce wetted components shall be used to determine compliance with paragraph 1.a. above
 - b. As an alternative to implementing the lead content calculation, the contractor may choose to demonstrate compliance with the act by requiring from manufacturer documentation certifying that products are lead-free based on either calculation or tests or third party certification.

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Maximum content of lead permitted in materials used in the manufacture of valves shall be .25%.
- B. All valves shall be designed for packing under pressure with valve open or closed.
- C. Valves 2" and under shall be all bronze. Valves 2½" and over shall have iron bodies with bronze mountings (IBBM), and with outside screw and yoke (OS&Y), unless space conditions prevent the use of O.S. & Y. valves, in which case non-rising stem valves may be used.
- D. All gate valves shall be of the solid wedge disk type.
- E. All valves up to 2" in diameter shall have threaded or solder ends, 2½" in diameter and over shall have flanged ends.
- F. Iron body flanged-valves, strainers and other items shall be provided with gaskets and sealing as manufactured by Garlock. All flanges shall be drilled for American Standard Association 125-pound standard.
- G. All valves, except as otherwise specified, shall be type and number as specified below:
 1. Gate Valves:

200-300 CWP (Cold Working Pressure)/ or WOG (Water/Oil/Gas), threaded, bronze body, solid wedge, inside screw non-rising stem, screw-in bonnet: Milwaukee UP105, Hammond UP645, NIBCO T-113-LF, Apollo Valves 102T-LF.

200-300 CWP / or WOG, Solder end, bronze body, solid wedge, inside screw non-rising stem, screw-in bonnet: Milwaukee UP115, Hammond UP647, NIBCO S-113-LF, Apollo Valves 102S-LF.

Class 125 & 150, flanged, iron body bronze mounted (IBBM), bolted bonnet, O.S.& Y., solid wedge: Stockham G-623, Milwaukee F-2885M, Hammond IR1140, NIBCO F-637-33, Crane 465-1/2, Apollo Valves 611F.

Class 125, flanged, iron body bronze mounted (IBBM), non-rising stem, bolted bonnet, solid wedge: Stockham G-612, Milwaukee F-2882M, Hammond IR1138, NIBCO F-619-RWS, Crane 461, Apollo Valves 610F.

2. Check Valves:

200-300 CWP/ or WOG, threaded ends, bronze body, horizontal swing, bronze disc: Milwaukee UP509, Hammond UP904, NIBCO T-413-Y-LF, Apollo Valves 161TF.

200-300 CWP /Or WOG, solder ends, bronze body, horizontal swing, bronze disc: Milwaukee UP1509, Hammond UP912, NIBCO S-413-Y-LF, Apollo Valves 161S-LF.

Class 125, flanged ends, iron body bronze mounted (IBBM), bronze disc and seat ring, bolted cap, horizontal swing: Stockham G-931, Milwaukee F-2974M, Hammond IR1124, NIBCO F-918-B, Crane 373, Apollo Valves 910F.

- H. Ball valves shall be two-piece, full port, 600 W.O.G., bronze body, chrome plated bronze or brass ball and Teflon seals, with thread or solder ends. Ball valves shall have a lever handle. Threaded ends ball valve shall be Conbraco Industries, Inc.; Apollo Valves 77CLF-100, Crane 9211, Milwaukee UPBA-400, Hammond UP8301, NIBCO T-585-80-LF, and soldered ends ball valve shall be Conbraco Industries, Inc.; Apollo Valves 77CLF-200, Milwaukee UPBA-450, Hammond UP8311, NIBCO S-585-80-LF. Ball valves should be used for up to 2" sizes only.

1. Press-Fit Ball Valves: Valves shall be two-piece bronze body with full port, chrome or brass plated ball, blow-out proof stem and PTFE or RTFE seats, rated at 200 psi with press fitting ends. Ball Valves shall be Viega Model 2971.1ZL, NIBCO C585-80-LF, Conbraco Industries, Inc.; Apollo Valves 77WLF, Milwaukee UPBA400-P2. Ball valves shall have a metal lever handle.

- I. Soldered end valves shall be joined using "soft" soldering.

NOTE: All valves of one type, i.e., all gates, or all check valves shall be of one manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install valves in accordance with the manufacturer's instructions. Follow valve manufacturers recommendations when brazing solder end valves.
- B. Valves shall be installed so that they shall be readily accessible. It is brought to the Contractor's attention that all valves shall be so located that they can be easily and safely operated. No valve shall be installed with the stem pointed downward. If, in the opinion of the Authority, valves are so installed as to create a hazardous and unsafe condition, this Contractor shall relocate these valves as directed without additional charge.
1. Valve shall be full size of pipe. Iron body bronze mounted (IBBM), flanged, outside screw and yoke (OS&Y) valves shall be used on: water service and sprinkler service assemblies, suction and discharge piping for pumps and water distribution piping

2½" and larger. Valves on water distribution piping 2" and smaller shall be brass or bronze body.

- C. Gate valves shall be provided at the base of all risers, on all mains, branch lines, take-offs, drains, etc., and at all pumps, equipment, and at all apparatus; so located and arranged as to give complete shut-off and regulating control of all systems piping and apparatus.
 - 1. Ball valves may be substituted for Gate Valves on water distribution pipes up to 2" in size for risers, branches and hot and cold headers in accessible toilet pipe spaces.
- D. Swing check valves shall be installed in horizontal position with hinge pin horizontally perpendicular to centerline of pipe.
- E. All valves shall have the name or trademark of the manufacturer and guaranteed working pressure cast or stamped on the body of the valve. All flanges shall be drilled for American Standards Association 125-pound Standard. Companion flanges for all iron body gate valves, check valves, strainers, etc., shall be iron.
- F. Special Installation Procedure

When included in the Disinfection and Water Quality Testing Plan (DWQTP) and such plan is approved by the Authority's Environmental and Industrial Hygiene Division, special installation procedures in accordance with the Article entitled "Procedure For Direct Replacement of Potable Water System Fixtures, Fittings and Appliances" in Section 15414 may be used in lieu of system disinfection. These procedures apply when potable water system components (e.g., fittings, valves, etc.) are installed or replaced as part of work that does not involve the replacement or installation of associated potable water piping.

3.02 VALVE APPLICATION SCHEDULE

- A. Compressed Air: Above Ground-Interior
 - 1. 2" and Less: Screwed or solder ends; Class 125, bronze body gates and bronze body swing checks.
 - 2. 2½" and Up: Flanged ends, Class 125, OS&Y iron body gates; and iron body swing checks.
- B. Domestic Hot & Cold Water
 - 1. 2" and Less: Solder or threaded ends; Class 125, bronze body gates; bronze body swing checks.
 - 2. 2½" and up: Flanged ends; Class 125, OS&Y iron body gates; and iron body swing checks.
- C. Gas Piping: Not Used.

END OF SECTION

SECTION 220413
INSULATION (P&D)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide non-conducting insulation, including accessories, on the following piping and apparatus.
1. All concealed and exposed hot water supply piping (which is not laid in the ground) including circulation and booster piping, tempered water piping, flanges, fittings and valves.
 2. All concealed and exposed cold water supply piping (which is not laid in the ground) including flanges, fittings and valves.
 3. All concealed and exposed horizontal runs and off-sets of storm water piping, except when laid in the ground or when located in non-occupied spaces in the basement. All fittings and vertical off-sets associated with the foregoing pipe shall also be insulated.
 4. Hot water reservoirs, booster heaters, pressure tanks, etc.
 5. All heat-traced piping.
- Note: Exposed supply and waste connections under plumbing and kitchen fixtures shall not be insulated except where waste lines are heat traced.

1.02 SUBMITTALS

- A. Product Data
- Submit manufacturer's product data for insulation materials, adhesives, mastics and cements. Include installation details for valves, fittings, pipes and all other item to be insulated. No material shall be delivered to the site prior to being approved.
- B. Schedule listing items to be insulated, description of insulation and finishing procedures.
- C. Certificates from the manufacturer stating compliance with the following:
- Insulation, finishing facings or jackets, adhesives, mastics and cements are asbestos free and all materials installed have composite fire and smoke hazard ratings, 25 & 50 respectively, to meet the requirements of the Building Code.
- D. Contractor Qualifications

1.03 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least three years of successful installation experience on projects with the piping and equipment insulation similar to that required for this Project.

B. Regulatory Requirements

1. Comply with the NY Plumbing Code, New York Energy Conservation Code (IECC) and ASHRAE 90.1.
2. All insulation, vapor barriers, as well as the adhesives and finishing facings or jackets used herewith shall have a flame spread rating not over 25 without evidence of continued progressive combustion, and shall have a smoke developed rating not higher than 50. All materials installed shall have composite fire and smoke hazard ratings to meet requirements of the Code.

C. Asbestos Prohibition

All products provided under this Section shall be asbestos, lead and mercury free.

1.04 DELIVERY, STORAGE AND HANDLING

- A. 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 and brand.
- B. Store insulation in original wrappings and protect from any damage.

1.05 TEMPERATURE REQUIREMENT

- A. Apply adhesive, sealers, coating, and all other items and accessories at the proper temperature as recommended by the manufacturer. If ambient conditions are not acceptable, provide temporary heat as required for proper installation without any delay to the Project completion.

1.06 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields
- B. Coordinate clearance requirements with piping installer for piping insulation application and equipment installer for equipment insulation application. Establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Insulation, fiberglass fitting cloth, bands and casings (predicated on meeting the specification requirements)
 1. Certain-Teed Corp.
 2. Johns Manville, Owens-Corning Fiberglass Corp.

3. Knauf Insulation.
 4. Armacell LLC; AP Armaflex.
 5. Pittsburgh Corning Corp.
- B. Adhesives (predicated on meeting the specification requirements)
1. Benjamin Foster Co.
 2. Epolux Manufacturing Corp.
 3. Armacell LLC
 4. Insul-Cooustic (Division of Birma Products Corp.)
- C. Pre-molded fiberglass fittings (predicated on meeting the specification requirements)
1. Hamfab Inc
- D. Vapor barrier and weatherproofing jacket (predicated on meeting the specification requirements)
1. Venture Tape Corp.
 2. Polyguard Products Inc.

2.02 MATERIALS

- A. Adhesives and Sealants for Insulation: All adhesives and sealants used on interior building insulation shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ-4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Foam insulation materials shall not use CFC or HCFC agents in the manufacturing process.
- D. Piping Insulation
1. One-piece molded sectional fiberglass: Nominal 4-pound density with a thermal conductivity in the following ranges per Section C404.4 & Table C403.11.3 of the NY IECC.
 - a. 0.21 – 0.27 per inch/h x ft² x °F for water flowing at temperatures of 40°F–60°F
 - b. 0.21 – 0.28 per inch/h x ft² x °F for water temperatures at 105°F-140°F. Also to be used for tepid water lines being supplied below the 105°F

- c. 0.25 – 0.29 per inch/h x ft² x °F for water temperatures at 141°F–200°F

The required insulation thickness mandated by these specifications shall be provided regardless of the exception granted by section C404.4 & Table C403.11.3 of the NY IECC for omitting insulation on piping surrounded by building insulation with a thermal resistance (R-value) of not less than R-3. Insulations shall have factory-applied all-service jacket (ASJ) and adhesive used to adhere the jacket to the insulation. It shall be suitable for use on piping up to 200°F.

2. Fiber Free Elastomeric Foam: Shall be closed-cell material with a thermal conductivity in the following ranges per Section C404.4 & Table C403.11.3 of the NY IECC.

- a. 0.21 – 0.27 per inch/h x ft² x °F for water flowing at temperatures of 40°F–60°F
b. 0.21 – 0.28 per inch/h x ft² x °F for water temperatures at 105°F–140°F. Also to be used for tepid water lines being supplied below the 105°F
c. 0.25 – 0.29 per inch/h x ft² x °F for water temperatures at 141°F–200°F

The required insulation thickness required by these specifications shall be provided regardless of the exception granted by section C404.4 & Table C403.11.3 of the NY IECC for omitting insulation on piping surrounded by building insulation with a thermal resistance (R-value) of not less than R-3. It shall be suitable for use on piping up to 200°F; the equal of AP Armaflex.

3. Fiberglass Paper-Free ASJ Pipe Insulation: Molded paper-free fibrous glass pipe insulation with the following ranges per Section C404.4 & Table C403.11.3 of the NY IECC.

- a. 0.21 – 0.27 per inch/h x ft² x °F for water flowing at temperatures of 40°F–60°F
b. 0.21 – 0.28 per inch/h x ft² x °F for water temperatures at 105°F–140°F. Also to be used for tepid water lines being supplied below the 105°F
c. 0.25 – 0.29 per inch/h x ft² x °F for water temperatures at 141°F–200°F

The required insulation thickness mandated by these specifications shall be provided regardless of the exception granted by section C404.4 & Table C403.11.3 of the NY IECC for omitting insulation on piping surrounded by building insulation with a thermal resistance (R-value) of not less than R-3.

Insulation shall have a factory-applied paper free all service jacket and double adhesive lap seal closure system, rated for a maximum service temperature of 850°F. Circumferential joints shall be sealed with paper free butt strips that are compatible with the required facing. Stapling shall not be required to complete the closure. Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed. On cold systems, vapor barrier shall be provided. All penetrations and exposed ends of insulation shall be sealed with mold resistant vapor barrier mastic.

E. Insulation and accessories

1. For valves, fittings, etc. for hot water piping, cold water piping, drainage and vent piping shall include the following:
 - a. One-pound density fiberglass blanket.
 - b. Segments of pipe insulation.
 - c. Pre-molded fiberglass fittings.
 - d. No. 20 gage galvanized steel annealed wire.
 - e. Insulating cement.
 - f. In lieu of the cement coat, and fiberglass blanket material or segment of pipe insulation on valves and fittings; the use of Zeston product, an ultra violet resistant, 20-mil thick, one-piece PVC fitting cover with pre-cut insulation inserts, HI-Lo-Temp, as manufactured by Manville, shall be accepted.
 2. For water meters, provide the following:
 - a. 1.5-pound density fiberglass blanket.
 - b. 2" hexagonal galvanized mesh wire.
 - c. Insulating cement.
 3. For hot water reservoirs, booster heaters and pressure tanks, the following shall be provided: (for replacement use only)
 - a. Calcium silicate blocks, 1½" thick, minimum 12-pound density.
 - b. No. 12 gage galvanized steel annealed wire.
 - c. 1" hexagonal galvanized wire mesh.
 - d. Welded studs, clips or angles.
 - e. Insulating and finishing cement.
- F. Jacket and accessories
1. Over insulation on hot water piping, install the following:
 - a. White kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn.
 - b. Outward clinch coated 9/16" staples.
 - c. 3/4" wide aluminum bands.
 - d. Aluminum casing, 0.16" thick.

- e. PVC Plastic: Zeston, one piece molded type fitting covers and jacketing material, gloss white. Connections: Tacks, pressure sensitive color matching vinyl tape.
- 2. Over insulation on valves, fittings, etc. for hot water piping, include the following:
 - a. Fiberglass fitting cloth which shall be 20 X 20 yarns per inch fiberglass mesh.
 - b. Lagging adhesive shall be Epolux No. 336, Foster 30-36.
 - c. PVC Plastic: Zeston, one piece molded type fitting covers and jacketing material, gloss white. Connections: Tacks, pressure sensitive color matching vinyl tape.
- 3. Over insulation for cold water piping, drainage and vent piping, install the following:
 - a. White kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn.
 - b. Insulation adhesive.
 - c. Aluminum casing, .016" thick.
 - e. Elastomeric closed cell fiber free foam with no vapor barrier is also acceptable.
 - d. Vapor barrier and weatherproofing jacket shall be a laminated five-ply self-adhesive material; weather resistant, high puncture and tear resistant. The product shall be used both indoors and outdoors, shall have zero permeability, and shall be manufactured with mold inhibitors: VentureClad 1577CW-All Grade or Alumaguard Lite or Alumaguard "All Weather" LT.
- 4. Over insulation on valves and fittings for drainage and vent piping and over valves, fittings, water meters for cold water, the following shall be included:
 - a. Glass cloth.
 - b. Vapor barrier coating shall be Foster 30-80.
- G. Special protection: At all points of support the following shall be included:
 - 1. Rigid calcium silicate pipe insulation having a minimum twelve (12) pound density. Blocks shall be 1½" thick.
 - 2. Galvanized metal shields as manufactured by Carpenter & Paterson, Fig. 265 P or Anvil International Fig. 167. Shields shall be 18 gage for pipe sizes up to and including 5" and 16 gage for larger sizes.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Insulation shall be installed only after tests of the piping systems.
- B. Valves shall be insulated up to the packing unit.
- C. Unions shall not be insulated.
- D. Fire Seal Application: Where pipes pass through fire walls, fire partitions, fire rated pipe chase walls or floors above grade, insulation shall pass through and a UL classified assembly shall be provided.
- E. All necessary insulating material not specified shall be as recommended by the manufacturer of the insulation.

3.02 INSTALLATION

A. Thermal Insulation for Piping

1. Hot Water Piping

- a. Temperature range from 105°F to 140°F.

- 1) 1" thick insulation for pipe sizes up to and including 1" in diameter.
- 2) 1½" thick insulation for pipe sizes larger than 1" in diameter and up to 8" pipe diameter.

- b. Temperature range from 141°F to 200°F

- 1) 1½" thick insulation for pipe sizes up to and including 1" in diameter.
- 2) 2" thick insulation for pipe sizes larger than 1" in diameter and up to 8" pipe diameter.

2. Cold Water Piping

- a. 1" thick insulation for pipe sizes up to and including 2" in diameter.
- b. 1½" thick insulation for pipe sizes larger than 2" in diameter.

3. Insulation for horizontal runs and off-sets including fittings and vertical off-sets of storm water piping shall be of the thickness specified for cold water piping.

4. Valves, fittings, etc. for hot & cold water piping shall be insulated as follows:

- a. For pipe sizes smaller than 4", wrap firmly under a minimum of a 3:1 compression, with 1-pound density fiberglass blanket, to a thickness equal to adjoining insulation. Secure with No. 20 gage galvanized steel annealed

wire. Finish with a smooth coat of insulating cement. In addition, insulating cement (except for cold water) applied in thickness equal to the adjoining pipe insulation material may also be used on valves & fittings.

- b. For pipe sizes 4" and larger, fit segments of pipe insulation equal in thickness to adjoining insulation and secure with No 20 gage galvanized annealed steel wire. Finish with a smooth coat of insulating cement.
 - c. In lieu of the foregoing methods, the use of pre-molded fiberglass fittings of the same thickness as adjoining pipe insulation will be accepted. Secure with No. 20 gauge galvanized annealed steel wire and finish with a smooth coat of insulating cement.
 - d. In lieu of the above a, b and c, the use of pre-formed PVC fitting covers with factory pre-cut Hi-Lo Temp insulation insert of the same thickness as adjoining pipe insulation will be accepted.
Valves, fittings, etc. shall be insulated by applying the PVC fitting covers of the same thickness as adjoining pipe insulation with the proper factory pre-cut Hi-Lo Temp insulation insert to the pipe fitting, valve, etc. The ends of the Hi-Lo Temp insulation insert shall be tucked snugly into the throat of the fitting, valve etc. and the edges adjacent to the pipe covering tufted and tucked in, fully insulating the pipe fitting, valve, etc. The PVC fitting cover [in conjunction with a mastic vapor barrier for cold water only] shall then be applied and shall be secured by tack fastening, and then taping the ends to the adjacent pipe covering. Where the operating temperature exceeds 250°F, 2 or more layers of the Hi-Lo Temp insulation inserts shall be applied prior to the installations of the PVC cover. The first layer shall be applied with a few wrappings of fiberglass yarn to eliminate voids or hot spots.
5. All water meters shall be covered with a 1", 1.5-pound density fiberglass blanket under a minimum of 3:1 compression. Over this insulation use a 2" hexagonal galvanized mesh wire, tightly stretched and secured in place with edges tied together. Finish with approved insulating cement 1/4" thick in one coat, troweled to a smooth finish.

B. Facing or Jackets

1. Hot Water Piping

- a. Insulation on concealed and exposed hot water piping shall have a jacket of white kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn. Longitudinal laps shall be secured with outward clinch coated 9/16" staples on 4" maximum centers. Circumferential joints shall be firmly butted and wrapped with a 3" minimum wide strip of the jacketing material securely stapled in place. In lieu of staples, longitudinal laps and circumferential joint butt strips may be smoothly secured with lagging adhesive. Jackets shall be additionally secured with 3/4" wide aluminum bands installed on 12" (maximum) centers.
- b. Insulation on hot water valves, fittings, etc., shall have a jacket of fiberglass fitting cloth smoothly adhered with lagging adhesive. Lap cloth on itself and

adjoining insulation facing. Lap shall be 1" on pipe sizes up to and including 3" and 2" on large pipe sizes.

2. Cold Water Piping

- a. Insulation on piping shall have a vapor barrier jacket of white kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn or of self-adhesive material. Longitudinal laps and butt strips shall be smoothly secured with insulation adhesive. Vapor barrier jackets on insulation must be applied with a continuous unbroken vapor seal. The use of staples on vapor barrier jacketed insulation is not permitted. The use of Elastomeric closed cell fiber free foam with no vapor barrier is acceptable.
- b. Insulation on valves, fittings, water meter, etc., shall be vapor sealed by applying glass cloth embedded between two 1/16" thick coats of vapor barrier coating. Lap seal glass cloth at least 2" on itself and the adjoining insulation.
- c. The ends of cold water pipe insulation shall be sealed off at all flanges, fittings, valves and interval of 21' on continuous runs of pipe with Foster fire resistant vapor barrier coating BF 30-80.

3. Horizontal Drainage Lines

- a. Insulation on horizontal runs and off-sets including fittings, vertical off-sets of storm water piping shall have a vapor barrier jacket as described for cold water piping in subparagraph 2 above. The use of Elastomeric closed cell fiber free foam with no vapor barrier is acceptable.
- b. The ends of drainage pipe insulation shall be sealed off at all fittings and at intervals of 21 feet on continuous run of pipe with Foster fire resistant vapor barrier coating BF 30-80.

C. Insulation and Protection at Points of Support

1. Install inserts made from rigid calcium silicate pipe insulation, in lieu of pipe insulation specified in Paragraph A above, at all points of support. Inserts shall be not less than 12" long and of thickness equal to adjoining insulation. A jacket shall be installed over the insert with longitudinal laps and butt strips for circumferential joints smoothly secured with insulation adhesive. Jacket shall provide vapor barrier where required.
2. Install galvanized steel shields between supports and inserts. Shields shall be formed to fit the insulation and shall extend up to the center line of the pipe and of the length specified for the inserts. Supports shall not pierce the insulation and all vapor barriers shall be unbroken and continuous.

D. Insulation and Jackets for Tanks

1. Tanks shall be covered with calcium silicate blocks tightly butted and joints staggered such that a minimum R 12.5 is achieved. Blocks shall be held in place with No. 12 gage galvanized steel wire on 12" maximum centers. Install studs, clips

or angles welded to the tank for the purpose of securing the wire to the tank. Install 1" hexagonal galvanized mesh over the block insulation. Mesh shall be stretched tight with edges tied together and secured with No. 12 gage galvanized steel wire to the anchors. Apply in one coat over the mesh, a 1/2" thick layer of insulating and finishing cement and trowel to a smooth finish.

2. For tanks storing hot water, install a jacket of fiberglass fitting cloth smoothly adhered with lagging adhesive over the insulating and finishing cement. The cloth shall lap on itself and the adjoining pipe insulation facing. Lap shall be 2".
 3. For tanks storing cold water, install a jacket of fiberglass fitting cloth embedded between two 1/16" thick coats of vapor barrier coating over the insulating and finishing cement. The cloth shall lap on itself and the adjoining pipe insulation facing. Lap shall be 2". The use of vapor barrier and weatherproofing jacket will be accepted. The use of Flexible Elastomeric closed cell foam sheet or roll insulation to cover tanks is acceptable.
- E. Protection of Piping Exposed to Freezing Temperatures: Piping to be frost proofed (heat traced) shall be insulated with two layers of molded fiberglass pipe insulation of thickness required for such pipe diameter depending on if it is cold or hot water piping. The outer layer shall be jacketed as specified for cold water piping in Paragraph 3.02 B of this Section. The final insulation shall be protected with not lighter than 0.016" aluminum casing. Where this piping is installed within a furred enclosure or room the casing shall be omitted. All water and waste piping in backflow preventer rooms in which RPZ discharges outside building above grade, shall have electric heat tracing cable installed on the piping prior to piping being covered by insulation, see Electrical Specifications Division 16.
- F. Protection of Sanitary Kitchen Waste Lines that are Heat-traced: Sanitary piping that is heat-traced shall be insulated with one layer of molded fiberglass pipe insulation. Thickness of layer shall be 1" thick for pipe sizes up to and including 2" and 1½" thick for larger pipe sizes. Insulation shall have a jacket of white kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn. Longitudinal laps shall be secured with outward clinch coated 9/16" staples on 4" maximum centers. Circumferential joints shall be firmly butted and wrapped with a 3" minimum wide strip of the jacketing material securely stapled in place. In lieu of staples, longitudinal laps and circumferential joint butt strips may be smoothly secured with lagging adhesive. Jackets shall be additionally secured with 3/4" wide aluminum bands installed on 12" (maximum) centers.

3.03 PROTECTION AND REPLACEMENT

- A. Replace insulation damaged during construction which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection

Insulation worker shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

3.04 PAINTING

- A. Insulation on all piping and fittings, exposed in Boiler Room, Mechanical Spaces and Fan Rooms, shall be given two (2) coats paint.

- B. Insulation on all piping and fittings, exposed in finished spaces shall be given two (2) coats of paint, the color of which shall match the adjacent surroundings.

3.05 LABELING

- A. After the finished coat of paint has been applied to the insulation, this contractor shall do all pipeline identification labeling.

END OF SECTION

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SECTION 220414
TESTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Every new plumbing system and every part of an existing plumbing system that has been altered or repaired shall be inspected and tested. Inspections and tests shall comply with the requirements of this Section. All testing is to be performed by the Contractor unless specifically indicated otherwise.
- B. Defects disclosed by tests shall be repaired, or, if required by the Authority, defective work shall be replaced with new work. Tests shall be repeated after defects have been repaired or replaced and shall be repeated as often as necessary until all work passes the required tests.
- C. All inactive portions of the potable water system(s) shall be flushed and tested.

1.02 SUBMITTALS

- A. Disinfection and Water Quality Testing Plan (DWQTP).
- B. Tests
 - 1. Manufacturer's pump tests with curves
- C. Reports
 - 1. Disinfection Completion Package.
 - 2. Lead Remediation Documentation.
- D. Qualifications
 - 1. DWQTP preparer.
 - 2. Water Disinfection and Sampling Company.
 - 3. Laboratory performing water testing.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide all materials, equipment and other items required for tests, retests, repairs and replacements that are required to complete the Work of this Section.
- B. All gauges, instruments and test devices shall be provided with a certificate of calibration and calibration curve or letter indicating that a minimum of five (5) test points have been calibrated. The certificate and letter must show the date of last calibration. The calibration date must be within a year of the testing date.
- C. If necessary, provide new (factory wrapped) hose for use during disinfection procedures.

PART 3 - EXECUTION

3.01 PIPING SYSTEM TESTS - GENERAL

- A. All new piping and equipment shall be tested prior to application of insulation, painting, concealing or placing of backfill. Testing as stipulated herein shall be considered minimum, and where tests stipulated by authorities having legal jurisdiction exceed these requirements, such more stringent tests shall be performed.
- B. The work of the Contractor shall include the furnishing of all labor, testing instruments, gauges, pumps, smoke machines, and other equipment required or necessary for tests, required by law, rules, and regulations and as specified.
- C. Provide all other tests required by local inspectors and all other authorities having jurisdiction.
- D. All appurtenances shall be operated after installation to determine whether or not they meet the requirements of the Specifications.
- E. Where controls and accessories are not designed to withstand pipe test pressures, they shall be removed or otherwise properly protected against damage during such test. After approval of such tests, controls and accessories shall be installed and tested with operating medium to operating pressures.
- F. If leaks are observed during any tests the defective work or material shall be replaced. No caulking of screwed joints or holes will be acceptable. Peening of welds is prohibited. Repetition of the entire test will be required as many times as leaks can be observed from the tests, until no leak results in successful completion of the test.
- G. All tests shall be made in the presence and to the satisfaction of a representative of the Authority, or their representatives, and the local authorities having legal jurisdiction over the work to be tested, and as may be directed; and at least 72 hours notice shall be given to all parties in advance of all tests.
- H. All piping which is to be enclosed in partitions or hung ceilings shall be tested and made tight when directed by the Construction Supervisor representative of the Authority and in adequate time to permit the installation of partitions and ceilings. When necessary, the Contractor shall drain the piping and/or take such precautions as required to prevent damage by freezing.

3.02 TESTING OF AUTOMATIC CONTROLS

- A. In cooperation with control manufacturer's representative, adjust controls to operate as specified. Testing personnel shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.

3.03 DOMESTIC WATER SYSTEM DISINFECTION

- A. The potable water system shall be disinfected and water samples shall be collected and analyzed by the Contractor. The requirements of this Section include disinfection of all parts of new, repaired or replaced potable water systems including, but not limited to, new service connections as specified.

- B. All work shall be performed in accordance with the applicable requirements of the New York Department of Health, and Section PC 610 of the Plumbing Code. As used in this Section, the potable water system includes, but is not limited to, the hot and cold water distribution system piping, fittings, fixtures, and related appurtenances, and service main connections.
- C. Chemicals, additives, treatment devices, and equipment that may come in contact with potable water shall be in compliance with the requirements of Section PC 610, the American Water Works Association (AWWA), National Sanitation Foundation International (NSF)/ American National Standards Institute (ANSI) 60 Drinking Water Treatment Chemicals – Health Effects and NSF/ANSI 61 Drinking Water System Components – Health Effects.
- D. The health and safety of the Contractor's employees and subcontractors is the sole responsibility of the Contractor during performance of the Work. All work must be completed in accordance with applicable Federal, State, Local agency and the Authority's Health and Safety requirements and regulations.
- E. The Contractor (specifically the individual responsible for preparing the DWQTP(s)) shall visit the site to inspect all parts of the potable water system to be disinfected and to determine site-specific conditions to be addressed prior to submittal of the DWQTP(s).
- F. The Contractor shall prepare a site specific DWQTP for review by the Authority's Indoor Environment Health (IEH) Division that complies with the "Drinking Water Quality and Testing Plan" Template available on Authority's website (under Environmental & Regulatory Compliance, Industrial and Environmental Hygiene) and the following requirements, as applicable:
 - 1. Description of pre-disinfection flushing procedures using Flushing Logs as per Template: Flushing shall be performed in the presence of the state representative using clean potable water to ensure a turnover of at least four complete water volumes of the water contained in the entire new piping system or one hour flushing; whichever is greater, and tested for residual chlorine concentration equal to 0.2 parts per million (ppm) or municipally-supplied water background chlorine levels.
 - 2. Pre-disinfection flushing shall be performed at a flow rate sufficient to remove all debris or sediment from new potable water piping and components and using methods to prevent retainage of debris or sediment by components such as aerators, strainers, vacuum breakers, filters, valves, etc.
 - 3. Sodium hypochlorite or approved equal shall be used for disinfection (chlorine gas is not acceptable and shall not be used).
 - 4. Description of testing procedures to verify pH is within acceptable range during disinfection procedures. The DWQTP shall include a statement that pH range will not result in damage to the potable water system and provides for optimal disinfection conditions.
 - 5. Point(s) of treatment for the potable water distribution system: The concentration range appropriate to achieve disinfection is equal to or greater than 50 ppm for a contact time of 24 hours, or equal to or greater than 200 ppm for a contact time of 3 hours. All potable water fixtures shall be tested (using field test strips or portable chlorine meter) to verify that chlorinated water is present throughout the system.

6. Contact time: The Contractor shall identify points of chlorine testing throughout the potable water system, which will be used to ascertain that there is sufficient concentration of chlorine remaining throughout the water system to ensure disinfection after the appropriate contact time has been reached (chlorine concentration shall be checked at the beginning of the hold time and once every hour thereafter). The contact times specified in Section PC 610 are the minimum required contact times. The Contractor shall place signs on each fixture/faucet indicating "Disinfection in Progress. Do Not Drink or Use Water."
7. Steps to achieve disinfection should the chlorine concentration remaining in the potable water system at the end of the contact time be below the acceptable level.
8. All potable water faucets, bubblers, hose bibs, etc. shall be tested for residual chlorine concentration after disinfection and thorough flushing with clean potable water in accordance with manufacturer's recommendations. Following flushing, residual chlorine concentrations shall be equal to 0.2 ppm or municipally supplied water background chlorine levels. Discharge of effluent shall be in accordance with federal, state, and local regulations.
9. Sampling points and number of samples for bacteriological examination. Samples shall be collected from a minimum of one fixture per area of work being performed when there is more than one work area/floor. Otherwise a minimum 10% of potable water fixtures per floor or two fixtures per floor, whichever is greater, shall be sampled. Samples shall be collected a minimum of 24 hours after completion of post-disinfection flushing.
10. Bacteriological analyses to be performed and applicable regulatory standards: Analysis of water samples for Total Coliform, E. Coli bacteria, and Heterotrophic Plate Count (HPC) or standard plate count (SPC) is required. The Contractor shall certify in the DWQTP that sample analyses will be performed in accordance with the latest edition of the Standard Methods for the Examination of Water and Wastewater, published jointly by the American Public Health Association (APHA), AWWA, and the Water Environment Federation (WEF).
11. Sample collection techniques and handling procedures shall meet or exceed all applicable regulatory standards.
12. Sample containers, preservation, holding times, custody seals, and chain-of-custody procedures shall be in compliance with New York State Department of Health (NYSDOH) requirements and the requirements of the analytical method.
13. Not Used.
14. Name and qualifications of specialty Contractor performing the disinfection, sampling and testing. Minimum contractor qualifications are: successful completion of at least three projects similar in scope and execution and at least three years experience in performing water disinfection and sampling.
15. Name of certified laboratory(ies) performing the disinfection testing (with copies of current certifications provided). Laboratory analysis shall be performed by a laboratory certified for bacteriological analyses by the NYSDOH under the Environmental Laboratory Approval Program (ELAP).
16. Report to be in standard laboratory reporting format.

17. Water Supply Service Connection Disinfection Procedure utilizing template DWQTP template and Paragraphs 3.03 I & J.
 18. Statement that the potable water system has been carefully evaluated, that the proposed disinfectant and disinfection procedures are compatible with all components of the potable water system, and that the disinfection will in no way result in damage to the potable water system.
 19. Explicitly identify each and every component, if any, of the building potable water system which the Contractor would propose to exclude from the disinfection procedures. Describe how each component would be excluded. Provide a justification for any such proposed exclusion, including citations to supporting regulations and/or guidance.
- G. The DWQTPs shall be submitted to the Authority's IEH Division and approved at least five (5) business days before scheduling the disinfection. No claims of delay shall be permitted due to the lack of approval of the Contractor's DWQTP by the Authority's IEH Division.
- H. An IEH representative will perform a site inspection to confirm that site conditions are consistent with the Disinfection and Water Quality Testing Plan (DWQTP) prior to providing authorization to begin disinfection.
- I. Written approval of the DWQTP by the Authority's IEH Division is required prior to implementation. Submittal of separate DWQTPs is required for the interior parts of the potable water system and the exterior service main connections. Incomplete DWQTPs will be rejected and the Contractor is responsible to address all comments and obtain the Authority's IEH Division's approval.
- J. The Contractor is advised that the safety of the students is of the highest priority. The Contractor's disinfection and testing operations shall not interfere with the school's operations or inhibit access to the school. No disinfection or testing activities shall be performed when school is in use by the Department of Education or others.
- K. All disinfection, flushing, sampling and testing shall only be performed under the direct, on-site supervision of a representative from the Authority's IEH Division. The IEH Division is to be notified a minimum of three (3) business days prior to the start of all disinfection and testing work after the DWQTP is approved.
- L. The Contractor shall ensure that all pipes, fittings, fixtures, and related appurtenances are all shipped, handled, delivered and stored in an acceptable, sanitary manner. Disinfection of interior parts of the potable water system shall not begin until all fixtures, piping, and drains are installed and functioning properly, and authorization to begin disinfection is issued by the Industrial and Environmental Hygiene (IEH) Division of the Authority.
- M. Valves and Fittings to Facilitate Disinfection
1. All new potable water plumbing subject to disinfection shall be isolated from the existing potable water system in the building until acceptable results from bacteriological analysis are received and approval to utilize the newly-installed plumbing is issued by the IEH Division of the Authority. The Contractor shall install new valves at each transition point between new and existing piping to ensure isolation of the newly-installed piping from the existing potable water

- system. The Contractor shall install fittings, as required, for injection and discharge of disinfectant from the newly-installed potable water plumbing. Injection and discharge points shall be installed as closely as possible to adjacent isolation valves. If any auxiliary devices are required to perform disinfection (e.g., a hose), they shall be delivered to the School new and within intact factory-wrapped packaging. All valves, fittings and auxiliary devices shall comply with the Plumbing Code and all other applicable codes and regulations.
2. Following disinfectant injection and after post-disinfection flushing, the Contractor shall measure chlorine levels from outlets immediately outside of the isolation valves to confirm no chlorine has entered the existing system from the work area. If chlorine concentrations from outlets immediately outside of the isolation valves are measured to be higher than the chlorine concentration of the incoming water supply, the on-site IEH representative shall be notified immediately.
 3. All temporary fittings associated with injection and discharge (as applicable) shall be removed and a plug installed in accordance with all applicable regulations after successful completion of the disinfection and water quality sampling and obtaining written acceptance by the Authority's IEH Division for the disinfection.
- N. Repaired and newly installed domestic water service connections joining the municipal water main to the building water system shall be disinfected in accordance with the procedures below, applicable laws and regulations, and the Authority-approved DWQTP. Disinfection shall be performed prior to installation of the service connection piping material in the ground. Disinfection can be performed in segments or in whole, depending on site-specific conditions. Service connection disinfection shall only be performed under the direct, on-site supervision of a representative from the Authority's IEH Division.
1. The interior of each pipe segment, fittings, valve(s), and appurtenances for the new, repaired or replaced service connection shall be disinfected using sodium hypochlorite or approved equal prior to assembly via one of the following methods:
 - a. Dip and Rinse Procedure: The contractor shall submerge the plumbing component into a 1 to 5 percent solution of chlorine for 30 minutes. Once removed from the chlorine solution, all surfaces of plumbing components shall be flushed with a volume of clean potable water equivalent to three times the water capacity of the components.
 - b. Spray/Swab Procedure: Spray-disinfect or swab each plumbing component with a minimum 1 to 5 percent solution of chlorine. After spray-disinfecting or swabbing, each plumbing component shall be allowed to sit for 30 minutes and then flushed with a volume of clean potable water equivalent to three times the water capacity of the components.
 2. At the conclusion of post-disinfection flushing, watertight plugs or caps shall be installed on both ends of each pipe segment of the new, repaired or replaced service connection and the segments shall be staged appropriately.

3. The disinfection, flushing, and capping shall be conducted less than 72 hours prior to installation. Longer timeframes shall not be permitted without the explicit approval of the Authority's IEH Division and may require additional controls such as more stringent capping and/or sealing methods and identification of staging locations, all of which require prior approval of the IEH Division.
 4. Prior to the installation of each new, repaired or replaced service connection segment, fittings, valve(s), and appurtenances to the water main, plastic sheeting or geotextile product shall be placed in the trench. Installed watertight plugs or caps shall only be removed at the time the "wet" connection is made to the municipal water main, new service connection segments are connected to one another and the final segment is connected to the interior piping. Care shall be taken so that soil and/or other deleterious material do not enter the service piping during placement of same.
 5. Following installation of the new, repaired or replaced service connection segments, continuous extensive flushing of at least four complete water volumes of the water contained in the entire new piping system or one hour flushing is required; whichever is greater, and tested for residual chlorine concentration equal to 0.2 ppm or municipally supplied water background chlorine levels. A minimum of one (1) sample shall be collected from the flushing effluent of each new service connection from a temporary hose bib installed at the school end of the new, repaired, or replaced service connection. Samples shall be analyzed by the Contractor's laboratory for total Coliform, E. coli bacteria, and Heterotrophic Plate Count (HPC). Samples shall be collected a minimum of 24 hours after post-installation flushing. A determination will be made by the Authority's IEH Division as to acceptability, in accordance with Article 3.03 L. The valve allowing flow to the potable water system of the school may not be opened until written approval by the Authority's IEH Division is received.
- O. All chain of custody forms and sample analysis results shall be submitted to the Authority's Project Officer and to the IEH Division of the Authority within 72 hours of the time that samples are delivered to the laboratory. The Contractor must obtain approval of the analytical sampling results from the IEH Division of the Authority. All disinfection procedures and bacteriological results shall be reviewed and a determination made by the Authority's IEH Division as to the suitability of the water for drinking purposes. This determination will be made upon verification that results are "negative/absent" for E. Coli and Total Coliform and are less than 500 Colony forming units/milliliter (CFU/mL) or most probable number/milliliter (MPN/mL) for HPC or SPC and that all work has been conducted in full compliance with the requirements of this Section and the approved DWQTP(s). If the disinfection and/or sampling are deemed unacceptable by the IEH Division (in accordance with Article 3.03 of this specification, Standard Methods for the Examination of Water and Wastewater, nd/or Section PC 610), flushing, disinfection and sampling shall be repeated until an acceptable water quality is demonstrated. The Authority may require submittal of a revised DWQTP with an alternative disinfection procedure to the IEH Division for approval prior to additional disinfection. The potable water system shall not be put into service until successful completion of the disinfection plan and written acceptance by the IEH Division.
- N. Assist and coordinate lead testing in accordance with Article 3.20 of this Section.

3.04 INACTIVE POTABLE WATER SYSTEM FLUSHING AND TESTING

- A. For potable water systems in vacant or inactive (or portions thereof) buildings that are being renovated for use as a school and where the existing potable water system was idle for an extended period of time, the following procedure shall apply:
1. The Contractor shall perform all activities described under Article 3.03, with the exception of initial disinfection of the potable water system. Activities will include submission of a DWQTP, flushing of the potable water system in the presence of an IEH representative, collection of bacteriological samples and reporting of results.
 2. If the sampling results are deemed unacceptable by the IEH Division of the Authority, the Contractor shall prepare a site-specific DWQTP specifying the disinfection, flushing, and sampling procedures which will be implemented until acceptable water quality is demonstrated.
 3. Lead testing will also be performed in accordance with the requirements of Article 3.20 for existing fixtures in vacant or inactive buildings (or portions thereof). If lead testing results are deemed unacceptable by the Authority, Contractor shall remedy the issue in accordance with Article 3.20.

3.05 DRAINAGE AND VENT PIPING INSIDE BUILDING

- A. Rough Plumbing: The piping of plumbing drainage and venting system shall be verified as to material and shall be tested upon completion of the rough piping installation and proven to be watertight. The representative of the local agency having jurisdiction may require the removal of any cleanout plugs to ascertain that the prescribed pressure has been reached in all parts of the system.
1. Water Test

A water test shall be applied to the drainage system which includes soil, waste, leader and vent piping either in its entirety or in sections after rough piping has been installed. If applied to the entire system, all openings in the piping, except the highest opening, shall be tightly closed and the system filled with water to the point of overflow. If the system is tested in section, each opening, except the highest opening of the sections under test, shall be tightly plugged and each section filled with water. No section shall be tested with less than a 10 ft., head of water. In testing successive sections, at least the upper 10 ft., of the following section shall be tested, so that no joint or pipe in the building (except the uppermost 10 ft., of the system) shall have been submitted to a test of less than 10 ft., head of water. The water shall be kept in the system or in the portion under the test for at least 15 minutes before inspection starts; the system shall then be tight at all points.
- B. Finished Plumbing: After the plumbing fixtures have been set and their traps filled with water the entire drainage system shall be verified as to materials and shall be tested and proven gas tight by smoke test.
1. Final Drainage and vent test:

A smoke test, if deemed necessary by the Plumbing Inspector, shall be performed when the visual final test of the completed drainage and vent system

is not in sufficient detail to determine that testing and inspection are in compliance with the Plumbing Code. When the smoke test is utilized, it shall be made by filling all traps with water and then introducing into the entire system a pungent thick smoke produced by one or more smoke machines. When the smoke appears at stack openings of the roof, these openings shall be closed and a pressure equivalent to a 1" water column shall be maintained for the period of inspection.

3.06 STORM DRAINAGE PIPING

- A. Storm drainage piping for playgrounds and areas outside of the building shall be tested with water under 10 feet of head pressure for at least 15 minutes before inspection starts. The test shall be conducted before the piping is covered.
- B. The contractor is responsible for damage to piping occurring during construction after the test has been completed.
- C. A hydrostatic pressure test of 10 feet head of water shall be performed when probing the integrity of corrugated high density polyethylene (HDPE) piping used in conjunction with storm water detention. The test shall last 15 minutes. Within that period, no visible water leak shall be observed around the exposed joints of the piping network. For proper support and for ease of installation, corrugated HDPE piping assembly shall be surrounded with 6" compacted fill, leaving only the top of all joints exposed prior to the test. A drop in water elevation within the inspection riser pipe shall not be construed as an automatic failure since the pipe liner tends to stretch and deform over time, thus giving a false sense that the pipe is leaking.

Water testing of HDPE piping shall be considered a failure when a sustained and noticeable water leak is seen at the joints.

- D. In lieu of the testing protocol outlined above, when checking a totally backfilled HDPE piping installation (excluding the joints that must remain exposed), testing requirements based on American Society for Testing and Materials (ASTM) C969 shall be utilized. As per the ASTM standard, an allowable leakage rate consisting of 200 gallons per inch per internal diameter per mile of sewer within a 24-hour period, shall form the basis for accepting or rejecting fully covered HDPE piping, including all joints.

The engineer of record shall prepare and file with the Authority's BBC unit a CCD-1 (construction code determination) forms indicating the ex-filtration rate expressed in feet of head of water per hour.

- E. Site Storm Drainage Disposal and Detention Facilities
 - 1. Storm water detention facilities, roof detention facilities and dry-well systems shall be subjected to special inspection for conformance with the approved construction documents. Minor variations, based on actual site conditions, shall be acceptable at the discretion of the registered design professional of record. Verification shall include:
 - a. Material of construction
 - b. Bedding of pipe and facilities
 - c. Placement and installation of fill materials

- d. Volume of drywell and detention facilities
 - e. Installation of volume flow control devices.
 - f. Workmanship and quality of installation
 - g. Overall conformance with the approved construction documents. Hydrostatic testing of the detention system shall be required when the system is designed as watertight.
2. The Authority will engage an approved testing laboratory or Inspection Agency to inspect and perform the above tests.
 3. The Testing Laboratory will be responsible to and under the supervision of the Licensed Professional Engineer designated for "Special Inspection"
 4. The Authority will assign a Licensed Professional Engineer to supervise the testing of the Installed systems.
 5. Results of the above tests will be made available to all parties on a regular basis.
 6. When tests results indicate noncompliance with the Contract Requirements, additional random testing will be done to determine the extent of nonconformance. This additional testing shall be paid for by the Contractor.

3.07 POTABLE WATER SUPPLY TEST

- A. When the water supply pipes are in place and the branches for the fixtures roughed in, the Contractor shall close all openings and test entire system under a pressure of 150 pounds per square inch for at least one hour as shown upon an approved test gage.

3.08 WATER SERVICE PIPE TEST

- A. Each new service pipe or repaired service pipe shall be subjected to a water test under the street main pressure by the plumber in the presence of the tapper or inspector. All pipes and appurtenances shall remain uncovered for the duration of the test and shall show no sign of leakage. Water test shall be done as per rules and regulations of the Department of Environmental Protection of the City of Newark.

3.09 WATER SUPPLY PIPING FOR ATHLETIC FIELD WASH DOWN SYSTEM

- A. Piping, excluding sprinklers and hoses, shall be thoroughly and completely tested for pressure strength and leakage. Piping installed underground shall be tested before backfill operations are undertaken.
- B. The Contractor shall close all openings and the piping system shall be filled with water, taking care to bleed all entrapped air in the process. The pressure shall be slowly built up to 1.5 times operation pressure but not less than 125 PSI for at least one hour. The piping shall be inspected in its entirety while the 125 PSI pressure is maintained. Where leaks or damage of any kind are discovered, they shall be properly repaired and the line shall be re-tested.
- C. For piping installed underground, it may be necessary to partially backfill the line before testing in order to hold the line in place. Where such is the case, the partial backfill shall cover only the body of the pipe sections leaving all joints and connections uncovered for inspection purposes. It shall be demonstrated by testing that the piping system will function properly at a pressure of 125 PSI. At or below design pressure rating, the

delivery or water shall be steady and there shall be no leaks or damage to the piping system and no water hammer.

3.10 ADJUSTMENTS

- A. During the preliminary operation, the manufacturers of the different apparatus installed, including the starting and stopping devices, shall make adjustments as may be necessary.

3.11 FIXTURE TEST

- A. Fixtures shall be tested for soundness, stability of support, and satisfactory operation of all parts. All water-closet floor flanges must be tested.

3.12 PUMP TESTS

- A. All pumps shall be tested by the manufacturers prior to shipment of the pump. The test shall show the characteristic curves, indicating the relations of capacity, head, efficiency and H.P. throughout the pump's entire range. For each pump three certified copies of the tests shall be delivered to the Authority before the pumps are set in position.

3.13 FINAL OPERATING TEST

- A. After the completion of the entire work, the Contractor shall operate the entire installation of plumbing and drainage in the presence of the Authority's Representative and of the representatives of the manufacturers of the different apparatus and appliances installed.

3.14 NOTIFICATION OF OFFICIALS, ETC.

- A. The Contractor shall provide written notification to The Authority and all department agencies and bureaus with jurisdiction required to witness any tests falling within their jurisdiction.

In addition, the manufacturers of the apparatus to be tested must have qualified representation at all tests of apparatus supplied by them.

3.15 FUEL, MATERIAL, AND LABOR FOR TESTS, ETC.

- A. The Contractor shall furnish all fuel, apparatus, material and labor required for preliminary and final operations, cleaning, testing and adjusting, including the necessary oil, electric current and the services of competent mechanics.

3.16 GAS PIPING SYSTEM: NOT USED.

3.17 FINAL TEST OF FIXTURES

- A. After all the fixtures are set and connected, Contractor shall turn water on at all fixtures, traps, etc., and the proper working of all shall be demonstrated by him to the satisfaction of the Authority.

3.18 INSPECTION

- A. The Authority reserves the right to order the Contractor to disassemble or take apart any or all material and equipment called for in order that it may be inspected to see that it has been constructed in strict accordance with the plans, specifications and details. If after inspection, it is found to fully comply, then the Contractor shall properly reassemble all such material and equipment.

Any material or equipment that does not fully comply with the requirements of the plans, details and specifications will be rejected and shall be at once removed from the premises and shall be replaced with new material and equipment that complies fully with the requirements of the plans, details and specifications.

3.19 PROCEDURE FOR DIRECT REPLACEMENT OF POTABLE WATER SYSTEM FIXTURES, FITTINGS AND APPLIANCES

- A. When approved in the DWQTP, in lieu of full system disinfection the following procedures may be implemented when potable water system components (e.g., fixtures, fitting, faucets, bubblers, valves, hose bibs, temperature or flow gauges, appliances etc.) are installed or replaced at a school as part of work that does not involve the replacement or installation of associated potable water piping.
- B. The procedures indicated apply to both the hot and cold water systems.
1. Potable water system components shall be delivered to the school new and in intact factory-wrapped packaging. Components not in intact factory-wrapped packaging will not be accepted for use. All components shall be maintained in a clean area prior to installation.
 2. Prior to installation, turn the water on to flush out any residual sediment or debris from within the piping.
 3. Install all components in accordance with applicable codes and regulations.
 4. Only remove components from the factory-wrapped packaging at the installation location.
 5. Immediately install the components after they are removed from the factory packaging.
 6. Tools used for installation shall be disinfected clean and free of deleterious material
 7. During installation, the plumber shall handle components in a sanitary manner to avoid contamination of waterside surfaces.
 8. Following installation of fixtures or faucets, turn on the hot and cold water valves separately and then simultaneously to confirm proper operation and water flow.
- C. After completing the procedure, a letter must be provided which certifies all steps were completed.
- D. Assist and coordinate lead testing in accordance with Article 3.20 of this Section, which is required regardless of disinfection or special installation procedure.

3.20 LEAD TESTING OF POTABLE WATER FIXTURES AND FAUCETS FOR CONTRUCTION QA/QC

- A. All new pipe, solder, flux, fittings, fixtures, and other appurtenances shall comply with the federally mandated Reduction of Lead in Drinking Water Act of 2011 (Lead-Free Act). In addition, all these components must be "lead-free" as defined in the act. A representative of the Authority's IEH Division will perform sampling for lead at faucets and fixtures to assure compliance.
- B. The Contractor shall provide access, means and otherwise facilitate the collection of water samples from the potable water fixtures (within the scope of contract work) by a representative of the Authority's IEH Division.
- C. All lead results will be reviewed and a determination made by the Authority's IEH Division as to the suitability of the water for drinking purposes. This determination will be made upon verification that results are below the NYSDOH Action Level for lead in drinking water.
- D. If the sample results are deemed unacceptable by the Authority, the Contractor shall be responsible for all actions required to remedy the issue including, but not limited to, pipe system flushing and/or pipe/fixture replacement. Attachment E of Template shall be used for system flushing unless otherwise directed by the Authority.
- E. Sampling procedures shall be repeated until acceptable water quality is demonstrated. Potable water system shall not be put into service until successful completion of the lead sampling and written acceptance by the IEH Division.
- F. The Contractor shall provide Lead Remediation Documentation to the Authority's IEH Division, including all documentation related to remedial activities, including flushing logs, replacement fixture model information, etc. Attachment E of Template shall be used for system flushing unless otherwise directed by the Authority.

END OF SECTION

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SECTION 220415
DRAINAGE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of Drainage Work is indicated on the Drawings and by the requirements of this Section. Coordinate with 22 Specification Sections for piping and Architectural Sections for flashing work.

1.02 CODES AND STANDARDS

- A. Comply with applicable portions of the Building Code of New Jersey and with the latest standards and rules of the Department of Environmental Protection, Bureau of Sewers and Division of Drainage Basin Management.
- B. Where requirements for products, materials, systems, equipment, methods and other portion of the work specified herein exceed minimum requirements of regulatory agencies having jurisdiction over the construction work, contractor shall comply with such requirements specified herein, unless specifically approved otherwise by the Authority.

1.03 SUBMITTALS

- A. Submit shop drawings for the following:
 - 1. Floor Drains: Not Used.
 - 2. Roof Drains
 - 3. Grease Interceptors: Not Used.
 - 4. Acid Neutralizing System: Not Used.
 - 5. Flashing Sleeves
 - 6. Trap Primer Valve
- B. The Contractor shall submit shop drawing for and obtain approval of each type of drain with location to be installed before delivery and installation. The shop drawings shall be marked as to type and shall include all dimensions, free area, and features as to meet the specifications.
- C. Certifications: Submit an affidavit stating that the flashing and sealing work at drains and vent stacks is acceptable and in conformance to the New Jersey Building Code.
- D. Maintenance materials
- E. Manuals: Operation & maintenance manuals for the grease interceptors and the acid neutralizing system. Include in the maintenance manuals of the acid neutralization system, logs detailing chips replacement.

1.04 EXTRA MATERIALS

- A. The Contractor shall furnish the School Custodian or a Representative of the Authority with spanner type tools that may be used for removal of clean-out covers, strainers and grates. Two (2) such tools shall be provided for each different type drain and clean-out covers. Tools shall match products installed and shall be packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.01 PIPING

- A. Piping, fittings and piping joints shall be as specified in Section 220410.

2.02 FACE PLATES

- A. Face plates for fresh air inlets shall be nickel bronze and shall be Jay R. Smith Fig. 9005, Zurn Z1471-ZANB, Josam 88950, MIFAB MI-GRILL, Watts Drainage Products MS-8000 or Wade 3880P.

2.03 FLOOR DRAINS: NOT USED.

2.04 FLASHING SLEEVES (CAULKING TYPE ROOFING)

- A. Flashing sleeves: vent stack flashing sleeve cast iron body, inside caulk type fabricated to accommodate roof system flashing shall be one of the following:
 - 1. Jay R. Smith Fig. 1740
 - 2. Zurn Z196
 - 3. Josam 26450
 - 4. MIFAB MI-910
 - 5. Wade 3670-C

2.05 VANDAL PROOF HOODED VENT CAPS

- A. Vandal Proof Hooded Vent Cap: cast iron body with dome cap and vandal-proof securing device shall be one of the following:
 - 1. Jay R. Smith Fig. 1748
 - 2. Zurn Z193
 - 3. Josam 26700
 - 4. MIFAB R1930
 - 5. Watts Drainage Products RD-680-VC
 - 6. Wade 3690

2.06 TEST TEES

- A. Test tees shall be as specified in Section 220410.

2.07 GREASE INTERCEPTORS: NOT USED.

2.08 BACKWATER VALVES: NOT USED.

2.09 INDIVIDUAL ACID NEUTRALIZING SUMP : NOT USED.

2.10 CENTRALIZED ACID WASTE "pH" NEUTRALIZATION SYSTEM: NOT USED.

2.11 ROOF DRAINS

- A. Type "A": Roof drain shall be Jay R. Smith Fig. 1017-07-CID-C-R-U, Zurn ZC100-C-R-85-VP, Josam 21500-IRMA-3-22-30-X Wade 3000-DFS-5-52-53-42-IC, Watts Drainage Products RD-100-X-85-B-D-K-L or MIFAB R1200-JC-6-B-U-M-X and shall be used with Inverted Roof Membrane Assembly (IRMA roof). Drain shall have cast-iron body with bottom caulk outlet, vandal proof cast-iron or ductile-iron dome, upper and lower flashing clamps, gravel stop or guard, perforated stainless steel extension with holes, sump receiver and underdeck clamp.

The height of the stainless steel extension shall be equal to thickness of the insulation + 1" and extension shall be secured between upper and lower flashing flanges to drain body by means of inside bolts.

- B. Type "B": Roof drain shall be Jay R. Smith Fig. 1011-CID-C-R-U, Zurn ZC100-84-C-R-VP, Josam 21500-19-3-22-30-X, Wade 3000-DP-5-52-53-42-IC or Watts Drainage Products RD-300-X-GSS-B-D-K-L or MIFAB R1200G-U-B-6-M-X for use in conjunction with roof systems where the insulation is installed directly under the crushed stone surfaced waterproof membrane (Built-up roof). Drain shall have cast-iron body with bottom caulk outlet, vandal proof cast-iron dome, underdeck clamp, sump receiver and with 4" high stainless steel perforated gravel stop 1/16" thick with 3/8" diameter openings equally spaced.
- C. Type "C": Roof drains shall be J.R. Smith Fig. 1010-C-R-U, Zurn ZC100-C-R-VP, Josam 21500-3-22-30-X, Wade 3000-5-52-53-IC, Watts Drainage Products RD-300-X-B-D-K-L or MIFAB R1200-6-M-U-X for use in conjunction with uninsulated built-up roof or with insulated mineral surfaced built-up roof where waterproofing membrane is installed over insulation tapered toward the drain. Drain shall have cast-iron body with bottom caulk outlet, combined flashing clamp and gravel stop, and vandal proof cast iron dome.
- D. Domes for roof drains shall have slots no greater than 1/2" in width and they shall be secured to the drain body by means of locking device.
- E. For type "B" and type "C" roof drains insulation is to be tapered at drain location. Refer to roof drain Details.
- F. Type "D": Roof drain shall be Jay R Smith Fig. 1096C (CID-E-WR), Josam 28600-VP-19-1-10NYCSCA, Zurn ZC105-92NYCSCA, Wade 3000E-FCS-DP6-DF-5-42-53 Watts Drainage Products RD-100-X-A-D-V-GSS-K-L or MIFAB R1200X-Z-JC8.25X4-F-M for use in conjunction with a controlled flow storm drainage system on a roof with a 2" rise (roof detention), and a liquid roof membrane similar to a product made by American Hydrotech. Drain shall have cast iron body with bottom caulked outlet, extended anchor flange, parabolic weir(s), vandal proof cast iron dome, perforated stainless steel gravel stop with 3/8" diameter holes, and a static extension ring with 1/4" holes.

The height of the stainless steel gravel stop shall be 6". The height of the static extension ring shall be equal to thickness of the insulation + 1" and the extension shall be secured between upper and lower flashing flanges to the drain body by means of inside bolts.

- G. Type "E": Roof drain shall be Jay R. Smith Fig. 1019C-CID-U-6HS, MIFAB R1200-G-M-Z-6, Wade 3000E-DP6-5-42-53, Watts Drainage Products RD-300-X-D-F-GSS-K-L, Zurn ZC107-84-C-E-VP or approved equal and shall be used with a liquid roof membrane system (no roof detention). Drain shall have cast iron body with bottom caulked outlet, extended anchor flange, vandal proof cast iron dome, perforated stainless steel gravel stop with holes.

The height of the stainless steel gravel stop shall be 6".

2.12 TRAP PRIMER VALVES

- A. Trap Primer Valve: 1/2" NPT inlet/outlet; Adjustable to line pressure; no distribution system; Operating range: 35 to 75 P.S.I.G; corrosion resistant brass or bronze; Integral Backflow Preventer; Vacuum Breaker Ports; conform to ASSE 1018.
- B. Acceptable Product: Precision Plumbing Products Model P-1, Sioux Chief Manufacturing Company Model #695 01, MIFAB MI-500, the equal of Josam Company will be accepted and JR Smith 2694.

2.13 ACID NEUTRALIZING TUBES: NOT USED.

PART 3 - EXECUTION

3.01 HOUSE SEWERS: NOT USED.

3.02 BUILDING SANITARY HOUSE DRAIN: NOT USED.

3.03 BUILDING STORM HOUSE DRAIN: NOT USED.

3.04 YARD DRAINS: NOT USED.

3.05 BOILER BLOW-OFFS: NOT USED.

3.06 SOIL, WASTE AND VENT LINES: NOT USED.

3.07 ACID WASTE SYSTEM: NOT USED.

3.08 FLOOR DRAIN: NOT USED.

3.09 ROOF DRAINS

- A. Install roof drains where indicated on the Drawings. Drains shall be set not less than 30" from parapet wall, chimney, bulkhead, etc.
- B. Roof drain cast iron dome shall extend at least 4" above the surface of the roof immediately adjacent to the roof drain.
- C. Flashing shall be installed as part of the work of Section 07600 but shall be acceptable to the licensed master plumber.

3.10 RAIN LEADERS

- A. Inside leaders shall be located where indicated on the Drawings. Leaders shall be offset as required, to keep the pipes close to walls or columns or in chases. The lower ends of leaders shall be turned by means of long sweep, 90 degree bends; install accessible tapped tee cleanouts with brass screw plug above bends, all properly supported on brick or concrete piers, or wrought iron hangers which must be approved before being used. Leader connections at roof shall be kept in hung or furred ceilings where possible.
- B. It is the intent that the leaders shall be put into service as soon as required. The leaders shall be protected against frost, obstructions and all damage, by the Contractor, who shall replace damaged leaders and remove obstructions until the work is completed and accepted.

3.11 PROTECTION

- A. All open ends of pipes shall be temporarily capped or closed by a proper fitting, to prevent obstruction and damage, until piping is approved and ready for service.

3.12 PIPING SYSTEM TRANSITIONS

- A. When a transition is required from one piping system to another, an approved transition coupling shall be used.
- B. When connecting No-hub to a bell & spigot fitting of cast iron piping system, an approved transition coupling shall be used. When it is necessary to cut a new fitting into an existing bell & spigot cast iron piping system, a section of the hubed cast iron piping shall be removed to allow a three-piece fold-in installation of new bell & spigot cast iron piping with lead and oakum joints. The use of No-hub shall not be permitted within a bell & spigot cast iron piping system.

3.13 NO-HUB PIPING -ADDITIONAL REQUIREMENTS

- A. No-Hub piping suspended in excess of 18" below structure shall be provided with sway bracing to prevent horizontal movement.
- B. Horizontal piping shall be installed with additional hangers at each horizontal branch connection.
- C. Horizontal piping 6" and larger shall be braced to prevent joint separation.
- D. Vertical piping shall be braced at each joint to assure maintaining alignment.
- E. Vertical piping shall be secured at base of stack to building structure with socket clamp and rods or trapeze hangers.

3.14 KITCHEN DRAINS: NOT USED.

3.15 GREASE INTERCEPTORS: NOT USED.

3.16 INSTALLATION OF TRAP PRIMER VALVES

- A. Install trap primers at all floor drains, except for those drains located in toilet rooms, janitor closet and the kitchen, and at other locations where the drain's trap seal is subject to loss by evaporation. Install on cold water supply. Connect primer line at the top of a horizontal cold

water line and install the trap primer valve in an accessible location using copper tubing. Unit shall be installed on cold fresh water lines of 1½" diameter or less.

- B. For every 20 feet of floor drain trap make-up water line the primer must be a minimum of one-foot elevation from the finished floor.
- C. A pressure drop of 5 to 10 P.S.I.G. is required to activate the priming valve
- D. The priming valve must have a minimum elevation of 12 inches above the finished floor.

3.17 INSTALLATION OF ACID NEUTRALIZING TUBES: NOT USED.

END OF SECTION

SECTION 220417
COLDWATER SUPPLY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of cold water supply Work is indicated on the Drawings and by the requirements of this Section.
- B. All parts of the potable water supply, such as valves, piping, water meter, etc. must be certified as "lead free" as defined in the Reduction of Lead in Drinking Water Act of 2011 (not more than a weighted average of .25% lead). Regardless of model numbers indicated herein, provide equivalent models that are "lead free" as defined in the act. All solder and flux used during installation of valves, backflow prevention, etc. associated with the potable water system must also meet the lead-free requirements of the act.

1.02 CODES AND STANDARDS

- A. The Building Code of the State of New York
- B. NY Department of Environmental Protection Agency
- C. Where requirements for products, materials, systems, equipment, methods and other portion of the work specified herein exceed minimum requirements of regulatory agencies having jurisdiction over the construction work, contractor shall comply with such requirements specified herein, unless specifically approved otherwise by the Authority.
- D. The Contractor shall install items that are certified as lead-free as defined in the 2011 Reduction of Lead in Drinking Water Act.
 - 1. The law makes it unlawful for any person, including a Contractor, to introduce into commerce any pipe, pipe fitting, plumbing fixture, faucet that is not lead-free.
 - a. "Lead free" content is intended to mean not more than 0.2% lead when applied in connection to solder and flux and not more than 0.25 percent of the weighted average of lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fixtures and faucets.
 - 2. To ensure compliance with "Reduction of Lead in Drinking Water Act", a procedure for determining lead content was developed. The calculation procedure works as follows:
 - a. "For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product. The lead content of the material used to produce wetted components shall be used to determine compliance with paragraph 1.a. above.
 - b. As an alternative to implementing the lead content calculation, the Contractor may choose to demonstrate compliance with the act by requiring

from manufacturer documentation certifying that products are lead-free based on either calculation or tests or third party certification.

1.03 SUBMITTALS

A. Submit Shop Drawings for the following:

1. Wall hydrant
2. Strainer
3. Backflow Preventer devices
4. Water Hammer Arresters
5. Meters
6. Double Detector Check Valve
7. Pressure Gauges
8. Pressure Reducing Valve
9. Water Level Gauges
10. Water Leak Detection System
11. Tamper Switch
12. Remote Control Valve on the Domestic Service
13. Water Sub-Meter

B. Training for DOE staff on Water Leak Detection.

C. Certificate from the manufacturer for satisfactory installation of the Water Leak Detection System.

D. Approval from DEP for main backflow preventer device and DOB for secondary back flow preventer device(s).

1. The Contractor shall hire a NY State certified tester of backflow prevention devices as well as a Professional Engineer (P.E) or a Registered Architect (R.A) to inspect the work and to sign and to seal NYDEP forms certifying the installation of the backflow prevention devices in accordance with approved plans.

E. Certifications

1. Lead-free Certifications: Provide manufacturer's certification that valve, backflow prevention devices, water meter, pipe, etc. in contact with the potable water are lead-free.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Piping shall be as specified in Section 220410 and shall also comply with the following:
 - 1. Ductile iron mechanical joint pipe shall be used on water service piping. Pipe shall be Class 52 for 3" and 4" pipe sizes and Class 56 for pipe sizes 6" and larger.
 - 2. Type "L" Copper Tubing (Hard Drawn) shall be for use on water distribution piping, excluding short branch supplies to fixtures, above ground.
 - 3. Copper Tubing Type "K" shall be hard drawn for use on water distribution piping below ground only.

2.02 WATER HAMMER ARRESTERS (SHOCK ABSORBERS)

- A. Provide engineered water hammer arresters where required and/or shown on the Drawings.

Engineered water hammer arresters shall conform to Plumbing and Drainage Institute Standard PD1-WH201 and ASSE Standard 1010. They shall be sized and installed in accordance with manufacturer's instructions. Engineered water hammer arresters by Josam, J. R. Smith, Zurn, Sioux Chief, MIFAB, Wilkins, Wade and Watts, Quiet Pipes by Oatey and FNW, Fig X10P & X11P will be accepted.

2.03 WATER METERS

- A. City Water Supply
 - 1. Water Meter shall be selected from the Gas Utility Company's List of Approved Water Meters and Related Equipment issued by the Bureau of Customer Services Universal Metering Division. The latest edition shall be utilized.
 - 2. Compound type water meters approved for use and shall comply with all applicable requirements of AWWA Standard C702, latest revision and also the latest requirements of the D.E.P. Bureau of Water and Energy Conservation. Meters must be equipped with an approved encoder register.
 - 3. Fire-Service type water meters approved for use and shall comply with all applicable requirements of AWWA Standard C703, latest revision and also the latest requirements of the D.E.P. Bureau of Water and Energy Conservation.
 - 4. Double detector check valve assembly on the fire service branch and a domestic-type meter on the domestic branch may be utilized in lieu of a fire-service compound type water meter or electromagnetic meter for the combined service. All detector check valves approved for use and shall comply with the latest applicable requirements of the D.E.P. Bureau of Water and Energy Conservation and the Bureau of Water Supply and Wastewater Collection, Cross Connection Control Unit as well as having UL and Factory Mutual (FM) approval.
- B. Remote Receptacles, Etc.
 - 1. Remote Receptacles and connecting wires or cable shall be of a type provided by the Bureau of Water and Energy Conservation with the meter.

2. Galvanized steel conduit for enclosing connecting wires or cable shall be 3/4" size. Aluminum conduit may be used for exposed run only.

- C. "Instructions" on how to read each meter shall be neatly framed under glass.

2.04 CURB VALVES AND BOXES

- A. Curb valves and boxes with covers for all water service pipes shall be as approved by the Department of Environmental Protection.
- B. Curb valves shall be of the gate type, non-rising stem valves, designed for a minimum of 150 lbs. per square inch working pressure.
- C. Valves shall be equipped with an operating nut at least 1¼" square. A wrench or key for operating each valve shall be left with the Custodian or with a representative of the Authority.

2.05 SIGNS FOR FIRE SERVICE

- A. Sign for fire curb valve shall be brass or bronze and shall have a white background with 1" red letters reading "Automatic Sprinkler Shutoff Valve 2 feet opposite this sign".
- B. Sign for main sprinkler control valve inside the building shall be an enameled sign, 4" x 10". The sign shall have a white background with 1" red letters reading "Main Sprinkler Valve".
- C. Signs over toggle switch operating the remote control valve inside the fire pump room shall be an enameled sign, 4" x 10". The signs shall have a white background with 1" red letters reading "DOMESTIC WATER VALVE ON" on top the switch and "DOMESTIC WATER VALVE OFF" at bottom of the switch.

2.06 STRAINERS

- A. Strainers in water service piping installed upstream of water meters shall be cast bronze body with stainless steel elements. Strainers shall be rated at 150 p.s.i. working pressure. Strainers shall be of the same manufacturer as the compound water meters.
- B. Strainers in water service piping installed upstream of Double Detector Check Valves shall be flanged basket type, cast iron body with bronze basket and bronze handle and 1/16" perforations, good for the same working pressure as specified for fittings. Strainers shall be Sarco Type 528-B, Mueller Steam Specialty No. 165, or J.R. Smith No. 8795.
- C. Y-Strainers
 1. Except as otherwise noted strainers shall be full size Y-pattern provided with removable cylindrical or conical screens of monel or stainless steel and suitable flanges or tapping to connect with the piping they serve.
 2. Strainers shall be cast iron on iron and steel piping and bronze on brass or copper piping except as otherwise noted in other sections of the specifications.
 3. Screen perforations for water shall be 1/16" (0.57 diameter) for pipe sizes up to 3" and 1/8" for 4" and above.
- D. Provide valves dirt blow-off connection for each Y-strainer. The blow-off connection shall terminate with a gate valve and nipple.

- E. Bronze Y-Strainers shall be Sarco Type BT, Mueller Steam Specialty No. 352, Conbraco Industries Inc.; Apollo Valves Model 59.
- F. Cast iron Y-Strainers shall be Sarco Type IT, Mueller Steam Specialty No.11, Conbraco Industries Inc.; Apollo Valves Model TCG.

2.07 PRESSURE GAGES

- A. Provide where shown on the Drawings or required, in addition to those called for with specific pieces of equipment, pressure gauges with stainless steel movement, 4½" diameter dials, 0-100 psi dial range, phosphor bronze bourdon tube and black enamel cast aluminum, safety case. Gauge dial shall be micro adjustable. Pressure gauges shall have an accuracy of 1/2 of 1% of the scale range and shall be Weksler Royal gauge Model No. AA14-4, Weiss Model No. 4UGN.
- B. All gauges shall be equipped with pigtail siphons and shutoff cocks.
- C. Siphons and cocks to be of same manufacture as gauges.
- D. No permanent gauge shall be used while the Contractor is making hydrostatic tests on any portion of the piping systems.

2.08 PRESSURE REDUCING VALVES

- A. Provide, where indicated on the Drawings, flanged pressure reducing valve (screwed ends 2½" and smaller) with equalizing pipe, and needle valve similar to Kiely Mueller, Warren Engineering Co., or Watts Regulating Co. or Zurn Plumbing Products Group, Wilkins Div. Up to 2" the pressure reducing valves shall be all bronze; over 2" the valves shall be iron body. Valves shall be of the size and type suitable for the service and flow conditions.

2.09 WATER GAGES

- A. Water gages shall be threaded for 1/2" connection, shall have four guards, 5/8" diameter glass and shall be as manufactured by Ernst Gage Co. All fittings in connection with gages shall be finished brass.

2.10 VACUUM BREAKERS AND BACKFLOW PREVENTION

- A. Atmospheric Vacuum Breakers shall be Febco 710A and 715A, Watts 288A series, or Conbraco 38-100 series or Wilkins Model 35. Atmospheric-type vacuum breakers shall conform to ASSE 1001 or CAN/CSA B64.1.1
 - 1. Poppets shall be molded plastic (polypropylene) or unicellular hi-car rubber.
 - 2. Vacuum Breaker shall be rated to 150 psi working pressure and shall withstand water temperature to 212°F. The uni-cellular hi-car rubber is recommended in 1/2" and 3/4" for low flow applications. The vacuum breaker cannot be subjected to more than 12 hours of constant pressure.
- B. Pressure Vacuum Breaker Assemblies shall consist of an approved check valve, vacuum relief, inlet and discharge shutoff and field testing cocks. All nipples and other fittings shall be red brass. Vacuum breakers shall be rated to 150 psi working pressure and shall withstand water temperatures to 170°F. The vacuum relief valve must be of brass construction with a spring loaded diaphragm member to assure positive opening of air inlet when back-siphonage occurs. Pressure Vacuum Breakers shall be Febco 765, Watts 800,

or Conbraco/Apollo 40-500 series or Wilkins Model 420. In sizes above 2", two check valves are required.

- C. The Double Check Valve Assembly shall consist of two brass internally spring loaded check valves, two brass gate valves and field testing cocks. Double Check Valve Assembly shall be rated to 150 psi working pressure and shall withstand water temperatures to 170°F, and shall be Febco Series 805YD, Watts 709, or Conbraco/Apollo 40-100 series or Wilkins 3/4"–2" Model 950XL, 2½"–12" Model 350A. Double check-valve assemblies shall conform to ASSE 1015 or AWWA C510.
- D. Reduced Pressure Zone (RPZ) Backflow Preventer with Auxiliary Flood Management Capability
 - 1. For use on domestic water services only, the RPZ with an auxiliary flood management system shall be a complete factory-assembled package consisting of an automatic control valve that is operated by a solenoid, a water leak sensing switch, a control panel and the conventional RPZ device that comes equipped with two separately spring loaded "Y" type check valves, a differential pressure relief valve, two shut-off valves and a test port for field testing. RPZ with integrated flood management feature shall comply with ASSE 1013, AWWA C511, be approved for use in NY and must be tested annually by a certified tester for backflow prevention devices. RPZ device with integrated flood management capability shall be rated for maximum working water pressure of 175 psi and maximum working water temperature of 140°F. Provide solenoid with manual override switch for operation in case of a power failure.
 - 2. Approved manufacturer: Zurn /Wilkins model #375 -FCIS-AST-OSY-AG-Z, Watts model #957 OS & Y -113RFP-ACV or other approved equal.
- E. Reduced Pressure Zone (RPZ) Backflow Preventer consisting of two separately spring loaded "Y" type check valves, a differential pressure relief valve, two shut-off valves, and test cocks for field-testing.
 - 1. Backflow Preventer shall be tested and certified under A.S.S.E. No. 1013, AWWA C511 and USC manual. It shall be rated to 150 psi (minimum) working pressure and 110°F water temperature.
 - 2. Types of Reduced Pressure Zone Backflow Preventer shall be Wilkins 575 3/4"–2" Model 975XL and 2½"-12" Model 375A, Watts 909, Febco 825Y, Conbraco/Apollo 40-200 series.

2.11 WALL HYDRANTS

- A. Wall hydrants shall be nickel bronze with nickel bronze casing, polished nickel bronze face, brass operating parts throughout, adjustable wall clamp, renewable nylon seat, 3/4" HPT standard hose outlet with integral vacuum breaker, 3/4" IPS male thread ground joint union elbow adapter, nickel bronze access box and nickel bronze hinged cover with locking device. Furnish and deliver four (4) operating keys to the Custodian. Wall hydrants shall be Josam 71000, Jay R. Smith 5509-E, Wade W-8625, Zurn Z-1300.

2.12 POST HYDRANTS

- A. Provide post hydrants where indicated on the Drawings. Post Hydrant shall be cast iron non-freeze with aluminum housing, brass casing, brass valve housing, brass removable operating parts and neoprene washers, removable handle with 3/4" hose connection, 3/4" IPS inlet, approved equal to Josam 71700, Smith 5910, Zurn 1385, or Wade W-8610. For number, location, depth, etc., see Drawings.

2.13 WATER LEAK DETECTION SYSTEM

- A. System shall include but not be limited to: 50' water sensing cable, an interconnecting leader cable and auxiliary equipment that detects the presence of water at all points along the cables length and alarm module composed of an electronic cable driver module installed in a NEMA-1 enclosure. In addition, the system shall convey trouble-status information to an Indicator Panel that is part of the Auxiliary Signal System.
- B. System shall provide an audible and visual alarm locally and at a remote location when the water sensing cable detects water.
- C. System shall require 120 V. AC power supply.
- D. The water leak detection system shall be Dwyer Series WD Water Detector with (2) TP25 units connected together to achieve 50' sensing cable, and including indicating alarm annunciator, AN2 (model # WD-TP25-AN2) or TRACETEK Model TTC-ENC-1/TT 1000 as manufactured by Raychem Corp., Menlo Park, California.

2.14 SUPERVISORY SWITCHES

- A. A supervisory switch on open stem and yoke (OS&Y) type valve shall be installed on each valve as designated in the drawings and/ or as specified herein: NEMA 3R enclosure, adjustable length of actuator to remove need for cutting of shaft, 3-position switch to control tampering and closing of valve. The switch shall be used to monitor the open position of an OS&Y valve. Switch assembly shall be provided with 2 switches rated at 2.5 amps at 24 or 30 VDC and 10 amps at 125/250 VAC. Provide UL listing for indoor and outdoor use, Factory Mutual and CSFM approvals. Provide cover plate with tamper resistant screws. Switch shall be similar to System Sensor, model #OSY2 or an approved equal.
- B. Install a supervisory switch on non-rising stem gate valves as indicated in the drawings and/ or as specified herein: NEMA 3 enclosure, tamper resistant cover screws, adjustable length of supervisory cord. Turning of the valve wheel shall disengage a plug out of a jack and close a set of normally open contacts, which shall then send a trouble signal to the fire alarm control panel. Supervisory switch shall be NEMA 3 rated for indoor/ outdoor installation. Switch shall be equal to model #PSP1 as manufactured by System Sensor.

2.15 REMOTE VALVE CONTROLLING WATER SUPPLY TO DOMESTIC & FIRE PROTECTION SYTEMS: Not Used.

2.16 WATER SUB-METER

- A. A sub-meter that provides for accurate flow measurement of potable water supplied to the school kitchen, swimming pool, cooling tower(s), central water heater and boilers shall be fitted on water lines feeding indoor plumbing fixtures, fittings and noted equipment. The sub-meter shall be a positive displacement type that is suitable for use on potable drinking water systems. All parts of the sub-meter in contact with water shall be fabricated with corrosion resistant materials.
- B. Water sub-meter body construction shall be of lead free brass meeting the 2011 Reduction of Lead in Drinking Water Act. The sub-meter shall comply with NSF 61 Annex G standards for lead free products. Water flowing through the sub-meter measuring chamber shall be expressed in US gallons on the register dial face. A hinged cover to protect the register shall be provided.

- C. Sub-meter shall be highly accurate when installed in any orientation. It shall be designed for suitability into potable water systems with pressure of up to 150 psi and negligible head loss (pressure loss) that is attributable to installing the device at flow rates from 5-10 gpm.
- D. For protection against reverse flow, the sub-meter shall come equipped with a check valve
- E. Approved Models: WM-NLD Series by Assured Automation; WM-NLC Series by Flow or other approved equal.

PART 3 - EXECUTION

3.01 COLD WATER SERVICE PIPING

- A. All operative permanent water service mains supplied by City shall be metered. Temporary service mains shall be metered if required by the Contract Drawings or the Water Company.
- B. In water service piping supplied from city water mains, including fire service, install meters of the size and type indicated on the Drawings and/or herein specified. When indicated on the Drawings and approved by the Bureau of Water and Energy Conservation, a fire line detector check valve in lieu of a fire meter may be installed on fire service.
- C. Support all meters on a suitable shelf or concrete pier above the floor.
- D. Where directed and with four expansion screws, install framed "instructions" on how to read each type of installed meter.
- E. Service mains shall be connected to the street mains by corporation stops, wet connections or other connections only by employees of the D.E.P. Bureau of Water Supply in accordance with their regulations. The size of tap is determined by the D.E.P. Bureau of Water and Energy Conservation, based upon the water demand load.
- F. Curb Valves and Boxes
 - 1. Install in each service pipe, under the sidewalk where indicated on the Drawings, a control valve in an extension box with cover. The cover shall be flush with the sidewalk level.
 - 2. Set under and at the side of each valve a footing 18" x 18" x 6", composed of stone concrete for the valve box to rest on.
- G. Each service main shall be extended inside of the building and shall end with a header which shall be fitted with O.S. & Y. valve, check valve, backflow preventer device, strainer (pressure reducing valve, when indicated on plans), plugged fittings, meter, pressure gages, appurtenances, etc., and all shall be of the size and arrangements indicated on Drawings. The Contractor shall protect from any and all damage.

3.02 SIGNS FOR FIRE SERVICE

- A. Install sign, for location of control valve under the sidewalk, on the fence or building directly opposite the sidewalk flush box cover where indicated on the Drawings.
- B. Where directed or indicated on Drawings, install sign at the main sprinkler control valve inside the building.

3.03 COLD WATER DISTRIBUTION PIPING

- A. The distributing mains shall be suspended from the overhead structural floor slab or steel beam and shall be of the sizes and arrangements indicated on the Drawings. The branches to fixtures in the cellar and basement shall be connected to the distributing mains and all shall be of the sizes indicated on the Drawings. Each branch shall be installed with a gate valve.
- B. Install gate valves, unions and 1/2" drain bibbs on all branches from main to risers; see Drawings. Branches connected to risers shall be connected in such a manner that the riser is free to expand upward for its entire length.
 - 1. Water hammer arresters shall be installed on all mains, risers and branches to fixtures where indicated on the Drawings and when required.
 - 2. Ball valves may be substituted for gate valves on distribution branches and risers for pipe sizes up to and including 2".
- C. The headers supplying flushometers to water closets shall be run in pipe spaces or as indicated on the Drawings and shall be 1½" for two (2) water closets, 2" for three (3) or four (4) water closets and 2½" for five (5) to ten (10) water closets with 1¼" branch for each water closet flushometer and 3/4" for urinal flushometer (1¼" for barrier-free urinal). Each flush header branch from riser shall be provided with a gate valve. The header shall be extended with a shock absorber where indicated on the Drawings and when required.

3.04 VACUUM BREAKERS AND BACKFLOW PREVENTION

- A. Install Atmospheric Vacuum Breakers where indicated on the Drawings. Atmospheric Vacuum Breakers may be used as protection against cross connections where the vacuum breaker is not subjected to back pressures due to pumps or gravity and must be installed on the discharge side of the shutoff. They must be installed a minimum of 6" above the highest overflow level. It must be installed with the air inlet in a level position.
- B. Install Pressure Vacuum Breakers where indicated on the Drawings. The Pressure Vacuum Breaker may be installed where it would be subject to continuous pressure but must be installed 12" above the highest outlet it is protecting. It should be installed where it would be accessible for periodic testing.
- C. The Double Check Valve Assembly must be installed in a horizontal position and they must be accessible for periodic testing.
- D. Reduced Pressure Backflow Preventers:
 - 1. Provide adequate clearance for testing and maintenance.
 - 2. Use proper drainage provision.
 - 3. Protect from freezing.
 - 4. Provide adequate support.
 - 5. Installation on domestic water service must be submitted for approval to the D.E.P. Bureau of Water and Energy Conservation and the Bureau of Water Supply and Wastewater Collection, Cross-Connection Control Unit.

3.05 WALL HYDRANTS

- A. Wall Hydrants shall be set in exterior walls at the time the walls are being erected. The Contractor shall ensure that each wall hydrant is at the location and elevation noted on the Drawings.

3.06 WATER LEAK DETECTION SYSTEM

- A. Install water leak detection system in existing building basement RPZ room where shown on the Drawings.
- B. All TRACETEK system components shall be installed in accordance with the manufacturer's instructions. System installation supervision and training to custodial staff shall be provided by manufacturer's authorized representative.
- C. The sensing cable shall be installed only after all other piping, electric and HVAC work in the room is completed. Prior to installing the sensing cable the floor shall be swept broom clean. The cable shall be fastened securely to the floor surface with hold down clips together with construction mastic plastic adhesive every 4 feet.
- D. Upon completion of system installation the manufacturer's representative shall certify that system is installed in accordance with their instructions and is fully operational. Certification shall be submitted to the Authority.

3.07 DISINFECTION AND LEAD TESTING

- A. The Contractor shall be responsible for bacteriological examination and disinfection of the potable water system in accordance with the provisions the Article entitled "Domestic Water System Disinfection" of Section 220414.
- B. Special Installation Procedure

When included in the Disinfection and Water Quality Testing Plan (DWQTP) and such plan is approved by the Authority's Environmental and Industrial Hygiene Division, special installation procedures in accordance with the Article entitled "Procedure For Direct Replacement of Potable Water System Fixtures, Fittings and Appliances" in Section 220414 may be used in lieu of system disinfection. These procedures apply when potable water system components (e.g., fitting, faucets, valves, hose bibs, temperature or flow gauges, appliances, etc.) are installed or replaced at as part of work that does not involve the replacement or installation of associated potable water piping.
- C. Assist and coordinate lead testing in accordance with Article 3.20 of Section 220414.

3.08 TESTING

- A. The Contractor is to engage a third party certified back flow preventer tester to perform testing and inspection of all back flow prevention devices and system and file the appropriate forms with NY DEP for the main back flow prevention device.

3.09 SUPERVISORY SWITCHES

- A. Install supervisory switches that will activate the fire alarm and sound local bells. Switches shall be so installed as to not interfere with the normal operation of the valve. It shall be adjusted to operate when the stem an OS&Y has moved no more than one-fifth of the distance from its normal position.

- B. Supervisory switches on non-rising stem gate valves shall utilize a plug and cord installed around the wheel to the valve. When pulled out, the cord closes a set of normally open contacts. A lockout feature prevents re-insertion of the cord until the cover is removed and the unit is re-set.
- C. Coordinate installation of supervisory switches with the electrical contractor.

3.10 REMOTE CONTROL VALVE TO SHUT-OFF THE DOMESTIC WATER SERVICE

- A. Valve shall be installed in accordance with the manufacturer's recommendations. Control valve shall be installed so that it is readily accessible and serviceable as required by the NY Plumbing Code, and such that the solenoid pilot assembly may be serviced and removed without interference from structure or other pipes and/or equipment. Control valve shall be placed on the domestic service connection at the point where such connection is taken from the city supply or service main. The remote control valve shall be controlled from a point near the pump control panel. Provide tags for all control valves indicating service and number. Tags shall be brass, 1½" in diameter, with 1/4" high letters. Securely fasten with chain and hook. Match identification numbers as shown on approved controls shop drawings
- B. Valve should be installed with the bonnet (cover) at the top, particularly 8" and larger valves. Shut-off valves should be installed upstream and downstream of the control valve. These are used to isolate the valve during startup and maintenance. Wire the valve solenoid via conduit appropriate to the application. Coordinate with the Electrical Contractor.

3.11 WATER SUB-METER

- A. Install sub-meter of the size and type indicated in the drawings and/or specified herein. The sub-meter shall be positioned with the register facing upwards.
- B. Provide on supply and discharge lines to the sub-meter isolation valves that will allow for maintenance and/ or replacement of the device.
- C. Ensure that the water supply service line upstream of the sub-meter is thoroughly flushed to remove dirt and debris that may cause damages to the internal parts of the device.

END OF SECTION

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SECTION 220418
HOT WATER SUPPLY

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of hot water supply Work is indicated on the Drawings and by the requirements of this Section.
- B. All parts of the potable water supply, such as valves, water sub-meter, etc. must be certified as "lead free" as defined in the Reduction of Lead in Drinking Water Act of 2011 (not more than a weighted average of .25% lead). Regardless of model numbers indicated herein, provide equivalent models that are "lead free" as defined in the act. All solder and flux used during installation of valves, mixing valves, submeters, etc. associated with the potable water system must also meet the lead-free requirements of the act.

1.02 CODES AND STANDARDS

- A. Comply with applicable portions of the Building Code of New York, and the NY Energy Conservation Code (NY IECC). Where requirements for products, materials, equipment, methods and other portion of the work specified herein exceed minimum requirements of the Building Code, the Contractor shall comply with such requirements specified herein, unless specifically approved otherwise by the Authority.
- B. The Contractor shall install items that are certified as lead-free as defined in the 2011.
 - 1. The law makes it unlawful for any person, including a contractor, to introduce into commerce any pipe, pipe fitting, plumbing fixture, faucet that is not lead free.
 - a. "Lead free" content is intended to mean not more than 0.2% lead when applied in connection to solder and flux and not more than 0.25 percent of the weighted average of lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fixtures and faucets.
 - 2. To ensure compliance with "Reduction of Lead in Drinking Water Act", a procedure for determining lead content was developed. The calculation procedure works as follows:
 - a. "For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product. The lead content of the material used to produce wetted components shall be used to determine compliance with paragraph 1.a. above.
 - b. As an alternative to implementing the lead content calculation, the contractor may choose to demonstrate compliance with the act by requiring from manufacturer documentation certifying that products are lead-free based on either calculation or tests or third party certification.

1.03 SUBMITTALS

- A. Submit Shop Drawings/Product Literature for the following:
 - 1. Master Tempering Valves
 - 2. Thermometers
 - 3. Strainers
 - 4. Vacuum Breakers
 - 5. Pressure Reducing Valve
 - 6. Water Sub-Meter
- B. Submit manufacturer's instructions for installation of thermometers.
- C. Certifications
 - 1. Lead-free Certifications: Provide manufacturer's certification that valves, water sub-meter, pipe, etc. in contact with the potable water are lead-free.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Piping shall be as specified in Section 220410 and shall also comply with the following:
 - 1. Type "L" Copper Tubing (Hard Drawn) shall be for use on water distribution piping above ground, excluding short branch supplies to fixtures.
 - 2. Type "K" Copper Tubing (Hard drawn) shall be for use on water distribution piping underground.

2.02 WATER HAMMER ARRESTERS

- A. Water hammer arresters shall be as specified in Section 220417, Cold Water Supply.

2.03 MASTER TEMPERING VALVE

- A. Master tempering valve for controlling hot water temperature delivered to plumbing fixtures shall be of the thermostatic type designed with either paraffin based technology or a liquid-filled thermostat that shall comply with ASSE 1017. Compliance with ASSE 1017 shall be in accordance with both a maximum flow capacity of 45 gpm and a minimum flow of 1 gpm given a pressure loss of 45 psi. Valve shall be of either bronze or brass body construction and shall come equipped with unions, check-stops for cross flow prevention and with strainers to screen out water-born debris. The maximum inlet water temperature shall be 180°F and valve shall be designed to provide protection against scalding in case of failure in hot or cold lines and the thermostat. Valve shall be equipped with a means to limit the maximum setting of the valve to 120°F, which shall be field adjusted in accordance with the manufacturer's instructions. Master tempering valve(s) shall be from one of the following series, with the specific Basis of Design model number indicated on the Drawings:

1. Powers - Hydroguard XP–Hi/Lo – Series SH 1430 – Temperature Range 90°F to 160°F.
 2. Lawler – Model #800 Series – High–Low – Temperature Range 90°F to 120°F.
 3. ACORN – MV17-2 Series
 4. Bradley S59-3045 (HL45)
- B. The size of hot and cold inlets and tempered water outlet shall be as indicated on the Drawings.

2.04 BALANCING VALVES

- A. Provide where shown on the Drawings and with manufacturer's recommendations calibrated balancing valves. For ease of installation, a balancing valve assembly with drainage option fabricated at the factory and consisting of balancing, isolation and in-line check valves in lieu of separate balancing valves with other accessories will be accepted. Balancing valve assembly shall be constructed as is required for individual balancing valves and shall be of brass or bronze material for up to 2". For 2½" and above, valve's construction shall be cast-iron or ductile-iron with PTFE or EPDM seat and have differential pressure read-out ports across valve seat area. Valves bodies shall have tapped drain/purge port. Valves to have memory stop feature and calibrated name plate to assure specific valve setting. Valve to be leak-tight at full rated working pressure. Valves to be manufactured by Bell and Gossett New Circuit Setter Plus Model CB, Tour & Anderson Model STAS, Grinnell Model CB800 by Tyco, Watts CSM-61-M1 or Wheatly Gaso Globe Style Circuit Balancer, Model TRAB-Q by Jomar Hydronics.

2.05 THERMOMETERS

- A. Provide thermometers in locations as indicated on the Drawings to record temperatures of the following:
1. Kitchen hot water circulating line
 2. Building hot water circulating line
 3. Tempered water, temperature downstream of 3-way mixing valve.
 4. Hot water storage tank temperature.
- B. Thermometers shall be gas actuated dial thermometers having a bulb 6" long with a brass separable socket, 1" NPT filled with a conducting medium. The dial shall be white enameled, black figured, approximately 4½" in diameter, graduated from 30°F to 240°F. The case shall be cast aluminum, with polished chrome ring. Thermometers shall be Weksler No. 433BKCL or Weiss G45VA406.

2.06 VACUUM BREAKERS

- A. Refer to Section 220417. Vacuum breakers shall be suitable for use on 180°F hot water.

2.07 PRESSURE REDUCING VALVE

- A. Provide a pressure reducing and regulating valve ahead of the automatic rinse valve on dishwasher. A strainer shall be installed ahead of this valve as shown on the Drawing Details.

The valve shall be Cash Acme-Model "B", Watts series 223 or Conbraco 36 series, 3/4", screwed ends with bronze body, stainless steel seat. The valve shall be set at the factory for 30 P.S.I. outlet pressure.

2.08 WATER SUB-METER

- A. A sub-meter that provides for accurate flow measurement of potable hot and return water supplied to the school kitchen shall be fitted on the water line(s) feeding the kitchen plumbing fixtures. The sub-meter (s) shall be a non-intrusive kind that requires no cutting of pipe or drilling of a hole. The devices shall not be in contact with the water and thus they shall not cause pressure drop.
- B. Design of the sub-meter shall use transit-time ultrasonic technology along with transducers to provide for flow totalizing (gallons used) and flow rate (gpm) in real time. Sub-meter (s) shall be wall –mounted and capable for +1% accurate flow measurement of clean liquids, suitable for liquids that contain small amounts of suspended solids or particle in sizes smaller than 100 um in order to make a measurement. Sub-meter shall be able to operate in temperatures ranging from 32°F to 212°F and come equipped with a device that emits pulse signals.
- C. The clamp-on sub-meter shall contain a display that is LCD with backlight. Indication for flow rate and flow accumulator shall be displayed in English (US) units.
- D. Clamp-on transducers that are strapped to the water lines and wired directly to the sub-meter electronics enclosure must be provided as part of the potable water sub-metering system.
- E. Enclosure shall be weather-resistant, NEMA 4X or IP65. It shall be constructed of stainless steel.
- F. Power requirement for the sub-meter is 90 VAC.
- G. Approved Models: STUF -300FxB by SHENITECH or TFX by Dynasonics.

2.09 POINT-OF-USE MIXING VALVES

- A. Hand- Washing: Provide thermostatic mixing valves that comply with ASSE 1070 and are capable of controlling as well as maintaining the delivered tempered water to 105°F. Mixing valve shall be constructed of corrosion resistant materials. Valve shall include integral checks with screens to prevent backflow and to filter debris from entering the valve.
 - 1. Acceptable manufacturers: Acorm model #ST70, Powers E-480, Leonard models: #170- LF or #270-LF, Bradley – Navigator, model S59-4007 or another approved equal
- B. Individual & Multi [Gang] Showers: Provide thermostatic mixing valves that comply with ASSE 1016 for individual shower. For Multi-showers, the thermostatic valve shall comply with ASSE 1069. Mixing valves shall be capable of controlling the setting of the temperature of the tempered water at 105°F. Valve shall be of brass body and shall include a field adjustable limit stop.
 - 1. Acceptable manufacturers for Gang Showers: Acorn, model #ST7069, Powers, model #LM 495-2-A; LM 496-2-A; LM-497-2-A, Leonard models: #269-LF; #369-LF or #XL-690-LF-DT or another approved equal

2. Acceptable manufacturers for individual shower: Acorn, model # SV16, Powers, model #e420 or another approved equal

PART 3 - EXECUTION

3.01 HOT WATER PIPING

- A. Connect to the hot water heater and extend, suspended from the cellar or basement ceiling, brass pipe or type "L" copper tubing hot water mains of the sizes indicated on the Drawings and extend from same the required number of branches and risers to supply all fixtures, apparatus, etc. All mains, risers and branches to fixtures shall have water hammer arresters where indicated on the Drawings and where required.
- B. Install gate valves, unions and 1/2" drain bibbs on all branches from mains to risers.
- C. Branches connected to the hot water and circulation risers shall be connected to the risers in such a manner that the risers supported at their base are free to expand upward for their entire length.
- D. From a point on the ceiling below the branch to the highest fixture on each riser, extend circulating pipes to the return main, which shall be extended and connected to the piping at water heater as indicated on the Drawings. At the base of the hot and circulation pipes and before they connect to return main, install gate valves, unions and 1/2" drain bibbs.
- E. Install check valves and balancing valves at the base of circulating line. Adjust balancing valves and regulate same so that a good circulation of hot water is obtained. Hot water system shall provide adequate hot water at the designated temperature to all plumbing fixtures that require hot water. Hot water system to be balanced at maximum velocity between 4 to 5 ft/sec.

3.02 MASTER TEMPERING VALVES

- A. The master tempering valve shall be installed and connected to the hot water header at top of the heater and to the cold water header with separate branches of pipe and fittings. Install brass and/or bronze "Y" type strainers on the hot and cold water inlet piping to mixing valve. The hot and cold water branches shall each be fitted with gate and check valves, drain faucets and unions.
- B. Master tempering valve shall be set to deliver water at a temperature of 105°F, unless otherwise noted.
- C. The end of the tempering valve, where the adjusting screw is located, shall have a clear space of 24" with any fixed object. This clearance will allow access for regulating and servicing of the valve.
- D. Extend from mixing valve with a tempered water header provided with the required tees for thermometer bulb, regulating bulb and connections for tempered water supply to fixtures throughout the building.
- E. Install O.S. & Y valved by-pass between hot water header and tempered water header.

3.03 THERMOMETERS

- A. Thermometers shall be installed in accordance with the manufacturer's instructions. Location of thermometers shall be as indicated on the Drawings or as directed by the Authority.

3.04 VACUUM BREAKERS

- A. Install vacuum breakers as detailed on the Drawings and as required by the Building code of the state of New York.

3.05 BALANCING VALVE

- A. Balancing valve shall be installed in accordance with the manufacturer's instructions where shown on the Drawings.

3.06 PRESSURE REDUCING VALVE

- A. Install valve as detailed on the Drawings and if required for proper operation.

3.07 WATER SUB-METER

- A. Follow the manufacturer's instructions for installation of the sub-meter. The recommended spacing between transducers and the laying-out or method of installation: Z-method (two transducers on opposite sides of the pipe), V-method (two transducers on the same side) that is outlined in the installers' guide must be adhered to. Provide cable of sufficient length to wire transducers to the electronic enclosure. The electronic enclosure shall be installed neatly at a location shown on the Drawings or as approved by the Engineer of Record in a location where the meter can be read.

3.08 DISINFECTION AND LEAD TESTING

- A. The Contractor shall be responsible for bacteriological examination and disinfection of the potable water system in accordance with the provisions the Article entitled "Domestic Water System Disinfection" of Section 220414.

- B. Special Installation Procedure

When included in the Disinfection and Water Quality Testing Plan (DWQTP) and such plan is approved by the Authority's Environmental and Industrial Hygiene Division, special installation procedures in accordance with the Article entitled "Procedure For Direct Replacement of Potable Water System Fixtures, Fittings and Appliances" in Section 220414 may be used in lieu of system wide disinfection. These procedures apply when potable water system components (e.g., fitting, faucets, valves, hose bibs, temperature or flow gauges, appliances, etc.) are installed or replaced at as part of work that does not involve the replacement or installation of associated potable water piping.

- C. Assist and coordinate lead testing in accordance with Section 220414.

END OF SECTION

SECTION 220431
TAGS, CHARTS, AND IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work of this Section includes the following:

1. Tags
2. Accessories
3. Charts and Frames
4. Pipeline Identification

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawing:

1. Provide list of identification wording, symbols, letter size, and color coding.
2. Valve numbering scheme; valve Schedules: For each piping system to be included in maintenance manuals.

C. Samples: Submit samples of tags and identification markers for each different type of service. Samples shall be submitted and approved before installation.

PART 2 - PRODUCTS

2.01 TAGS

A. All controlling valves on hot water, circulation, cold water and gas supply pipes throughout the building, except those at fixtures, shall be furnished with heavy brass tags 2" in diameter, with numbers and the words "Hot", "Circ.", "Cold" or "Gas" thereon. The numbers and letters shall be of the block type, indented and filled with durable black compound. The letters shall be 1/4" high and the numbers shall be 1/2" high. The tags on circulation (Circ) pipe valves shall be numbered the same as the hot water valve controlling the riser or branch to which the circulation pipe is connected.

B. Tags shall be as manufactured by Seton Nameplate Corp., Brimar Industries, Inc., Marking Services Inc., EMED Co., Inc.

2.02 CHARTS AND FRAMES

A. The numbers on valves for hot, circ., cold and gas shall be arranged in the following manner:

In cellar or basement commencing with	No. 1
In the first story commencing with	No. 100
In the second story commencing with	No. 200
In the third story commencing with	No. 300
In the fourth story commencing with	No. 400

In the fifth story commencing with
In penthouses commencing with

No. 500
No. 600

- B. If it should occur that the number of valves on any floor exceed the number of tags provided for said floor, then a letter must be added which would read, for example 100A or 100B, and so on, until all valves on the floor are properly numbered, but in no case shall a number be applied other than as herein stated.
- C. The number of each and every valve throughout the building shall be plainly typed on approved heavy paper. Opposite each number shall be set the location of the valve bearing that number, also the fixture or fixtures controlled by that valve. The charts shall be framed in an approved glazed frame. The frames shall be made of 1" wide oak picture molding with wood back, and shall be finished with natural color varnish with screw-eyes and wire for hanging same, and shall be submitted to the Authority for approval before installation.

2.03 PIPELINE IDENTIFICATION

- A. Identification shall be in accordance with "Scheme for Identification of Piping System ANSI A13.1" and OSHA safety color regulation.
- B. Markers shall be snap-on type as manufactured by Seton Nameplate Corp., (Setmark System) EMED Co., Inc., Brimar Industries, Inc., Marking Services Inc. Markers shall completely encircle the pipe with a substantial overlap. No adhesive shall be used. They shall be manufactured of UL approved, self-extinguishing plastic. When the pipe including insulation (if any) is 6" diameter and larger, markers shall be strap on type.
- C. Provide identification for piping, and equipment.
- D. Pipe shall be lettered in accordance with the schedule below. Lettering shall be located at the supply side of each valve and branch connection and at intervals of not over 20'(10' on fire lines in the basement and cellar and 5'-0" for gas lines everywhere) on straight runs of pipe. Provide flow arrows for all piping at each marker. Adjacent to the legend, stencil the size of the pipe. Background and letter colors are as follows: Yellow with black letters, green with white letters, blue with white letters and red with white letters.

STENCIL SCHEDULE

Service	Stencil Designation	Background Color
Cold Water	Cold Water	Green
Cold Water Make-up	Cold Water Make-up	Green
Hot Water	Hot Water 105°F	Yellow
Hot Water (Kitchen)	Hot Water 140°F	Yellow
Hot Water Circulating	Hot Water Cir. 105°F	Yellow
Hot Water Circulation	Hot Water Cir. 140°F	Yellow

(Kitchen)

Sanitary Sewer	San. Sewer	Green
Storm Sewer	Storm Sewer	Green
Combined Sewer	Comb. Sewer	Green
Storm Water Piping	St. W.	Green
Soil Piping	Soil	Green
Waste Piping	Waste	Green
Vent Piping	Vent	Green
Gas	Gas	Safety Yellow
Gas Vent	Gas Vent	Safety Yellow
Compressed Air	Compressed Air psi	Yellow above 90 psi Blue below 90 psi
Pump Discharge	Pump Disch.	Green

- E. The nature of service of all machinery, equipment, tanks, pumps, and other apparatus shall be stenciled in 2" high letters unless otherwise directed.

2.04 ACCESSORIES

- A. Accessories for attaching tags to their respective hot, circ., cold, and gas valves shall include solid brass jack chain with adjustable open and close links and solid brass S-Hooks.
- B. Jack chains and S-hooks shall be as manufactured by Seton Nameplate Corp., EMED Co., Inc., Brimar Industries, Inc., Marking Services Inc.

2.05 GAS PIPING IDENTIFICATION

- A. All gas piping shall be identified by a yellow label marked "GAS" written in black letters and in accordance with ASME A13.1. On the same label or adjacent to it, the gas pressure for each line shall also be marked.

1. Manufacturers: Marking Services, Inc., Brimar Industries, Inc., EMED Co., Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Attach solid brass tags to their respective hot, circ., cold and gas valves with jack chain and S-Hooks.

3.02 INSTALLATION OF LABELS ON GAS PIPING: Not used.

END OF SECTION

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SECTION 220440
PLUMBING FIXTURES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all required plumbing fixtures and associated supports as specified herein. The extent of fixture and trim work is as indicated on the Drawings and by the requirements of this Section.
- B. All faucets, bubblers, mixing valves must be certified as “lead free” as defined in the Reduction of Lead in Drinking Water Act of 2011 (not more than a weighted average of .25% lead). Regardless of model numbers indicated herein, provide equivalent models that are “lead free” as defined in the act. All solder and flux used during installation of all faucets, bubblers, mixing valves associated with the potable water system must also meet the lead-free requirements of the act.

1.02 CODES AND STANDARDS

- A. Comply with applicable portions of: the Building Code of New York; including all administrative local and state codes.
- B. Showerheads, private lavatory faucets, water closets and for urinals, the urinal flush valve or fixture/valve combination, shall meet the specifications required for the WaterSense program label and shall bear such label, or shall be approved in accordance with the Plumbing Code.
- C. The Contractor shall install items that are certified as lead-free as defined in the 2011 Reduction of Lead in Drinking Water Act.
 - 1. The law makes it unlawful for any person, including a contractor, to introduce into commerce any pipe, pipe fitting, plumbing fixture, faucet that is not lead free.
 - a. “Lead-free” content is intended to mean not more than 0.2% lead when applied in connection to solder and flux and not more than 0.25 percent of the weighted average of lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fixtures and faucets.
 - 2. To ensure compliance with “Reduction of Lead in Drinking Water Act”, a calculation procedure for determining lead content was developed. The calculation procedure works as follows:
 - a. “For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product. The lead content of the material used to produce wetted components shall be used to determine compliance with paragraph 1.a. above.
 - b. As an alternative to implementing the lead content calculation procedure, the contractor may choose to demonstrate compliance with the act by

providing manufacturer documentation certifying that products are lead-free based on either calculation or tests or third party certification.

1.03 SUBMITTALS

- A. Submit shop drawings for the following:
 - 1. Fixtures
 - 2. Shower Equipment
 - 3. Trim, faucets, mixing valves etc.
 - 4. Fixture Supports
- B. Submit manufacturer's instructions for installation of fixtures.
- C. Submit samples consisting of two pieces of each piece of brass work (fitting-trimming-etc.) required in connection with plumbing fixtures and showers, etc., only if other than specified item.
- D. Certifications: Provide manufacturer's certification that all faucets, bubblers, mixing valves provided meet the requirements of the 2011 Reduction of Lead in Drinking Water Act.

1.04 INDEXING FAUCET HANDLES

- A. All faucet handles shall be indexed to indicate type of water it will supply. Cold water faucet shall be indexed by a "C", "COLD", or be color coded blue. Hot water faucet shall be indexed by an "H", "HOT", or be color coded red. Tempered water shall be indexed by a "T" or be color coded white.

1.05 FIXTURE MOUNTING HEIGHT SCHEDULE

- A. Plumbing fixtures shall be mounted in accordance with the Drawings. Mounting heights are measured from finished floor (AFF) to rim of fixture unless indicated otherwise, such as to bubbler.

PART 2 – PRODUCT

The school (NBOE) has provided a preferred list of the plumbing fixtures as shown in the list below. Contractor shall provide these fixtures and submit product submittals to the engineers and school for review and approval. In case, the fixture is not listed in the school's list below, the suggested model numbers listed under each fixture section, shall be picked. Contractor shall submit these fixtures' submittals for the engineer and school's review.

2.01 FIXTURE SUPPORTS

- A. Water closet chair carrier shall be J. R. Smith, Josam Co., Zurn, Watts Drainage, MIFAB or Tyler Pipe/Wade Division having two separate base supports secured to an adjustable faceplate. Carrier shall include cast iron anchor foot assembly, cast iron fittings, cast-iron adjustable faceplate with side mounted base support assembly, cast iron nipple and cast iron coupling. Chair carrier with masonry wall construction for above floor soil piping shall be: J. R. Smith 210-M51-M54 or 210Y-M51-M54, Zurn Z1201-CC, MIFAB MC-10-3-CI-G, Watts Drainage Products ISCA-101-L/R-CI and Wade 310-M26 for single fixture; J. R. Smith 210D or 210DY, Zurn Z1201-D-C, MIFAB MC-10D-CI-G or Wade 310D-M26 or Watts Drainage

Products ISCA-101-D-CI for back to back fixtures; J. R. Smith 240-M5I or 240Y-M51, Zurn Z1202-1N4-CC, MIFAB MC-13-3-CI-G and Wade 340-M26 or Watts Drainage Products ISCA-131-L/R-CI for a single fixture roughing tying into a stack with single side inlet; J. R. Smith 240D or 240DY, Zurn Z1202-1ND4-CC, MIFAB MC-13D-CI-G and Wade 340D-M26 or Watts Drainage Products ISCA-131-D-CI for back to back fixtures; J. R. Smith 280-M51, Zurn Z1202-2N4-CC, MIFAB MC-13-CI-HS-3-G and Wade 340A-M26 or Watts Drainage Products ISCA-131-2-CI for a single fixture roughing tying into a stack with double side inlets; J. R. Smith 280-D, Zurn Z1202-2ND4, MIFAB MC-13D-CI-G and Wade 340A-M26 or Watts Drainage Products ISCA-131-D2-CI for back to back fixtures.

Chair carrier for fixtures installed in a stud wall construction and connecting to a stack with adjustable steel or cast iron faceplate shall be: J. R. Smith 0550F, MIFAB MC-13-CI-G and Wade 371-M26 or Watts Drainage Products ISCA-151-D-CI for single fixture; J. R. Smith 0550F-D, MIFAB MC-13D-CI-HS-G and Wade 371D-M26 or Watts Drainage Products ISCA-151-D-CI for back to back fixtures. Carrier for a single fixture roughing and connecting to a branch pipe shall be: J. R. Smith 542, MIFAB MC-13-CI-HS-G and Wade 350-NH-M26 or Watts Drainage Products ISCA-141-4-V2-CI or Zurn Z1282-H42.

- B. Chair carrier for barrier-free water closets whose seat is set more THAN 16" ABOVE THE FLOOR SHALL BE J.R. SMITH "HI-SET" elevated adjustable fixture support, Zurn, Josam Co., MIFAB or Tyler Pipe/Wade Division. Carrier shall include an anchor foot assembly, cast iron nipple and cast iron coupling. Chair carrier on masonry wall construction for above floor soil piping shall be: J. R. Smith 115-M51 or 115Y-M51, MIFAB MC-10-3-CI-G and Wade 310H-M26 or Watts Drainage Products ISCA-101-L/R-CI or Zurn Z1207-N-X3 for single fixture; J. R. Smith 115D or 115DY, MIFAB MC-10D-CI-G and Wade 310H-D-M26 or Watts Drainage Products ISCA-101-D-CI or Zurn, Z1207-ND4-X3 for back to back fixtures; J. R. Smith 175-M51 or 175Y-M51, MIFAB MC-13-3-CI-G and Wade 340H-M26 or Watts Drainage Products ISCA-131-L/R-CI Zurn Z1204-1N4-X3 for a single fixture roughing tying into a stack with single side inlet ; J. R. Smith 175D or 175DY, MIFAB MC-13D-CI-G and Wade 340H-D-M26 or Watts Drainage Products ISCA-131-D-CI for back to back fixtures; J. R. Smith 185-M51 or 185Y-M51, MIFAB MC-13-2-CI-G and Wade 340A-H-M26 or Watts Drainage Products ISC-131-2-CI or Zurn Z1204-2H-X3 for a single fixture roughing tying into a stack with double side inlets; J. R. Smith 185D or 185DY, MIFAB MC-13D-2-CI-G and Wade 340A-H-D-M26 or Watts Drainage Products ISC-131-D2-CI or Zurn Z1204-2ND4-X3 for back to back fixtures.
1. Fixture support for wall-mounted, barrier-free water closets that have a final installation height of 14" to the rim of the fixture shall be adjustable type with the center line of the discharge outlet set at 4" minimum. Base section of the support shall be securely anchored to the floor and support for a single water closet shall come with a rear lug for anchoring to the floor. Acceptable fixture support shall be JR Smith, model #0211 series; Zurn, model #Z1201 series, ISCA-101-L/R-CI or other approved equal.
- C. Each carrier shall be provided with the appropriate fixture supporting devices specified, or recommended by the manufacturers.
- D. Urinal support: Floor mounted carrier support shall be high strength steel uprights with welded feet, top support and bottom bearing plates, both adjustable and mounting fasteners Carrier must be similar to: Josam Co 17560-UR, Zurn Z1222, MIFAB MC-32, Wade 400-AM11-M36, Watts Drainage Products CA-321 or Jay R. Smith. All standard urinals and barrier-free fixtures from Kohler shall be supported by Jay R. Smith Figure 637-M31; barrier free units from American Standard: Jay R. Smith Figure 644-M31 and all units from Crane: by Jay R. Smith Figure 637M-M31.

- E. Lavatory/Hand Sinks support: floor-mounted, concealed arms with positive mechanical locking device, arms fully adjustable, high-strength steel uprights with welded feet and supporting brackets: Josam Co. 17100, MIFAB MC-42, Zurn Z1231-EZR, Wade 520-M36, Watts Drainage Products TCA-411 or Jay R. Smith Figure 700-M31.
- F. Service Sink: floor-mounted fixture support with acid resistant coating and a fixture mounting plate to receive the fixture manufacturer's hanger device, high-strength steel uprights with welded feet and supporting brackets. Carrier shall be similar to J. R. Smith Figure 851-M31, Watts Drainage Products ISCA-560 and Wade 640-M36 or Zurn Z1218.
- G. Dark Room Sink, Barrier-Free: floor mounted chair carrier, high strength steel uprights with welded feet, adjustable support plates, and mounting fasteners including an additional bearing plate for supporting and mounting thermostatic mixing valve J. R. Smith Figure 849-M31 or Wade 623-M36-AM27 or Watts Drainage Products CA-401-Q or Zurn Z1229-WS.

2.02 FLUSH VALVES

- A. General: Unless otherwise indicated, all flush valves used on pupil, staff and adult (non-staff) water closets and urinals shall be of the sensor operated automatic exposed type.
- B. Hard-Wired, Sensor Activated Type
 - 1. Flush Valve for Water Closets: Valve shall be sensor-operated, hard-wired high efficiency type, using 1.28 gallon flush (1.28 gpf). Flushometer shall be ADA compliant, polished brass chrome plated assembly, hardwired and equipped with automatic sensor flush technology. Flush valve shall be quiet, exposed, using infrared sensor with range adjustment and a true manual override push-button. Valve shall comply with ASSE 1037 & 1001. Provide power converter/step down transformer from flush valve manufacturer. Valve shall contain adjustable tailpiece and be chloramine resistant. Other valve accessories shall include, vacuum breaker, and 1" adjustable angle stop with protective bumper. Flush connection and coupling for 1½" top spud shall include wall and spud escutcheons. Flush valve shall be similar to Zurn Aquasense model #ZEMS6000PL-HET-IS-P6000-HW6 or Sloan Regal model #111-1.28 SFSM HW. Contractor shall verify flow requirements with the manufacturer of the selected flushometer to ensure that the valve will work with the selected toilet bowls.
 - 2. Flush Valve for Urinals: Valve shall be sensor-operated, hard-wired high efficiency type, using 0.125 gallon flush (0.125 gpf). Flushometer shall be ADA compliant, polished brass chrome plated assembly, hardwired and equipped with automatic sensor flush technology. Flush valve shall be quiet, exposed, using infrared sensor with range adjustment and a true manual override push-button. Valve shall comply with ASSE 1037 & 1001 and shall bear the WaterSense label. Provide power converter/step down transformer from flush valve manufacturer. Valve shall contain adjustable tailpiece and be chloramine resistant. Other valve accessories shall include, vacuum breaker, adjustable angle stop with protective bumper. Flush valve shall be similar to Zurn Aquasense model #ZEMS6003AV-ULF-IS-VP-P6000-HW6 or Sloan Regal model #186-0.125 SFSM HW other approved equal. Contractor shall verify flow requirements with the manufacturer of the selected flushometer to ensure that the valve will work with the selected urinals.
- C. Battery-Operated, Sensor Activated Type
 - 1. Flush Valve for Water Closets: Valve shall be sensor-operated, battery-powered, using 1.28 gpf. Flushometer shall be ADA compliant, polished chrome-plated brass

and come equipped with a true mechanical override button. Valve shall comply with ASSE 1037 & 1001. Other valve accessories shall include: batteries, vacuum breaker, adjustable angle stop with protective bumper, spud escutcheons. Flush valve shall be similar to; Zurn model #ZER6000AV-HET-CCP-CPM, Sloan Regal model #111-1.28 SFSM, Delany model # U402-1.28-SM-AM-T5-T36-VPS. Contractor shall verify flow requirements with the manufacturer of the selected flushometer to ensure that the valve will work with the selected toilet bowls.

2. Flush Valves for Urinals: Valve shall be sensor-operated, battery-powered, using 0.125 gpf. Flushometer shall be ADA compliant, polished chrome-plated brass and come equipped with a true mechanical override button. Valve shall comply with ASSE 1037 & 1001 and shall bear the WaterSense label. Other valve accessories shall include: batteries, vacuum breaker, adjustable angle stop with protective bumper, spud escutcheons. Flush valve shall be similar to Zurn model #ZER6003AV-ULF-CP or Sloan Regal model #186-0.125 SFSM. Contractor shall verify flow requirements with the manufacturer of the selected flushometer to ensure that the valve will work with the selected urinals.

2.03 STOPS

- A. Provide lock shield key angle stop or straight stop with loose key with each compression type faucet whether specifically called for or not, including sinks in wood and metal casework, and laboratory furniture, and cafeteria milk sink. Locate stops centrally above or below fixture in accessible location. Chrome plated brass 1/2" IPS angle stop with loose key shall be Chicago 442-LK or T&S Brass B-0418CP; Chrome plated brass 1/2" IPS straight stop with loose key shall be Chicago 45-LKCABCP, T&S Brass B-0416CP.
- B. Provide keys for lock shield stops to the Authority.
- C. Supply from stops shall be chrome plated copper flexible tubing.
- D. Supply pipe from wall to valve stop shall be rigid threaded IPS copper alloy pipe.

2.04 ESCUTCHEONS

- A. Refer to Section 220410 for Escutcheon types and locations.

2.05 FAUCET

- A. All faucets shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act".
- B. Barrier-free faucets shall be constructed to meet the clearances and requirements of ANSI A117.1. Barrier free faucet operated by controls needing no more than 5 lbf (pound force) for activation shall be push-type with metering device lasting at least 10 seconds.
- C. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor for lavatories and sink. Coordinate faucet inlets with supplies and outlet with diverter valve for bathtubs and showers.
- D. All Lavatories - Single or Under the Counter Lavatory, Multiple Lavatories, Barrier-Free, General Use (Pupil & Staff), Hand Sink, Kitchen Lavatory: Faucet shall be sensor-operated, battery-powered ADA compliant faucet. The control of the faucet's operation shall utilize infrared convergence-type proximity for detection. Faucet shall be chrome-plated, battery operated. Faucet's flow performance rating shall be 0.125 gallon/cycle using a metering

device that is pre-set at the factory to produce the required flow. Provide local mixing valve to ensure that tempered water is delivered at the appropriate temperature for hand-washing.

For all lavatories: single, under-the-counter type, multi-lavs assembly, acceptable electronic hand washing faucets shall be Zurn model #6955-XL-S-F-15S, Sloan Model #EAF 350 or Chicago model #116CR44813 or T&S EC-3103-LMV-VF05

- E. Sink and Drinking Fountain (K-5th) or Sink (pre-K), Barrier-Free, Single Bowl, Self-Rimming: Unit shall be fitted with a single hole, deck mounted, chrome-plated brass faucet with a control handle located to the side of the faucet shank. Faucet shall also come equipped with a goose neck fitted with a vandal resistant aerator having 0.5 gpm water flow rating. Accessories such as locking nut, washer and set screws shall be included so as to ensure that the gooseneck spout cannot rotate. Faucet shall be Elkay model #LKD208513C-733/ or Zurn model #Z825B4-XL-AR-3F.
- F. Art Room Trough Sink/Non-Barrier-Free Unit Set on Cabinets: Unit shall be fitted with three (3) combination hot and cold faucets with handles indexed "hot" and "cold". Combination faucet shall be wall mounted, chrome plated cast brass with a 8" adjustable centerline, gooseneck with a vacuum breaker, four arm handles, vandal resistant serrated tip with 0.5 gpm flow control. The vandal resistant serrated tip with 0.5 gpm flow control shall be similar to T&S Brass and Bronze Works B-0198-F05. The faucets shall be T&S Brass and Bronze Works BL-5725-08 with B-0198-F05, Zurn Aquaspec Z842U2-HCT-6MF with vandal resistant serrated tip with 0.5gpm flow control, Moen 8121-SV003 with vacuum breaker spout and vandal resistant serrated tip with 0.5gpm flow control, Chicago Faucets 943 with vandal resistant serrated nozzle with 0.5gpm flow control WaterSaver Faucet Co. L511VB-WS with vandal resistant serrated tip with 0.5gpm flow control or Component Hardware Group (CHG) KN54-8153-KT2 with vandal resistant serrated tip with 0.5gpm flow control.
- G. Single Bowl Sink, Self-Rimming, Barrier-Free and Non-Barrier-Free (Art/Dental/Life Center/Library Rooms Sink): Sink bowl shall be fitted with one (1) chrome plated brass deck mounted single lever side mount base faucet having a ceramic cartridge, rigid (non-movable) gooseneck spout with a 0.5gpm flow control. Accessories such as locking nut, washer and set screws shall be included so as to ensure that the gooseneck spout cannot rotate. Faucet shall be Chicago Faucets 2302-E2805-CP single lever deck faucet with a 0.5 gpm vandal resistant gooseneck spout, Delta 710LF-HDF with a 0.5gpm vandal resistant spray outlet, T&S Brass and Bronze Works B-2741 w/B-0199-06F-05, Zurn Aquaspec Z824B0-3F-VR with G6791 locking nut assembly with set screws.
- H. Medical/School Based Health Clinic Rooms Sink: Unit shall be fitted with hand free electronic hand washing faucet and soap dispenser. The faucet shall be battery powered, deck mounted chrome plated brass gooseneck with the following: adjustable infrared sensor located in a splash-proof module mounted into the base of the gooseneck, in-line filter, solenoid valve, 0.5gpm vandal resistant gooseneck spout, low battery indicator light, mixing tee, trim plate for 4" centerset sink, Alkaline batteries of the manufacturer recommended size. Sensor range shall be factory set, but can be easily adjusted for a given application. Battery operated deck mounted sensor for activation of an electronic chrome plated cast brass spout of the soap dispenser with the following features: modular one-piece construction, active infrared sensor, four (4) D-size Alkaline batteries, low battery indicator, low soap level indicator, disposable soap refills, pump and delivery soap tube; unit shall be similar to Sloan ESD-250PB. Faucet shall be Chicago Faucet HyTronic SKU 116.203.21.1 with Accessory Plate 240.627.21.1; Moen 8303-52603-104426; Sloan EBF-750PB with 0.5gpm vandal resistant spray outlet, Zurn Z6920-MT-F-CP4 or T&S Brass and Bronze Works, Inc. EC-3100 Mod W/B-0199-01F-05. Provide fresh batteries.
- I. Double Bowl Sink, Self-Rimming (Culinary Arts Classroom): Unit shall be fitted with one (1) chrome plated brass deck mounted single lever faucet having at least 8⁷/₁₆" swing spout with

a 1.5gpm vandal resistant spray outlet. Faucet shall be Moen 8710-52611 with a 1.5gpm vandal resistant gooseneck spout, Elkay LK-4300-F with a 1.5gpm vandal resistant gooseneck spout, American Standard 4205.453 with a vandal proof cap and a 1.5gpm vandal proof spray outlet, T&S Brass and Bronze Works B-2731w/B-0199-06F-15, Delta Faucet 100WFELHHDF with 060552A cover plate and 1.5gpm vandal resistant gooseneck spout or Chicago Faucets 2300-E34VP-8CP.

- J. Art-Science, Sink Trim: Combination faucet shall be chrome plated brass with quarter turn ceramic disc cartridges, 8" adjustable centerline, 6" fixed gooseneck spout with a 0.5gpm flow control. Hot and cold handles shall be indexed and shall be of the 4-arm type. Faucet shall be Chicago Faucets 942-GN2AE2805-5CP, T&S Brass and Bronze Works BL-2012-01 with B-0199-07F-05, Moen 8121-SV003-52603 with vacuum breaker spout and 0.5gpm vandal resistant gooseneck spout, Component Hardware Group (CHG) KN54-8102-RA2 with vacuum breaker spout and 0.5gpm vandal resistant gooseneck or Zurn Aquaspec Z842B2-HCT-3F.
- K. Service Sink Combination Faucet: Combination faucet shall be 8" c/c adjustable, polished chrome plated brass with four-arm handles, lockshield stops on hot and cold inlets, 1/2" flanged IPS inlets, vacuum breaker, pail hook, 0.5gpm vandal resistant spray outlet and wall brace. Faucet shall be furnished with a 2' long piece of 3/4" 4-ply rubber hose with wrot female hose connector. Faucet shall be T&S Brass and Bronze Works B-0665 BSTR with four-arm handles, 0.5gpm vandal resistant spray outlet and 2' rubber hose; Speakman S-5811 with 0.5gpm vandal resistant spray outlet and 2' rubber hose; Kohler K-8928-CP w/cross handles, 0.5gpm vandal resistant spray outlet and 2' rubber hose; Eljer 749-1450 with 0.5gpm vandal resistant spray outlet and 2' rubber hose; Chicago Faucets 897-RCF combination service sink faucet with vacuum breaker spout, 204 indexed 4 arm handles, quatern cartridge units, hose thread outlet, adjustable supply arms, 0.5gpm vandal resistant spray outlet, 2' rubber hose and integral stops; Zurn AquaSpec Z842M1-HCT-RC-WHK-5H with 0.5gpm vandal resistant spray outlet and 2' rubber hose Component Hardware Group (CHG) KN78-8106-BR with 0.5gpm vandal resistant spray outlet and 2' rubber hose or Moen 8124-8199 with 0.5gpm vandal resistant spray outlet and 2' rubber hose.
- L. Mop Sink Basin: The faucet shall be 8" c/c adjustable, rough chrome plated brass construction, 1/2" supply fitting equipped with integral vacuum breaker spout, four-arm handles, integral stops, renewable seats and heavy cast brass spout braced to wall with rigid support. Faucet shall be Chicago Faucets 897-RCF combination service sink faucet with vacuum breaker spout, 204 indexed 4 arm handles, quatern cartridge units, hose thread outlet, adjustable supply arms, 0.5gpm vandal resistant spray outlet and integral stops; Speakman S-5811 with 0.5gpm vandal resistant spray outlet; Kohler K-8928-CP with cross handles and 0.5gpm vandal resistant spray outlet; Eljer 749-1450 with 0.5gpm vandal resistant spray outlet; T&S Brass and Bronze Works B-0665-BSTR with four-arm handles and 0.5gpm vandal resistant spray outlet; Zurn AquaSpec Z842M1-WHK-5H with 0.5gpm vandal resistant spray outlet, Component Hardware Group (CHG) KN78-8106-BR with 0.5gpm vandal resistant spray outlet or Moen 8124-8199 with 0.5gpm vandal resistant spray outlet. Faucet shall have a hose thread and shall be provided with a four foot length of 3/4" 4-ply rubber hose connected to hose end of faucet.
- M. Dark Room Sink, Barrier-Free: Faucet shall be a chrome plated brass, deck mounted, single lever faucet, having at least 8^{7/16}" swing spout with a 0.5gpm vandal resistant spray outlet. Faucet shall be Moen 8710-52603 with 0.5gpm vandal resistant spray outlet, Elkay LK4300-F with 0.5gpm vandal resistant spray outlet, Chicago Faucets 2300-E2805-8CP, American Standard 4205.453 with 0.5gpm vandal resistant spray outlet and cap, Zurn Aquaspec Z82300-CP8-WF-3M or T&S Brass and Bronze Works B-2731w/B-0199-06F-05.

- N. Music Instrument Storage Room: Faucet shall be chrome plated brass, back mount with lever handles, 6" swing spout fitted with a .5gpm spray outlet. Other accessories include built-in check valves and adjustable 8" center to center flanged female 1/2" I.P.S inlets. Faucet shall be similar to Elkay Model LK66B with a 0.5gpm vandal resistant spray outlet; T&S Brass and Bronze Works B232w/B-0199-01F-05; Moen 8126-52603, Component Hardware Group (CHG) KN54-8106-SA1 or Chicago Faucets 540-LD- E2805-5CP.

2.06 WATER CLOSETS (GENERAL)

- A. Water closets shall be approved vitreous china. All water closets shall be wall hung unless otherwise noted.
- B. Water closets with existing floor roughing are permitted to be floor mounted.

2.07 WATER CLOSET, SIPHON JET, TOP SPUD, WALL HUNG, NON-BARRIER_FREE

- A. Wall hung top spud siphon jet water closet shall be an approved elongated vitreous china bowl and marked with the name of manufacturer. The trap and outlet shall have smooth interior waterway without sharp corners capable of passing a ball having a diameter of at least 1 3/4". Water closet shall require no more than 1.28 gallons per flush and shall meet or exceed the requirements of ANSI 112.19.2M. Water closet shall be Zurn Z5615-HET Series, Sloan ST-2050-A-1.28, Kohler K-4325, Crane Plumbing 3-446NS, American Standard 2257.001 or Mansfield Plumbing Products #1301
- B. Water closet chair carrier: Refer to the description provided under the Fixture Supports article.
- C. Flush valve: Refer to the description provided under the Flush Valve article. Contractor needs to exercise care when ordering flush valve as not all toilet bowls will work with all of the flushometers listed in Article 2.02.
- D. Water closet seat shall be without cover, open front, extended back, without seams, and shall properly fit the elongated bowl. Seat shall be of solid white plastic not less than 3/4" thick with 5 1/2" hinge spread. Seat shall be impervious to moisture, chemicals, and have impact resistance. Hinges shall be stainless steel rod which shall be encased in the same plastic as the seat. The hinge shall have a concealed or external check. Each hinge post shall be furnished with two (2) rubber washers, one (1) stainless steel washer and one (1) 3/8" self-locking stop nut. The seat shall have molded-in permanent plastic bumpers. Seat shall have imbedded into the underside of the seat Manufacturer's Name and Model Number. Seat shall be nominally 1" thick. Water closet seat shall be Bemis 1955CT, Church 295CT, Zurn Z5955SS-EL, Kohler K-4731 or American Standard 5901100.020.

2.07A WATER CLOSET, SIPHON JET, TOP SPUD, WALL HUNG, BARRIER-FREE

- A. Water closet shall be the same as specified in Article 2.07 except for the support. The chair carrier shall be as specified in Article 2.01 Par. B.

2.08 WATER CLOSET, SIPHON ACTION, TANK, FLOOR OUTLET (PRINCIPAL'S TOILET) (FOR FIXTURE REPLACEMENT & IN UPK USING EXISTING SANITARY ROUGH-IN))

- A. Floor outlet tank type siphon action water closet shall be an elongated vitreous china one-piece tank and bowl marked with the name of the manufacturer. Water closet shall require no more than 1.28 gallons per flush with inlet water pressure no more than 25 pounds per square inch, meeting or exceeding the requirements of ANSI 112.19.2M. Water closet shall

be Kohler Model K-3575, Mansfield Plumbing Products #114-112, Sloan WETS 9020-1.28, American Standard 2403.128 or Zurn model #Z5555.

- B. Toilet seat shall be stain resistant, chip resistant, and peel resistant solid plastic seat and cover. Seat shall be Kohler Model K-4664, for Kohler toilet; Olsonite 44 10CT, Bemis 1200Slow or Church 295CT for Sloan and American Standard; Zurn Z5958SS-EL for Zurn and Mansfield Plumbing Products #SB1175 for Mansfield toilet.
- C. Supply fitting shall be chrome-plated brass. Stop valve shall have 1/2" I.P.S. inlet and compression fitting for annealed tube for tank connection. Stop shall have a four arm handle. Supply fitting shall be Kohler Model K-7638, EBC CA10, McGuire 166 or Zurn Z8802CR-PC.
- D. Water closet shall come complete with Sloan, Kohler, American Standard, Zurn or Crane bolt caps to cover ends of mounting bolts and nuts. Bolt caps shall be provided by the water closet manufacturer.

2.08A WATER CLOSET FOR USE IN 3K

- A. Floor-mounted vitreous china bowl with siphon jet flushing action shall be high efficiency toilet that operates with flush valves that have a minimum water rating of 1.28 gpf. Bowl shall be designed with a fully glazed trap-way, and having a maximum 10" high elongated front rim. Water closet shall be Baby Devoro by American Standard or Model Z5675-BWL by Zurn.
- B. Flush valve: Refer to the description provided under the Flush Valve article. Contractor needs to exercise care when ordering flush valve as not all toilet bowls will work with all of the flushometers listed in Article 2.02.
- C. Toilet seat shall be stain resistant, chip resistant, and peel resistant solid plastic seat and cover. Seat shall be Kohler Model K-4664, for Kohler toilet; Olsonite 44 10CT, Bemis 1200Slow or Church 295CT for Sloan and American Standard; Zurn Z5958SS-EL for Zurn and Mansfield Plumbing Products #SB1175 for Mansfield toilet.
- D. Water closet shall come complete with closet bolt caps to cover mounting bolts and nuts, wax ring kit and inlet spud.

2.09 WALL HUNG URINAL, TOP SPUD

- A. Urinal shall be wall hung, 3/4" top spud, siphon jet or washout, 0.125 (1/8) gallons per flush, vitreous china. Urinal shall be American Standard 6590.1250.125gpf, Crane Plumbing 7399.125, Kohler K-4904-ET, Mansfield #422., Sloan Model SU-1000-0.125, Zurn Z5798.207.00. Contractor needs to exercise care when ordering flush valve as some urinals may not work with the flushometers listed in Article 2.02.
- B. Flush valve: Refer to the Flush Valve Article.
- C. Urinal support: Floor mounted urinal carrier, refer to the Fixture Supports Article.

2.10 WALL HUNG URINAL, BARRIER-FREE

- A. Urinal shall be wall-hung 3/4" top spud, siphon jet or washout, 0.125 (1/8) gallon per flush, vitreous china, lip to wall dimension shall be at least 14". Urinal shall be American Standard 6590.1250.125gpf, Crane Plumbing 7399.125, Kohler K-4904-ET, Mansfield #422, Sloan

Model SU-1000-0.125, Zurn Z5758.207.00 Contractor needs to exercise care when ordering flush valve as some urinals may not work with the flushometers listed in Article 2.02.

- B. Flush valve: Refer to the Flush Valve Article.
- C. Urinal support floor mounted: Refer to the Fixture Supports Article.

2.11 SINGLE LAVATORY, BARRIER-FREE OR GENERAL USE (PUPIL & STAFF)

- A. Barrier-free Lavatory shall be 22" x 21", vitreous china, with 4" center faucet holes and shroud/knee contact guard. Lavatory shall be Mansfield Plumbing Products #2040 complete with vitreous china shroud, Zurn Z5324-PED, Crane Plumbing Serena 179V or Sloan model #SS-3065. Provide with holes for concealed arm carrier systems. Color: white.
- B. Lavatory support: Floor mounted with concealed arms; refer to the Fixture Support Article.
- C. Lavatory drain shall be the integral perforated grid type with cast brass locknut, 1¼" diameter tailpiece, and chrome plated finish: Kohler K-7715-CP, Eljer 803-0552, Chicago 327A, EBC SG7, Zurn Z8743-PC, McGuire 155AECO or T&S Brass and Bronze Works, Inc. B0899.
- D. Each lavatory shall have a faucet. Refer to Faucet Article. Provide a thermostatic mixing valve (TMV), pre-set at the factory to maintain 105°F tempered water, similar to Acorn model #ST70, Powers LFe480-01, Chicago model #131-ABNF or other approved equal with factory installed union angle strainer check-stops and chrome plated brass dome shield. Valve shall be compliant with ASSE 1070.
- E. Lavatory trap shall meet New York Building Code requirements, chrome plated cast brass with cleanout plug and cast brass slip nut: 1¼" inlet x 1½" outlet by Eljer 804-1125, McGuire 201C, Kohler K-9009-CP, EBC TN140 or Zurn Z8716B-PC.
- F. Hot and cold water supply piping shall be chrome plated screw brass piping with 1/2" IPS angle stops. The angle stop shall be as specified in the Stops Article.
- G. One lavatory in each toilet with a floor drain shall have a drain bibb on the fixture side of the cold water stop valve. Drain bibb shall be 1/2" male inlet plain end, loose-key lockshield, heavy duty chrome plated brass faucet by T&S Brass and Bronze Works B-0703 with 124A/1802-45 lockshield and key or Zurn Aquaspec Z80402 with lockshield and key.
- H. 3K & Pre-K Toilet Rooms Lavatory
 - 1. Provide wall-hung lavatories, including all accessories described above, such as supports, drain, faucet, local thermostatic mixing valve and other plumbing trims for a completely functioning and operational fixture.
 - 2. Lavatories shall come with a hole bored at the factory on either the left or the right side to receive soap dispenser, such as Zurn Z-5324-PED-LS/or RS.

2.12 UNDER THE COUNTER LAVATORY/MULTIPLE STATIONS FOR GENERAL USE OR BARRIER-FREE (STUDENTS)

- A. Barrier-free lavatory shall be constructed to meet the clearances and requirements of ANSI A117.1. Lavatories shall be 19" x 15", vitreous china, and suitable for under-the-counter installation, the equal of American Standard, Model 9482.000, Crane Tiara Model 1992, Sloan Model SS-3001 Mansfield Plumbing Products 217 or Zurn Z5220. Color: white.

- B. Each lavatory shall be fitted with grid drain and metering faucet. Refer to the Faucet Article. Provide a thermostatic mixing valve (TMV), pre-set at the factory to maintain 105°F tempered water, and similar to Acorn model #ST70, Powers Series LFe480-01 or other approved equal with factory installed union angle strainer check-stops and chrome plated dome shield. Valve shall be compliant with ASSE 1070.
- C. Each lavatory shall be provided with a New York approved 1¼" inlet by 1½" outlet trap with cleanout plug and cast brass slip nut: Eljer 804-1125, Kohler K-9009CP, McGuire 201C, EBC TN140 or Zurn Z8716B-PC.
- D. Stop valve on hot and cold supply: angle type. Refer to the Stops Article.
- E. Counter supporting the multi-lavatories assembly will be provided by architect. This contractor shall coordinate with the G.C. for provision of the appropriate cut in the counter to receive the fixtures.

2.13 KITCHEN LAVATORY (HAND SINK)

- A. Lavatory shall be 20" x 18", vitreous china as manufactured by Kohler K-1729, Crane 1412V drilled for carrier with concealed arms, American Standard 0321.075, Sloan SS-3003 or Zurn Z5344. Color: white.
- B. Lavatory support: Floor mounted with concealed arms; refer to the Fixture Supports Article for the vitreous china.
- C. Lavatory faucet: 4" center with metering device and delivering .125 gpc that is set at the factory. Refer to the Faucet Article.
- D. Lavatory drain shall be the integral perforated grid type with cast brass locknut, 1¼" diameter tailpiece and chrome plated finish: Kohler K-7715CP, Eljer 803-0552, McGuire 155AECO, Zurn Z8743-PC or T&S Brass and Bronze Works, Inc. B0899.
- E. Lavatory trap shall meet New York Building Code requirements, chrome plated cast brass, 1¼" inlet by 1½" outlet with cleanout plug and cast brass slip nut by Eljer 804-1125, Kohler K-9009-CP, McGuire 201C, EBC TN140 or Zurn Z8716B-PC.
- F. Hot and cold water supply piping shall be chrome plated screw brass piping with 1/2" IPS angle stops. The angle stop shall be as specified in the Stops Article. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn, model #ST70, Powers LFe480-01. Mixing valve shall comply with ASSE 1070.
- G. Each water supply and fixture drain shall have a chrome plated cast brass escutcheon. Refer to the Escutcheon Article.
- H. One lavatory in each area of the kitchen shall have a drain bibb on the fixture side of the cold water stop valve. Drain bibb shall be a 1/2" male inlet, plain end, chrome plated loose key lockshield, heavy duty chrome plated brass faucet by T&S Brass and Bronze Works B-0703 with 124A/1802-45 lockshield and key or Zurn Aquaspec Z80402 with lockshield and key.

2.14 ART ROOM TROUGH SINK/NON BARRIER-FREE UNIT SET ON CABINETS

- A. Non barrier-free art room trough sink unit shall be overall 74"L by 30"W by 61"H. Sink bowl shall be 302 stainless steel with number 4 stain finish (72"X22"X8") with two base cabinets 29"H X 24"W with closer panel. Unit shall be Sheldon 76810 (or the approved equal by

Hamilton Industries) with Art Service Turret #73290, Art Sink Service Wall #73285 and two #39100 Base Cabinets.

- B. Unit shall be fitted with three (3) combination hot and cold faucet with handles indexed "hot" and "cold". Refer to the Faucet Article.
 - 1. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.
- C. Sink strainer shall be type 304 stainless steel to fit 3½" bowl opening with 1½" tailpiece: Elkay LK-18B or Just J-35SSF.
- D. Unit shall have 2" sediment trap with aluminum body, acid resistant coating on the inside and outside of the body, and stainless steel screens: Wade W-5730-63, J. R. Smith Figure 8730-ARIO or Zurn Z1184.
- E. Stop valves 1/2" angle type as specified in the Stops Article.

2.15 MEDICAL/DENTAL/LIFE CENTER/LIBRARY/SCHOOL BASED HEALTH CLINIC ROOMS SINK - SINGLE BOWL, SELF-RIMMING, BARRIER-FREE

- A. Barrier-free self-rimming single bowl sink shall be 18-gage, type 304 stainless steel sink. The bowl shall be 16" by 22" by 5½" deep with drain opening centered in the rear of bowl. The rim shall be 21" by 25" with two (2) holes for a deck-mounted faucet, one (1) hole for the countertop mounted liquid soap dispenser and mounting channels welded to rim. The underside of bowl shall be coated with a moisture and fireproof sound deadening material. Sink shall be provided with a sufficient number of U-channel or J-channel clips so that the spacing between clamps is no greater than 11". Sink bowl shall be Just SLADA-2125-A-GR or Elkay LRAD-2521.
- B. Sink bowl shall be fitted:
 - 1. Dental/Life Center/Library Rooms Sink: One (1) chrome plated brass, deck mounted, single lever faucet, having a rigid gooseneck spout with 0.5gpm vandal resistant spray outlet. Refer to the Faucet Article
 - 2. Medical/School Based Health Clinic Rooms Sink: Battery powered chrome plated brass, deck mounted, sensor activated soap dispenser and faucet. The faucet shall have a rigid gooseneck spout with 0.5gpm vandal resistant spray outlet. Refer to the Faucet Article.
 - 3. Thermostatic mixing valve having a body with provisions for fastening it to the cabinet, with factory installed stop-check-strainer valve on both inlets and lockshield dome on thermostatic adjustment shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Valve shall be certified for compliance with ASSE 1070.
- C. Provide a sink strainer for each bowl. Strainer shall be type 304 stainless steel to fit 3½" bowl opening with 1½" tailpiece. Provide Elkay LK-18B or Just J-35SSF.
- D. Sink trap shall meet Building code requirements and shall be 2" chrome plated brass. Provide NY City approved 1½" inlet by 2" outlet trap with cleanout plug as manufactured by Kholer Model K-8997, McGuire 1207, EBC TN190 or Zurn Z8718-PC.

- E. Stop valve where shown on Drawing shall be 1/2" angle type as specified in the Stops Article.

2.15A ART ROOM SINK - SINGLE BOWL, SELF-RIMMING, BARRIER-FREE

- A. Barrier-free self-rimming single bowl sink shall be 18-gage, type 304 stainless steel sink. The bowl shall be 16" by 22" by 5½" deep with drain opening centered in the rear of bowl. The rim shall be 21" by 25" with two (2) holes for a deck-mounted faucet, one (1) hole for the countertop mounted liquid soap dispenser and mounting channels welded to rim. The underside of bowl shall be coated with a moisture and fireproof sound deadening material. Sink shall be provided with a sufficient number of U-channel or J-channel clips so that the spacing between clamps is no greater than 11". Sink bowl shall be Just SLADA-2125-A-GR or Elkay LRAD-2521.
- B. Sink bowl shall be fitted:
 - 1. Art Room Sink: One (1) chrome plated brass, deck mounted, single lever faucet, having a rigid gooseneck spout with 0.5gpm vandal resistant spray outlet. Refer to the Faucet Article
 - 2. Thermostatic mixing valve having a body with provisions for fastening it to the cabinet, with factory installed stop-check-strainer valve on both inlets and lock-shield dome on thermostatic adjustment shall be Acorn model #ST70, Powers LFe480-01 or other approved equal. Valve shall be certified for compliance with ASSE 1070.
- C. Provide a sink strainer for each bowl. Strainer shall be type 304 stainless steel to fit 3½" bowl opening with 1½" tailpiece. Provide Elkay LK-18B or Just J-35SSF.
- D. Unit shall have a 2" sediment trap Wade W-5730-63, J.R. Smith Figure 8730-AR10-AA or Zurn ZA1184 having aluminum body, acid resistant coating inside and outside and stainless steel screens
- E. Stop valve where shown on Drawing shall be 1/2" angle type as specified in the Stops Article.

2.16 MEDICAL/DENTAL/LIFE CENTER/SCHOOL BASED HEALTH CLINIC ROOMS SINK – SINGLE BOWL, SELF-RIMMING, NON BARRIER-FREE

- A. Non barrier free, self-rimming sink shall be 18-gage, type 304 stainless steel: 22" X 22" x 10" deep; single bowl with the underside fully coated for sound deadening and moisture reduction. The fixture shall be similar to Elkay Model #DLR 222210 or Just SLX-2222-A-GR-304.
- B. Sink bowl shall be fitted with:
 - 1. Dental/Life Center/Library Rooms Sink: One (1) chrome plated brass, deck mounted, single lever faucet, having a rigid gooseneck spout with 0.5gpm vandal resistant spray outlet. Refer to the Faucet Article.
 - a. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.

2. Medical/School Based Health Clinic Rooms Sink: Battery powered chrome plated brass, deck mounted, sensor activated soap dispenser and faucet. The faucet shall have a rigid gooseneck spout with 0.5gpm vandal resistant spray outlet. Refer to the Faucet Article.
 - a. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn, model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.
- C. The bowl shall be provided with a 3½" drain outlet that shall be centered. The drain opening shall be fitted with type 304 stainless steel sink strainer connected to a 1½" tailpiece similar to Elkay LK-18B or Just J-35SSF.
- D. Sink trap shall meet Building code requirements and shall be 2" chrome plated brass. Provide NY City approved 1½" inlet by 2" outlet trap with cleanout plug as manufactured by Kholer Model K-8997, McGuire 1207, EBC TN190 or Zurn Z8718-PC.

2.16A ART ROOM SINK – SINGLE BOWL, SELF-RIMMING, NON BARRIER-FREE

- A. Non barrier-free, self-rimming sink shall be 18-gage, type 304 stainless steel: 22" X 22" x 10" deep; single bowl with the underside fully coated for sound deadening and moisture reduction. The fixture shall be similar to Elkay Model #DLR 222210 or Just SLX-2222-A-GR-304.
- B. Sink bowl shall be fitted with:
 1. Art Room Sink: One (1) chrome plated brass, deck mounted, single lever faucet, having a rigid gooseneck spout with 0.5gpm vandal resistant spray outlet. Refer to the Faucet Article
 - a. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.
- C. The bowl shall be provided with a 3½" drain outlet that shall be centered. The drain opening shall be fitted with type 304 stainless steel sink strainer connected to a 1½" tailpiece similar to Elkay LK-18B or Just J-35SSF.
- D. Unit shall have a 2" sediment trap Wade W-5730-63, J. R. Smith Figure 8730-ARIO-AA or Zurn ZA1184 having aluminum body, acid resisting coating on the inside and outside of the body and stainless steel screens.

2.17 MUSIC INSTRUMENT STORAGE ROOM SINK

- A. Sink shall be 24"x24" 12" min deep single compartment fixture. It shall be constructed of 14-gage, type 304 stainless steel similar to Elkay Model WNSF8124L or R or Just NSF8124(814).
- B. Sink shall be provided with an 8" high, full length stainless steel backsplash fitted with two holes for accepting a back mount faucet. Drain outlet shall be centered and shall have a 3½" dia.

- C. Sink shall be provided with a drainboard. Supported by special brackets, drainboard shall be 14-gage, type 304 stainless steel and shall be 24" long. The drainboard shall be installed to the left or right of the sink depending on the space allocation.
- D. Faucet- Chrome plated back mount sink faucet with lever handles. See Article on Faucets.
 - 1. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.
- E. Provide a stainless steel sink strainer to fit the 3½" drain outlet. Strainer shall have 3" perforated grid and 1½" chromed plated brass tailpiece. Strainer shall be similar to Elkay LK18B or Just J 35 SSF.
- F. Sink trap shall meet Building code requirements and shall be 2" chrome plated brass. Provide NY City approved 1½" inlet by 2" outlet trap with cleanout plug as manufactured by Kholer Model K-8997, McGuire 1207, EBC TS190 or Zurn Z8718-PC.

2.18 DOUBLE BOWL SINK, SELF-RIMMING

- A. Self-rimming double bowl sink for mounting in a counter top with cabinet furnished under another Section. Bowl shall be 18-gage, type 302 or 304 stainless steel with mounting channels welded to the rim. Rear ledge shall have openings for a deck mounted single lever faucet. Each sink bowl shall be 13½" by 16" by 8" deep with opening for drain outlet centered within the bowl. The rim shall be 33" by 22". The underside of bowl shall be coated with a moisture and fireproof sound deadening material. Sink shall be provided with a sufficient number of U-channel or J-channel clips so that the spacing between clamps is no greater than 11". Sink shall be Elkay LR-3322 or Just DL-2233-A-GR.
- B. Unit shall be fitted with one (1) chrome plated brass deck mounted single lever faucet having at least 8⁷/₁₆" swing spout with 0.5 gpm vandal resistant spray outlet. Refer to the Faucet Article. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.
- C. Provide a sink strainer for each bowl; strainer shall be type 304 stainless steel to fit 3½" bowl opening with 1½" tailpiece Elkay LK-18B or Just J-35SSF.
- D. Each bowl shall drain into the grease interceptor specified in the specification section 220415.
- E. Stop valve where shown on Drawing shall be 1/2" angle type as specified in the Stops Article.

2.19 SINK AND DRINKING FOUNTAIN, BARRIER-FREE, SINGLE BOWL, SELF- RIMMING

- A. Barrier-free self-rimming single bowl sink shall be 18-gage, type 304 stainless steel sink. The bowl shall be 14" by 16" by 4½" deep with drain opening in the rear of bowl. The rim shall be 17" by 25" with one (1) hole for a deck-mounted faucet, one (1) hole for a bubbler and one (1) hole for the countertop mounted liquid soap dispenser. Mounting channels welded to the rim. The underside of bowl shall be coated with a moisture and fireproof sound deadening material. Sink shall be provided with a sufficient number of U-channel or J-channel clips so that the spacing between clamps is no greater than 11". Sink bowl shall be Just CRA-ADA-1725-A-GR-MOD, Haws 4210ADA-MOD or Elkay DRKAD2517-NYBE.

- B. Unit shall be fitted with one (1) chrome plated brass deck mounted single lever faucet. Refer to the Faucet Article. Thermostatic mixing valve having a body with provisions for fastening it to the cabinet, with factory installed combination stop-check-strainer valve on both inlets and lockshield dome on thermostatic adjustment shall be Acorn model #ST70, Powers LFe480-01 or other approved equal. Valve shall be compliant with ASSE 1070.
- C. Sink bowl shall be fitted with one (1) deck mounted bubbler similar to Haws 5054LF, Just JBB-5-VR or Elkay LKVRBH1141A. Deck Mounted Bubbler shall be a polished, chrome-plated lever handle bubbler valve, self-contained with integral stream flow regulation; integral, chrome-plated brass basin shank; 1/2" O.D. slip joint supply, shielded bubbler to provide an anti-squirt, angled, sanitary drinking stream. All bubblers shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act.
- D. Provide a sink strainer for the bowl. Strainer shall be type 304 stainless steel to fit 3½" bowl opening with 1½" tailpiece: Elkay LK-18B or Just J-35SSF.
- E. Sink trap shall meet Building code requirements and shall be 2" chrome plated brass. Provide NY City approved 1½" inlet by 2" outlet trap with cleanout plug as manufactured by Kholer Model K-8997, McGuire 1207, EBC TN190 or Zurn Z8718-PC.
- F. Stop valve: Angle type. Refer to the Stops Article.
- G. The sink & drinking fountain, SDF, shall be supported in a counter. Coordinate with the GC the size of the opening in the counter receiving the fixture.

2.19A BARRIER-FREE SELF-RIMMING SINK, SINGLE BOWL

- A. Barrier-free self-rimming single bowl sink shall be 18-gage, type 304 stainless steel sink. The bowl shall be 14" by 16" by 4½" deep with drain opening in the rear of bowl. The rim shall be 17" by 25" with one (1) hole for a deck-mounted faucet and one (1) hole for a countertop mounted liquid soap dispenser. Mounting channels welded to the rim. The underside of bowl shall be coated with a moisture and fireproof sound deadening material. Sink shall be provided with a sufficient number of U-channel or J-channel clips so that the spacing between clamps is no greater than 11". Sink bowl shall be Just CRA-ADA-1725-A-GR-MOD, Haws 4210ADA-MOD or Elkay DRKAD2517-NYBE.
- B. Unit shall be fitted with one (1) chrome plated brass deck mounted single lever faucet. All faucets shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". . Refer to the Faucet Article. Thermostatic mixing valve having a body with provisions for fastening it to the cabinet, with factory installed combination stop-check-strainer valve on both inlets and lockshield dome on thermostatic adjustment shall be Lawler Series 4205B, Leonard 210F STR or Powers e420-PCFSS00IN. Valve shall be compliant with ASSE 1070 T/P.
- C. Provide a sink strainer for the bowl. Strainer shall be type 304 stainless steel to fit 3½" bowl opening with 1½" tail-piece: Elkay LK-18B or Just J-35SSF.
- D. Sink trap shall meet Building code requirements and shall be 2" chrome plated brass. Provide NY City approved 1½" inlet by 2" outlet trap with cleanout plug as manufactured by Kholer Model K-8997, McGuire 1207, EBC TN190 or Zurn Z8718-PC.
- E. Stop valve: Angle type. Refer to the Stops Article.

- F. The sink shall be supported in a counter. Coordinate with the GC the size of the opening in the counter receiving the fixture.

2.20 SERVICE SINK (24" by 20")

- A. Service sink shall be nominally 24" by 20" by 13" deep and shall be enameled cast iron with at least a 10" high backsplash. Backsplash shall be drilled for hot and cold water faucets. Service sink shall have a stainless steel rim guard, continuously covering both sides and front rim. Service sink shall be Eljer 242-0155, Kohler K-6716 or Zurn Z5898.
- B. Trap shall be 3" cast iron with threaded outlet and chrome plated brass strainer drain. Trap shall be "P" type with front cleanout plug and flange floor stand. Trap to be enameled on the inside. Trap shall be Eljer 804-1060, Kohler K6673 or Zurn Z5900-IP3.
- C. Each sink shall have one (1) hot and one (1) cold water bibb. Bibb shall be 1/2" IPS inlet and shall be of the self-closing type with four arm handles and 0.5GPM vandal resistant spray outlet. Bibbs shall have a 1/2" IPS loose key stop with flange. Bibbs shall be T&S Brass and Bronze Works B-708-J-J with a 0.5GPM vandal resistant spray outlet. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.
- D. Chair carrier: Refer to the Fixture Supports Article.

2.21 SERVICE SINK (22" by 18") WITH COMBINATION FAUCET

- A. Service sink shall be nominally 22" by 18" by 13" deep and shall be enameled cast iron with at least a 10" high plain backsplash. Service sink shall have a stainless steel rim guard, continuously covering both sides and front rim. Service sink shall be Eljer 242-0120, Kohler K-6718 or Zurn Z5888.
- B. Trap shall be 2" cast iron with threaded outlet and chrome plated brass strainer drain. Trap shall be "P" type with front cleanout plug and flange floor stand. Trap to be enameled on the inside. Trap shall be Eljer 804-1040, Kohler K-6772 or Zurn Z5900-IP2.
- C. Combination faucet, four arm handles, lockshield stops on hot and cold inlets. Refer to the Faucet Article. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.
- D. Chair carrier: Refer to the Fixture Supports Article.

2.22 MOP SINK BASIN

- A. Mop sink basin shall be cast terrazzo made from Portland cement and black and white marble chips or pearl gray marble chips, having a compressive strength of at least 3000 PSI after seven (7) days. Size of basin shall be as noted on Drawings with side and back wall being 12" high and front wall having a 6" high drop section. Bottom of basin shall be pitched toward cast in place drain. Shoulders of basin shall be at least 2" thick and front drop shoulder shall have a stainless steel cap cast in place. Drain shall be cast brass or stainless steel with stainless steel strainer. Drain shall be designed for a 3" inside caulk joint. Mop sink basin shall be Fiat TSB 3000 Series, Stern-Williams "HILOW" Series or Acorn TDF-24-SSC.

- B. Provide faucet. Refer to the Faucet Article. Provide a thermostatic mixing valve for tempered water. Mixing valve to be installed at the point of use and shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal. Mixing valve shall comply with ASSE 1070.

2.23 DARK ROOM SINK, BARRIER-FREE

- A. Barrier-free dark room sink shall be made from type 304 stainless steel, having a drawn (not fabricated) bowl (22" by 16" by 4" deep) with horizontal and vertical corners having at least 1½" radii of 18-gage thickness with drain outlet centered in the rear. Bowl shall be welded into a 18-gage top and back splash. Top shall be 23" by 42" with a 4" high by 1" thick backsplash. Top shall have three (3) holes for deck mounted faucet. Apron depth shall be 4½". Provide two (2) stainless steel tubing legs with flange feet at the front of unit. A wall hanger shall be provided to support and secure the rear of unit. Sink shall be ground smooth and finished to an architectural number 6 satin finishes. Sink shall be Metcraft MET 42-3.
- B. Each sink shall be provided with a 16-gage, Type 302 or 304 stainless steel piping enclosure. Piping enclosure shall not encroach on the clearance requirements of ANSI A117.1. Piping enclosure shall be Metcraft MET 42-3-PE.
- C. Faucet: Chrome plated brass, deck mounted, single lever faucet. Refer to the Faucet Article.
- D. Strainer shall be 304 stainless steel to fit 3½" bowl opening with 1½" tailpiece: Elkay LK-18B or Just J-35SSF.
- E. Trap shall be a New York approved P-trap, 1½" inlet by 2" outlet Kohler K-8997 McGuire 1207 , EBC TN190 or Zurn Z8718-PC.
- F. Thermostatic mixing valve having a body with provisions for fastening it to the wall, with factory installed combination stop-check-strainer valve on both inlets and lockshield dome on thermostatic adjustment shall be Acorn model #ST70, Powers LFe480-01 or other approved equal. Valve shall be certified for compliance with ASSE 1070.
- G. Unit shall be supported by a floor mounted chair carrier with a bearing plate. Refer to the Fixture Supports Article.
- H. Provide for each dark room sink or photo-finishing table a silver recovery unit in accordance with DEP rules that regulate discharge from public schools of silver halide into the public sewer system. The device must be capable of removing 90% of photographic wastes from individual sink or film-developing table.
 - 1. The silver recovery unit shall intercept silver halide in the process wastewater by filtration through a cartridge that is filled with steel wool. Provide for each sink or table a 5-gallon recovery unit as manufactured by Town & Country model #SR-5 or other approved equal.

2.24 DRINKING FOUNTAIN, WALL MOUNTED, SINGLE BUBBLER BARRIER-FREE FOR ADULT & CHILDREN USERS

- A. Single bubbler wall mounted drinking fountain shall be designed to meet the clearances required by ANSI A117.1 and ADA. Fountain shall be made from 14-gage, type 304 stainless steel with a satin finish. All seams shall be welded and ground smooth. Interior of unit shall be coated with a fire and moisture resistant sound deadening material. Unit shall have a strainer and a valve regulator assembly. Receptor drain shall be of the 90° angle

type. All waterways shall be constructed of copper. Unit shall be furnished with a bottom plate secured with vandal resistant screws. Furnish a screwdriver for removing bottom plate screws. Bubbler shall be polished chrome plated forged copper-zinc alloy with shielded anti-squirt angle stream with integral receptor shank for vandal-resistant mounting using locknut and washer, Haws Model 5703M or an approved equal. Unit shall be Elkay EHWM214C, Acorn AquaContour A151400-FG, Willoughby Industries DF-1812-FA-ASDB-PS1-PPB-MOD, Halsey Taylor HDFEBP-VR or Oasis F140PM-14GA With Back Panel. All bubblers shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act.

- B. Provide Josam Co., J. R. Smith Figure 824-M31 or Wade 420-M36 floor mounted chair carrier. Floor mounted hanger plate carrier using rectangular high-strength steel uprights welded to base plates.
- C. Drinking fountain trap shall meet New York Building Code requirements, shall be chrome plated cast brass: 1¼" inlet by 1½" outlet by Eljer 804-1125, McGuire 201C, EBC TN140, Kohler K-8995-CP or Zurn Z8716B-PC.
- D. Cold water stop shall be chrome plated cast brass 1/2" IPS angle stop as specified in the Stops Article.

2.24A DRINKING FOUNTAIN, WALL MOUNTED, SINGLE BUBBLER BARRIER-FREE FOR ADULT & CHILDREN USERS

- A. Single bubbler wall mounted drinking fountain shall be designed to meet the clearances required by ANSI A117.1 and ADA. Fountain shall be made from 18-gage, type 304 stainless steel with a satin finish. All seams shall be welded and ground smooth. Interior of unit shall be coated with a fire and moisture resistant sound deadening material. Unit shall have a strainer and a valve regulator assembly. Receptor drain shall be of the 90° angle type. All waterways shall be constructed of copper. Unit shall be furnished with a bottom plate secured with vandal resistant screws. Furnish a screwdriver for removing bottom plate screws. Bubbler shall be polished chrome plated forged copper-zinc alloy with shielded anti-squirt angle stream with integral receptor shank for vandal-resistant mounting using locknut and washer, Haws Model 5703M or an approved equal. Unit shall be Elkay ECDFPW314C. All bubblers shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent model that meets the requirements of the act.
- B. Provide Josam Co., J. R. Smith Figure 824-M31 or Wade 420-M36 floor mounted chair carrier. Floor mounted hanger plate carrier using rectangular high-strength steel uprights welded to base plates.
- C. Drinking fountain trap shall meet New York Building Code requirements, shall be chrome plated cast brass: 1¼" inlet by 1½" outlet by Eljer 804-1125, McGuire 201C, EBC TN140, Kohler K-8995-CP or Zurn Z8716B-PC.
- D. Cold water stop shall be chrome plated cast brass 1/2" IPS angle stop as specified in the Stops Article.

2.24B DRINKING FOUNTAIN, WALL MOUNTED, SINGLE BUBBLER BARRIER-FREE WITH BOTTLE FILLING STATION

- A. Single bubbler wall mounted drinking fountain with bottle filling station shall be designed to meet the clearances required by ANSI A117.1 and ADA. Fountain shall be made from type

300 stainless steel with a satin finish. All seams shall be welded and ground smooth. Unit shall have stainless steel basin with anti-splash ridge and removable drain strainer. All waterways shall be constructed of copper. Unit shall be furnished with a bottom plate secured with vandal resistant screws. Furnish a screwdriver for removing bottom plate screws. Bubbler shall be chrome plated with non-removable anti-squirt feature and integral hood. Automatic stream height regulator shall be located inside unit to prevent tampering. Includes self-closing, light touch front and side pushbar actuation. Unit shall include filter certified to NSF/ANSI for lead reduction with visual monitor to indicate when replacement is necessary.

Bottle Filler shall be sensor-actuated with auto shut-off timer and bottle counter, shall provide 1.1 to 1.5 GPM with laminar flow for minimal splash and shall include anti-microbial protected plastic components. Unit shall be lead-free design which meets Safe Drinking Water Act and is certified to NSF/ANSI 61. Unit shall be Halsey Taylor HTHB-HACD, Elkay LMABFDWSSK or Acorn Aqua All1400B-VRB-BF2S-WF1 modified with copper tubing. All bubblers shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act.

- B. Provide Josam Co., J. R. Smith Figure 824-M31 or Wade 420-M36 floor mounted chair carrier. Floor mounted hanger plate carrier using rectangular high-strength steel uprights welded to base plates.
- C. Drinking fountain trap shall meet New York Building Code requirements, shall be chrome plated cast brass: 1¼" inlet by 1½" outlet by Eljer 804-1125, McGuire 201C, EBC TN140, Kohler K-8995-CP or Zurn Z8716B-PC.
- D. Cold water stop shall be chrome plated cast brass 1/2" IPS angle stop as specified in the Stops Article.

2.24C BOTTLE FILLING STATION

- A. Provide ADA compliant bottle filler that is fully recessed (in-wall mounted) with no bubbler. Unit must also comply with NSF 61.9 and shall be of stainless steel construction, is non-refrigerated and delivers potable water at ambient temperature. Unit activation shall utilize sensor technology for operation with an auto 20-second shut-off timer. Bottle filling station shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". In addition, unit shall come with an anti-microbial protection for growth mitigation of micro-organisms, mildew, discoloration and odors. Basin design shall be such as to eliminate splashing and standing water.
- B. Provide mounting box for framing and complete installation of the bottle filling station.
- C. Trap for bottle filler shall meet New York Building Code requirements, shall be cast brass: 1¼" inlet by 1½" outlet by Eljer 804-1125, McGuire 201C, EBC TN140, Kohler K-8995-CP or Zurn Z8716B-PC.
- D. Cold water stop shall be cast brass 1/2" IPS angle stop as specified in the Stops Article.
- E. Approved manufacturers are: ELKAY, model # LZWSMDK, Halsey Taylor, model # HTHBLR-NF or other approved equal.

2.25 TRI-LEVEL OUTDOOR DRINKING FOUNTAIN, BARRIER FREE FOR ADULT & CHILDREN USERS

- A. Barrier free, tri-level pedestal type, non-filtered and non-refrigerated outdoor drinking fountain shall meet ADA requirements. Spout outlet heights provided shall be wheelchair accessible for adults and children and for a standing adult with special attention paid to the three separate mounting heights for each level/station. Unit shall be fabricated of heavy-duty vandal-resistant stainless steel with a powder-coated finish. Unit shall be secured with anchors to a concrete foundation base support.
- B. Drinking fountain shall be constructed of lead-free parts for compliance with the Lead Reduction in Drinking Water Act of 2011. Water flow to vandal resistant bubblers shall be controlled by front mounted pushbuttons that require less than 5 lbs. force for activating water flow.
- C. Shut-off valves shall be provided for the water supply line and for servicing. In addition, trapping requirements for the drinking fountain shall be as per PC 1002 of the Plumbing Code. A fixture trap is not required for an outdoor drinking fountain that discharges to a drywell.
- D. Drinking fountain shall come equipped with freeze resistant valve system plus vandal access door for servicing.
- E. Approved manufacturers are: Murdock, model# GRQ45-FRU3; Elkay model# LK-4430-FRK-EVG; Halsey Taylor, Model 4430-FRK-EVG.

2.25 BI-LEVEL OUTDOOR DRINKING FOUNTAIN, BARRIER FREE FOR ADULT & CHILDREN USERS (Grades 6-12)

- A. Barrier free, bi-level pedestal type, non-filtered and non-refrigerated outdoor drinking fountain shall meet ADA requirements. Spout outlet heights provided shall be wheelchair accessible for adults and for a standing adult, with special attention paid to the two separate mounting heights for each level/station. Unit shall be fabricated of heavy-duty vandal-resistant stainless steel with a powder-coated finish. Unit shall be secured with anchors to a concrete foundation base support.
- B. Drinking fountain shall be constructed of lead free parts for compliance with the Lead Reduction in Drinking Water Act of 2011. Water flow to vandal resistant bubblers shall be controlled by front mounted pushbuttons that require less than 5 lbs. force for activating water flow.
- C. Shut-off valves shall be provided for the water supply line and for servicing. In addition, trapping requirements for the drinking fountain shall be as per PC 1002 of the Plumbing Code. A fixture trap is not required for an outdoor drinking fountain that discharges to a drywell.
- D. Drinking fountain shall come equipped with freeze resistant valve system plus vandal access door for servicing.
- E. Approved manufacturers are: Murdock, model#GRM45-FRU2; Elkay model# LK-4420-FRK-EVG; Halsey Taylor, Model 4420-FRK-EVG.

2.26 ELECTRIC WATER COOLER BARRIER-FREE

- A. Electric water cooler shall be a double bubbler unit meeting ANSI A117.1 and ADA. Water cooler shall be constructed using 18-gage, type 304 stainless steel with a satin finish. The nonbarrier-free section shall be designed to provide an enclosure for the cooling unit. The cooling unit enclosure shall be provided with sufficient opening for heat dissipation. The

barrier-free station shall be 6" below the nonbarrier-free station. All seams shall be welded and ground smooth. Interior of unit shall be coated with a fire and moisture resistant sound deadening material. Unit shall have two (2) strainer, valve and regulator assembly. Each valve shall feed water to its respective bubbler. Each receptor shall have a grid drain with a 1¼" close elbow. The waste from each receptor shall be combined in order to have a single waste connection. All waterways shall be constructed using copper tubing and have brazed lead-free joints. Barrier-free station shall be provided with a bottom plate secured with vandal resistant screws. Front louver of cooler enclosure shall be removable and shall be secured to the enclosure with vandal resistant screws. Bubblers shall be vandal resistant, chrome plated brass, shielded anti-squirt angle stream with integral receptor shank for vandal resistant mounting using locknut and washer. All bubblers shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act.

- B. Inlet water shall be filtered by a strainer with a removable stainless steel screen. Cooler shall be capable of delivering minimum of 7 gallons per hour at 50°F, based on 80°F inlet water temperature and 90°F room temperature. Cooler coils shall be made from pure copper. Refrigerant system shall use a refrigerant which contains no CFC's or HCFC's, an internally spring mounted hermetically sealed compressor with overload protection, fan cooled condenser, and all motors permanently lubricated. Compressor motor shall be single phase (115V), 60 hertz and of the manufacturer recommended horsepower. Cooler unit shall be provided with a 3-wire cord set for plugging into a receptacle. Cooling unit shall come with a 5 years limited warranty.
- C. Cooler shall be supported by a floor mounted carrier with acid resistant coated, hanger support plate and valve plate securely fastened to carrier upright: J. R. Smith Figure 849-M31 or Wade 620-M36-AM27.
- D. Cooler trap shall meet New York Building Code requirements, shall be chrome plated cast brass and be 1¼" inlet by 1½" outlet by Eljer 804-1125, McGuire 201C, EBC TN140, Kohler K-8995-CP or Zurn Z8716B-PC.
- E. Cold water stop shall be chrome plated cast brass 1/2" IPS angle stop as specified in the Stops Article.
- F. Cooler shall be Elkay ERFVVR28C, Acorn Aqua A152408B-VR, Halsey Taylor HRFSEVR-Q-VR or Oasis M8SCPM-VR.

2.27 DRINKING FOUNTAIN AND CUSPIDOR, BARRIER-FREE

- A. Barrier-free drinking fountain and cuspidor shall be constructed of stainless steel, type 304, with satin finish. Cuspidor and drinking fountain shall be wall mounted, fully-recessed type fitting into two (2) mounting boxes, one for each unit. Units shall be constructed to meet ADA requirements for drinking fountain clearances and operating force required for controlling the bubbler or spreader. All bubblers shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act.
- B. Drinking fountain and cuspidor shall be 18 gage, type 304, stainless steel construction surfaces having no welded seams brushed or ground to a smooth finish. All waterways shall be lead-free and activation of a push-bar control shall supply both rinsing water to the spray head of the cuspidor and drinking water to the bubbler. Receptor drain shall be of the 90° angle type. Drinking fountain shall have in-line regulator for maintaining constant stream height of water flow. Other accessories shall include but not be limited to: mounting box,

manufacturer supplied supports, strainer, push-bar control etc. Fully recessed drinking fountain shall be designed with contour-formed basin to eliminate splashing and standing water. Unit shall have rounded corners and edges, and shall be secured with vandal resistant screws. Provide a screwdriver for removing the bottom plate screws. Bubbler shall be chrome plated finish with shielded anti-squirt angle stream and shall be similar to Elkay model #97446C or AOSIS model #030774-017.

- C. Barrier-free cuspidor shall be fully recessed, shall include contour-formed basin to eliminate splashing and standing water, shall have rounded corners and edges, and shall be secured with vandal resistant screws. The vertical portion shall be pitched to insure continuous washing of the vertical surface by the water from the spreader. Vertical section shall have an opening for the spreader centered near the top. Receptor shall have an opening for angle drain at the center rear.
- D. Combination drinking fountain and cuspidor shall be similar to Elkay Model #EDFBC212C, OASIS Model #FLF231PM, Acorn Model #A181400B-CUSP-HP, Halsey Taylor Model #8880 w/10245MOD or Haws Model #2403.
- E. Mounting boxes for each, the cuspidor and the drinking fountain shall be a min of 18-gage, type 304, stainless steel. Mounting boxes shall be by the units' manufacturer. Provisions shall be made to accept oval head spanner machine screws for securing top of recessed section of combination drinking fountain and cuspidor to mounting boxes. Boxes shall have "Z" channels for securing bottom plate-access panel for cuspidor and drinking fountain. Mounting box shall come with a 18-gage bottom plate-access panel. Mounting box shall be similar to Elkay model #MB24 or an approved equal.
- F. Cuspidor shall be fitted with a Haws 15387954 chrome plated brass spreader. Spreader shall be designed and constructed so as to completely flush the vertical section.
- G. Each drinking fountain and each cuspidor shall have a trap that meet New York Building Code requirements, shall be chrome plated cast brass and be 1¼" inlet by 1½" outlet: Eljer 804-1125, McGuire 201C, EBC TN140, Kohler K-8995-CP or Zurn Z8716B-PC. Provide access to traps.
- H. Cold water stop shall be chrome plated cast brass 1/2" IPS angle stop as specified in the Stops Article.

2.28 BATH TUB

- A. Bath tub shall be enameled cast iron with slip resistant bottom finish 60" by 30" by 14" high. Bath tub shall be Eljer 018-5000-00 for left hand waste outlet or 018-5025-00 for right hand waste outlet or Kohler K-715 left hand waste outlet or K-716 right hand waste outlet. "R" suffix added to unit identification on Drawing shall indicate right hand waste and "L" suffix shall indicate left hand waste outlet.
- B. Bath tub shall have a 1½" pop-up drain Model by Kohler K-7160-TF, Zurn Z8773-PC, Eljer 512-1000, or Moen 90400. Pop-up drain shall be all brass construction and faceplate, trip lever, and pop-up shall be chrome plated.
- C. Bath tub shall have a New York approved 1½" inlet by 2" outlet trap: Kohler K-8997, McGuire 1207, EBC TS190 or Zurn Z8718-PC.
- D. Shower and tub valve with integral stops, shower head, shower arm, and tub diverter spout shall be polish chrome finish and shall be able to deliver no more than 1.8GPM flow rate. Valve, shower, and spout shall be Zurn Aquaspec Z7302-SS-MT-S8 or Moen 8389EP15 with

1.8gpm vandal resistant shower head. Provide thermostatic mixing valve to ensure that safe tempered water is delivered to the bather. Mixing valve shall be similar to Acorn model #SV16, Powers LFe420 or other approved equal. Valve shall comply with ASSE 1016.

2.29 SHOWER, INDIVIDUAL, NON-BARRIER-FREE

- A. Non-barrier-free individual shower shall be a corner mounted or surface mounted shower module consisting of shower head, thermostatic shower valve, metering valve, and built-in liquid soap system. Module housing and piping shrouds shall be made from 16-gage stainless steel, type 304 with a satin finish. All internal water piping shall be copper tubing. Shower head shall be solid brass triple chrome plated with adjustment of spray from coarse to fine mist spray. Shower head shall have low flow control which maintains 1.8GPM at pressures from 10-100 PSI and up-down ball joint. Shower valve shall regulate shower water to maintain a constant water temperature and shall shut shower water off in the event of loss of either water supply. A metering valve shall be installed between the shower valve and the shower head. Metering valve shall be adjustable to deliver water between 5 to 60 seconds. Soap dispenser valve shall be designed for liquid soap from a built-in liquid soap system. Soap valve shall be constructed of solid brass with stainless steel spring and metering system, and Buna-N O-ring seals. Entire exterior of soap valve shall be chrome plated. Soap dispenser valve shall be the equal of Acorn 3050.
- B. Built-In Liquid Soap System: Integral soap tank, factory pre-piped, and installed within the Shower. The liquid soap shall be piped to the dispenser. Shower single station model shall be provided with a one quart tank. Soap dispenser shall be supplied for each soap station. The exact size is affected by shower supply configuration.
- C. Shower modules shall be Acorn "Apex" Model #M0428-E503 APEX SHOWER MODIFIED w/F1.6-Z-BS-MV; Willoughby Industries CWKS/TSV-PM1-1.8GPMUDBJ-GX-PS-LSD-MOD or Bradley model #: WS-1K-TMV-S15-LBJ-AST-RSD-VS for corner mounted. For surface mounted shower, use Acorn "Apex" Model #M0458-E503 APEX SHOWER MODIFIED w/F1.6-Z-BS-MV; Willoughby Industries CWSMS-TSV-PM1-1.8GPMUDBJ-GX-PS-LSD-MOD or Bradley model#:WS-1WCA-TMV-S15-LBJ-AST-SSD-DV-VS.
- D. Provide thermostatic mixing valve to ensure that safe tempered water is delivered to the bather. Mixing valve shall be similar to Acorn model #SV16, Powers LFe420 or other approved equal. Valve shall comply with ASSE 1016.

2.30 SHOWER, INDIVIDUAL, BARRIER-FREE (SURFACE-MOUNTED)

- A. Barrier-free individual shower shall be a surface mounted shower module consisting of shower head, hand-held shower, thermostatic shower valve, diverter, surface mounted soap dish. Module housing and piping shroud shall be made from 16-gage, type 304 stainless steel with a satin finish. All internal water piping shall be copper tubing. Shower head shall be solid brass triple chrome plated with adjustable spray from coarse to fine mist. Shower head shall have low flow control which maintains 1.8 GPM at pressures from 10 to 100 PSI and up-down ball joint. Hand-held shower shall have a 5' spiral stainless steel hose, vacuum breaker, white plastic hand shower and bracket. Shower valve shall regulate shower water to maintain a constant water temperature, shall have a limit stop to prevent discharge of shower water to no higher than 105°F, and shall shut shower water off in the event of loss of either water supply. A lever handle diverter shall be used to deliver water to hand-held shower or shower head. A barrier-free fold-up padded seat shall be Acorn 1103-31 (Left Hand) and 1103-32 (Right Hand) or Willoughby Industries FSS-R (Right Hand Seat), FSS-L (Left Hand Seat).

- B. Shower module shall be Acorn "Apex" Model Number #M0458-E559-3 APEX SHOWER MODIFIED w/F1.6-Z-QD; Willoughby Industries CWBFS-250-TSV-PM1-1.8GPMUDBJ-GX-PS-FSS-L/R or Bradley model#: WS-1WCA-HN-TMV-S15-LBJ-SSD-DV-VS.
- C. Provide thermostatic mixing valve to ensure that safe tempered water is delivered to the bather. Mixing valve shall be similar to Acorn model #SV16, Powers LFe420 or other approved equal. Valve shall comply with ASSE 1016.
 - 1. For Multi [Gang] showers, provide mixing valve installed at the point of use that complies with ASSE 1069. Mixing valve shall be similar to Acorn model #ST7069, Powers model #LM495-2-A; LM 496-2-A or other approved equal.

2.30A SHOWER, INDIVIDUAL, BARRIER-FREE (FLUSH-MOUNTED)

- A. Barrier-free individual shower shall be a flush or recessed mounted shower module consisting of shower head, hand-held shower, thermostatic shower valve, diverter, recessed soap dish. Module housing and piping shroud shall be made from 16-gage, type 304 stainless steel with a satin finish. All internal water piping shall be copper tubing. Shower head shall be solid brass triple chrome plated with adjustable spray from course to fine mist. Shower head shall have flow control which maintains 1.8GPM at pressures from 10 to 100 PSI and up-down ball joint. Hand-held shower shall have a 5' spiral stainless steel hose, vacuum breaker, white plastic hand shower and bracket. Shower valve shall regulate shower water to maintain a constant water temperature, shall have a limit stop to prevent discharge of shower water to no higher than 105°F, and shall shut shower water off in the event of loss of either water supply. A lever handle diverter shall be used to deliver water to hand-held shower or shower head. A barrier-free fold-up padded seat shall be Acorn 1103-31 (Left Hand) and 1103-32 (Right Hand), or Willoughby Industries FSS-R (Right Hand Seat), FSS-L (Left Hand Seat).
- B. Shower module shall be Acorn "Apex" Model #M0418-E559-3 APEX SHOWER MODIFIED w/F1.6-Z-QD-D; or Willoughby Industries CWBFS-200-TSV-PM1-1.8GPMUDBJ-GX-FSS-L/R or Bradley model #: HN200-TMV-S15-LBJ—HS-SSD-VS.
- C. Provide thermostatic mixing valve to ensure that safe tempered water is delivered to the bather. Mixing valve shall be similar to Acorn model #SV16, Powers LFe420 or other approved equal. Valve shall comply with ASSE 1016.
 - 1. For Multi [Gang] showers, provide mixing valve installed at the point of use that complies with ASSE 1069. Mixing valve shall be similar to Acorn model #ST7069, Powers, model #LM495-2-A; LM 496-2-A or other approved equal.

2.30B HAND HELD SHOWER, BARRIER-FREE

- A. Barrier-free hand held shower shall be a flush or recessed mounted shower module consisting of hand-held shower, thermostatic shower valve and soap dish. Module housing and piping shroud shall be made from 16-gage, type 304 stainless steel with a satin finish. All internal water piping shall be copper tubing. Hand-held shower shall have a 5' spiral stainless steel hose, vacuum breaker, hand held shower head and bracket. Shower valve shall regulate shower water to maintain a constant water temperature, shall have a limit stop to prevent discharge of shower water to no higher than 105°F, and shall shut shower water off in the event of loss of either water supply. Provide without seat and grab bar.
- B. Shower module shall be Acorn "Apex" Model #M0418-E502 APEX SHOWER MODIFIED w/F1.6-QD-D, Bradley model# : HN200-TMV-HS-SSD-V modified with no showerhead and

diverter valve or Willoughby Industries CWBFS-200-TSV-GX modified with no seat, grab bar, showerhead or diverter valve.

- C. Provide thermostatic mixing valve to ensure that safe tempered water is delivered to the bather. Mixing valve shall be similar to Acorn model #SV16, Powers LFe420 or other approved equal. Valve shall comply with ASSE 1016.
 - 1. For Multi [Gang] showers, provide mixing valve installed at the point of use that complies with ASSE 1069. Mixing valve shall be similar to Acorn model #ST7069, Powers, model #LM495-2-A; LM 496-2-A or other approved equal.

2.31 CABINET SHOWER, NON-BARRIER-FREE

- A. Cabinet shower shall consist of a terrazzo base, shower module, panels, corner brackets, head rails, curtain rod, curtain rings, curtain, etc. Panels, corner brackets, head rails, terrazzo base, etc. shall be provided.
- B. Non-barrier-free individual shower shall be a surface-mounted shower module consisting of showerhead, thermostatic shower valve, metering valve, and soap dispenser valve with a built-in liquid soap system. Module housing and piping shrouds shall be made from 16 gage, stainless steel, type 304 with a satin finish. All internal water piping shall be copper tubing. Shower head shall be solid brass triple chrome plated with adjustment of spray from coarse to fine mist spray. Shower head shall have low flow control which maintains 1.8 GPM at pressures from 10-100 PSI and up-down ball joint. Shower valve shall regulate shower water to maintain a constant water temperature and shall shut shower water off in the event of loss of either water supply. A metering valve shall be installed between the shower valve and the shower head. Metering valve shall be adjustable to deliver water between 5 to 60 seconds.
- C. Shower modules shall be Acorn "Apex" Model Number #M0458-E503 APEX SHOWER MODIFIED w/F1.6-Z-BS-MV; Willoughby Industries CWSMS-TSV-PM1-1.8GPMUDBJ-GX-PS-LSD-MOD or Bradley model#: WS-1WCA-TMV-S15-LBJ-AST-SSD-DV-VS .
- D. Provide thermostatic mixing valve to ensure that safe tempered water is delivered to the bather. Mixing valve shall be similar to Acorn model #SV16, Powers LFe420 or other approved equal. Valve shall comply with ASSE 1016.
 - 1. For Multi [Gang] showers, provide mixing valve installed at the point of use that complies with ASSE 1069. Mixing valve shall be similar to Acorn model #ST7069, Powers, model #LM495-2-A; LM 496-2-A or other approved equal.

2.32 EMERGENCY HAND HELD EYEWASH TRIM

- A. Emergency Hand held eyewash shall be provided as specified below.
- B. Hand held eyewash should be connected to tempered water through cabinet-mounted thermostatic mixing valve systems. The mixing valve assembly shall consist of a mixing valve with stop check strainers and temperature limit control in a surface mounted stainless steel cabinet with view port for thermometer indoor and lockset for cabinet. Mixing valve assembly shall be connected to 105°F inlet hot water and cold water and shall be set for 85°F water temperature with a maximum temperature of 90°F. Mixing valve shall not discharge any flow upon failure of cold water supply in order to avoid scalding. Mixing valve shall have an internal cold water bypass capable of delivering at least 3 GPM at 30 PSI upon failure of hot water supply. Valve assembly shall be Leonard Model TA-300-STSTL-EXP-VIEW with cylinder lock, Bradley model#: EFX8(S19-2000)-P-SS-W, Lawler Model 911E/F

Unit No. 84909 with stainless steel surface mounted cabinet and a lockset or Powers ES150AEN00 with view port for thermometer.

2.32A EMERGENCY SHOWER WASH TRIM

- A. Emergency shower-eye and face wash shall be provided as specified below.
- B. Provide factory assembled and tested emergency fixture thermostatic mixing valves and stainless steel cabinet as specified within. The mixing valve assembly shall consist of a mixing valve with stop check strainers and temperature limit control installed in a recessed stainless steel cabinet with view port for thermometer indoor and locks set for cabinet. Mixing valve assembly shall be connected to 105°F inlet hot water and cold water and shall be set for 85°F water temperature with a maximum temperature of 90°F. Mixing valve shall not discharge any flow upon failure of cold water supply in order to avoid scalding. Mixing valve shall have an internal cold water bypass capable of delivering at least 20 GPM at 30 PSI upon failure of hot water supply. Valve assembly shall be Leonard Model TM 800-STSTL-REC-VIEW with cylinder lock, Bradley model #: EFX50(S19-2250)-P-SS-W, Lawler 911 Unit No. 84701 with stainless steel recess cabinet and a lockset or Powers ETV400AEN00W with view port for thermometer. For retrofit of existing installations, a surface mounted cabinet will be used. The valve assembly shall be Leonard Model TM 800-STSTL-EXP-CP-VIEW with cylinder lock, Bradley model # : EFX50(S19-2250)-P-RS-W, Lawler 911 Unit No. 84701 with stainless steel surface mounted cabinet and lockset or Powers ETV400AEQ00W with view port for thermometer, stainless steel surface mounted cabinet.
- C. Provide a New York approved 1½" inlet by 2" outlet trap: Kohler K-8997, McGuire 1207, EBC TN190 or Zurn Z8718-PC.
- D. Stop valve shall be 1/2" IPS angle stop as specified in the Stops Article.

2.33 WASHFOUNTAIN, BARRIER-FREE: Not Used.

2.34 WASHFOUNTAIN, BARRIER-FREE, 3-STATION

- A. Three-station barrier-free wash fountain shall be designed to serve 3-persons. Bowl, head, and pedestal sides shall be pre-cast terrazzo, constructed at 85-percent marble chips and 15-percent binder. All Terrazzo pieces shall be reinforced with reinforcing steel. Terrazzo shall be ground, polished, and sealed with a clear durable coating. Front access panel of pedestal shall be stainless steel and shall provide access to temperature mixing valve, solenoid valves, transformer, control panel, and trap. Wash fountain shall meet the clearance requirements of ANSI A117.1, and ADA for lavatories. Bowl shall be 36" wide by 26" deep with a 4½" rim height and 6" high backsplash. All water piping within the fountain shall be copper tubing. The head shall have three (3) spray nozzles; each nozzle shall deliver between 0.4 GPM to 0.5 GPM and shall require no more than 20 pounds per square inch to operate satisfactory. All spray nozzles shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act. Hand Control Pushbutton Operation: Operation of pushbutton shall activate an air metering valve with field-adjustable timing. Each push button shall activate one valve that, in turn, activates one station. Push button shall require less than five pounds of pressure. Terrazzo shall consist of tan and brown marble chips and white binder.

- B. Each unit shall have two (2) liquid soap actuation buttons. Metering liquid soap dispensing system: soap tank to be housed within the fixture base having the actuation button horizontally mounted on the backsplash.
- C. Each unit shall be provided with thermostatic mixing valve with factory installed combination stop-check-strainer valve on each inlet. Thermostatic mixing valve shall be factory set to maintain a temperature of 105°F. Thermostatic mixing valve shall be Acorn model #ST70, Powers LFe480-01 or other approved equal. Valve shall be certified for compliance with ASSE 1070.
- D. Wash fountains meeting the above requirements are Acorn Model Number M3603-2-H-PDM-MXTP-H&C-OCT01 or Bradley model#: SN2003-A-AST4-NSD-BS
- E. A New York approved P-trap having 1½" inlet by 1½" outlet shall be provided on fountains having a suffix "PT" of chrome plated cast brass. Trap shall be Eljer 804-1130, Kohler K-9010, McGuire 202C, EBC TN150 or Zurn Z8717B-PC. A 1½" sediment trap shall be provided on fountains having a suffix "ST" and shall be 1½" J. R. Smith Figure 8730-ARIO or JOSAM 61030-30 with optional aluminum body and acid resisting coating on the inside and outside of the body.
- F. Provide floor mounted chair carrier similar to J. R. Smith Figure 860-M31, Wade 623-M36-AM27 or Zurn Z1225.

2.35 WASHFOUNTAIN, BARRIER-FREE, 4-STATION

- A. Four-station barrier-free wash fountain shall be designed to serve 4 persons. Bowl, head, and pedestal sides shall be pre-cast terrazzo, constructed of 85-percent marble chips and 15-percent binder. All terrazzo pieces shall be reinforced with reinforcing steel. Terrazzo shall be ground, polished, and sealed with a clear durable coating. Front access panel of pedestal shall be stainless steel and shall provide access to temperature mixing valve, solenoid valves, transformer, control panel, and trap. Wash fountain shall meet the modified clearances, of the Peoples Housing Inc. publication on "Accessibility Design Guidelines for Public Facilities Serving Children," for lavatories. Bowl shall be 46" wide by 26" deep with a 4½" rim height and 6" high backsplash. All water piping within the fountain shall be copper tubing. The head shall have four (4) spray nozzles; each nozzle shall deliver between 0.4 GPM to 0.5 GPM and shall require no more than 20 pounds per square inch to operate satisfactory. All spray nozzles shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act. Hand Control Pushbutton Operation: Operation of pushbutton shall activate an air-metering valve with field-adjustable timing. Each push button shall activate one valve that, in turn, activates one station. Push button shall require less than five pounds of pressure. Terrazzo shall consist of tan and brown marble chips and white binder.
- B. Each unit shall have two (2) liquid soap actuation buttons. Metering liquid soap dispensing system: soap tank to be housed within the fixture base having the actuation button horizontally mounted on the backsplash.
- C. Each unit shall be provided with thermostatic mixing valve with factory installed combination stop-check-strainer valve on each inlet. Thermostatic mixing valve shall be Acorn model #ST70, Powers LFe480-01 or other approved equal. Valve shall be certified for compliance with ASSE 1070.
- D. Wash fountains meeting the above requirements are Acorn Model Number M3604-2-H-JH-PDM-MXTP-H&C-OCT01 or Bradley model #: SN2004-A-AST4-NSD-BS

- E. A New York State approved P-trap having 1½" inlet by 1½" outlet shall be provided on fountains having a suffix "PT" of chrome plated cast brass. Trap shall be Eljer 804-1130, Kohler K-9010, McGuire 202C, EBC TN150 or Zurn Z8717B-PC. A 1½" sediment trap shall be provided on fountains having a suffix "ST" and shall be 1½" J. R. Smith Figure 8730-ARIO or JOSAM 61030-30 with optional aluminum body and acid resisting coating on the inside and outside of the body.
- F. Provide floor mounted chair carrier similar to J. R. Smith Figure 860-M31, Wade 623-M36-AM27 or Zurn Z1225.

2.36 WASHFOUNTAIN, BARRIER-FREE, 4-STATION, GRADES 6-12

- A. Four-station barrier-free wash fountain shall be designed to serve 4 persons. Bowl, head, and pedestal sides shall be pre-cast terrazzo, constructed of 85-percent marble chips and 15-percent binder. All terrazzo pieces shall be reinforced with reinforcing steel. Terrazzo shall be ground, polished, and sealed with a clear durable coating. Front access panel of pedestal shall be stainless steel and shall provide access to temperature mixing valve, solenoid valves, transformer, control panel, and trap. Wash fountain shall meet the clearance requirements of ANSI A117.1, for lavatories. Bowl shall be 46" wide by 26" deep with a 4½" rim height and 6" high backsplash. All water piping within the fountain shall be copper tubing. The head shall have four (4) spray nozzles; each nozzle shall deliver between 0.4 GPM to 0.5 GPM and shall require no more than 20 pounds per square inch to operate satisfactory. All spray nozzles shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act. Hand Control Pushbutton Operation: Operation of pushbutton shall activate an air metering valve with field-adjustable timing. Each push button shall activate one valve that, in turn, activates one station. Push button shall require less than five pounds of pressure. Terrazzo shall consist of tan and brown marble chips and white binder.
- B. Each unit shall have two (2) liquid soap actuation buttons. Metering liquid soap dispensing system: soap tank to be housed within the fixture base having the actuation button horizontally mounted on the backsplash.
- C. Each unit shall be provided with thermostatic mixing valve with factory installed combination stop-check-strainer valve on each inlet. Thermostatic mixing valve shall be Acorn model #ST70, Powers LFe480-01 or other approved equal. Valve shall be certified for compliance with ASSE 1070.
- D. Wash fountains meeting the above requirements are Acorn Model Number M3604-2-H-PDM-MXTP-H&C-OCT01 or Bradley model #: SN2004-A-AST4-NSD-BS
- E. A New York state approved P-trap having 1½" inlet by 1½" outlet shall be provided on fountains having a suffix "PT" of chrome plated cast brass. Trap shall be Eljer 804-1130, Kohler K-9010, or McGuire 202C, EBC TN150 or Zurn Z8717B-PC. A 1½" sediment trap shall be provided on fountains having a suffix "ST" and shall be 1½" J. R. Smith Figure 8730-ARIO or JOSAM 61030-30 with optional aluminum body and acid resisting coating on the inside and outside of the body.
- F. Provide floor mounted chair carrier similar to J. R. Smith Figure 860-M31 or Wade 623-M36-AM27 or Zurn Z1225.

2.37 WASHFOUNTAIN, SEMI-CIRCULAR, WALL-MOUNTED, BARRIER-FREE, 3-STATION

- A. 3-users station with sectional spray head. The wash fountain shall be semi-circular and wall-supported by a concealed fixture carrier. Bowl and trap enclosure shall be constructed of 14-gage, type 304 stainless steel with #4 polish or finish. Bowl shall be 36" or 38" semi-circular with manual control, 5" or 4½" deep and 4½" high backsplash. Removable and pre-assembled fixture frames and cover panels measuring 25" or 29½" high shall provide access to water lines, solenoid valve, local thermostatic mixing valve and trap. A sediment trap, if needed, as in the case of a wash fountain located in an Art room, shall be recessed in the construction wall. Coordinate the location of the wall access panel.
- B. All water piping within the wash fountain shall be copper tubing. The head shall have three (3) spray nozzles, each capable of delivering 0.5 gpm. All spray nozzles shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act. Hand Control Pushbutton Operation: Operation of pushbutton shall activate an air metering valve with field-adjustable timing. Each push button shall activate one valve that, in turn, activates one station. Push button shall require less than five pounds of pressure.
- C. The fixture shall come complete with thermostatic mixing valve with factory installed combination stop-check-strainer on each inlet. Thermostatic mixing valve shall be factory set to maintain a temperature of 105°F. Mixing valve shall comply with ASSE 1070.
- D. Wash fountain meeting the above requirements shall be BRADLEY, model #: SN2023-A-AST4-NSD-BS or ACORN model M3423ADA-1-H-MXTP-H&C-SPX16GA-CR.
- E. New York State approved P-trap having 1½" inlet by 1½" outlet shall be provided and shall be similar to Eljer 804-1130, Kohler K-9010 or McGuire 202C, EBC TN150 or Zurn Z8717B-PC. When necessary, as in the case of a wash fountain placed in an Art room, a 1½" sediment trap shall be provided and it shall be similar to J R. Smith 8730-ARIO or JOSAM 61030-30, having acid resisting coating inside and outside.
- F. Provide floor mounted fixture carrier similar to J R. Smith 823-M31 or Zurn Z1225.
- G. Fixture setting shall be the mounting height for barrier free sinks as described on the Drawings for each age group.

2.38 WASHFOUNTAIN, SEMI-CIRCULAR, WALL-MOUNTED, BARRIER FREE, SINGLE (1) USER

- A. Single user wash fountain shall be semi-circular, wall-supported by a concealed fixture carrier. Bowl and trap enclosure shall be constructed of 14-gage, type 304 stainless steel with #4 polish finish. Bowl shall be 36" or less semi-circular with manual control, 5" or 4½" deep and 4½" high backsplash. Removable and pre-assembled fixture frames and cover panels measuring 25" or 29½" high shall provide access to water lines, solenoid valve, local thermostatic mixing valve and trap.
- B. All water piping within the wash fountain shall be copper tubing. The head shall have one (1) spray nozzle, capable of delivering 0.5 gpm. The spray nozzle shall meet the requirements of the federally mandated "Reduction of Lead in Drinking Water Act". Regardless of model numbers indicated herein, provide equivalent models that meet the requirements of the act. Hand Control Pushbutton Operation: Operation of pushbutton shall activate an air metering valve with field-adjustable timing. Each push button shall activate one valve that, in turn, activates one station. Push button shall require less than five pounds of pressure.

- C. The fixture shall come complete with thermostatic mixing valve with factory installed combination stop-check-strainer valve on each inlet. Thermostatic mixing valve shall be factory set to maintain a water temperature of 105°F. Mixing valve shall comply with ASSE 1070.
- D. Wash fountain meeting the above requirements shall be BRADLEY, model #: SN2024-A-AST4-NSD-BS or ACORN model M3401-1-H-MXTP-H&C-SPX16GA-CR
- E. New York State approved P-trap, chrome plated, cast brass having 1½" inlet by 1½" outlet shall be provided and shall be similar to Eljer 804-1130, Kholer K-9010 or McGuire 202C, EBC TN150 or Zurn Z8717B-PC.
- F. Provide floor mounted fixture carrier similar to J R. Smith 823-M31 or Zurn Z1225.
- G. Fixture setting shall be the mounting height for barrier free sinks as described on the Drawings for each group.

2.39 ART-SCIENCE, SINK TRIM

- A. Art-science sink shall have the following trim: combination faucet, gas cock, stop valves, drain outlet, and sediment trap.
- B. Combination faucet, gooseneck spout with 0.5gpm vandal resistant spray outlet: Refer to the Faucet Article.
- C. Gas cock shall have an indexed lever handle (indexed "GAS") and panel flange. Gas cock and flange shall be chrome plated brass. Gas cock shall be screwed tight into flange and sealed with "Locktite" cement. Each gas cock shall come with a panel supply nipple and locknut, consisting of a nipple, nut, and washer. Gas cock shall be T&S Brass and Bronze Works BL2012-1 with BL-5500-7 panel supply nipple and locknut, Water Saver VR-2900-158 with L-137 mounting shank, or Chicago 986-909AGV.
- D. Stop valve on hot and cold water supplies shall be angle type with lockshield. Stop valve 1/2" IPS angle type as specified in the Stops Article. Stop valve for gas shall be an approved gas ball valve. Provide thermostatic mixing valve that complies with ASSE 1070. Mixing valve shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal.
- E. Sink drain strainer shall be Elkay LK-337, or Just J-15SSF-316 which shall be type 316 stainless steel having a 3" diameter top, perforated grid, fitting a 2" diameter opening, and 1½" diameter tailpiece.
- F. Sediment trap shall be Wade W-5730-63, J. R. Smith Figure 8730-ARIO-AA or Zurn ZA1184 with 2" inlet and outlet. Body and cover shall be cast iron with acid resistant coating on the inside and stainless steel screens.

2.40 SCIENCE INSTRUCTOR DEMONSTRATION TABLE SINK TRIM (FOR SCHOOLS WITH CENTRAL ACID NEUTRALIZING SYSTEM)

- A. Demonstration table, which includes cabinets, top, sink, hand held eyewash, water, gas, air and vacuum trim, shall be furnished as required by the school. The installations of sink, hand held eyewash, water, gas, air and vacuum trim are part of this section. Provide waste trim. Sink outlet shall be of polypropylene plastic material similar to part #PP-21MT made by Town & Country, Orion or Zurn Chemical Waste. Likewise, drum type trap shall be of polypropylene as manufactured by ORION, Model #DT1, and having a 2" waste outlet. Each table shall be provided with a sink overflow (beehive strainer) which shall fit into sink outlet.

Sink overflow shall be polypropylene, part #PP-42M as manufactured by Town & Country, Orion or Zurn Chemical Waste. Sink strainer assembly shall be PP-40APM, polypropylene part made by Town & Country, Orion or Zurn Chemical Waste.

- B. Hand held eyewash should be connected to tempered water through cabinet-mounted thermostatic mixing valve systems. The mixing valve assembly shall consist of a mixing valve with stop check strainers and temperature limit control in a surface mounted stainless steel cabinet with view port for thermometer indoor and lockset for cabinet. Mixing valve assembly shall be connected to 105°F inlet hot water and cold water and shall be set for 85°F water temperature with a maximum temperature of 90°F. Mixing valve shall not discharge any flow upon failure of cold water supply in order to avoid scalding. Mixing valve shall have an internal cold water bypass capable of delivering at least 3 GPM at 30 PSI upon failure of hot water supply. Valve assembly shall be Leonard Model TA-300-STSTL-EXP-VIEW with cylinder lock, Bradley model #: EFX8(S19-2000)-P-SS-W, Lawler Model 911E/F Unit No. 84909 with stainless steel surface mounted cabinet and a lockset or Powers ES150AEN00 with view port for thermometer.
- C. Hot and cold water stops shall be cast brass 1/2" IPS straight loose key stops Kohler, K-7679, Chicago 45-LK, EBC VSH15BK or T&S Brass and Bronze Works B416 CP. Stop valve for gas, air and vacuum shall be an approved ball valve.

2.41 SCIENCE INSTRUCTOR DEMONSTRATION TABLE SINK: Not Used.

2.42 STUDENT STATION SINK TRIM

- A. Student sink, which includes cabinets, top, sink, water and gas trim, shall be furnished. The installation of sink, water and gas trim is part of this section. Provide waste trim. Sink outlet shall be of polypropylene plastic material, similar to part #PP-21MT made by Town & Country, Orion or Zurn Chemical Waste. Each sink shall be provided with a sink overflow (beehive strainer) which shall fit into sink outlet. Sink overflow shall be polypropylene, part #PP-42M as manufactured by Town & Country, Orion or Zurn Chemical Waste. Trap shall be drum type made of polypropylene, similar to ORION, model #DT1 with 2" waste outlet. Threaded tailpiece and fittings for connecting sink outlet to trap and trap to acid waste shall be polypropylene.
- B. Hot and cold water stop shall be cast brass 1/2" IPS straight loose key stop Kohler K-7679, Chicago 45-LK, EBC VSH15BK or T&S Brass and Bronze Works B416 CP. Stop valve for gas shall be an approved gas ball valve. Provide thermostatic mixing valve that complies with ASSE 1070. Mixing valve shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal.

2.43 ACID ROOM SINK TRIM

- A. Sink, which includes top, sink, hand held eyewash and water trim, shall be furnished. The installation of sink, hand held eyewash and water trim is part of this section. Provide waste trim. Sink outlet shall be of polypropylene plastic material similar to part #PP-21MT made by Town & Country or Orion. Each sink shall be provided with a sink overflow (beehive strainer) which shall fit into sink outlet. Sink overflow shall be polypropylene, part #PP-42M as manufactured by Town & Country, Orion or Zurn Chemical Waste. Trap shall be drum type, made of polypropylene as manufactured by ORION, model #DT1 and having a 2" waste outlet. Threaded tailpiece and fittings for connecting sink outlet to trap and trap to acid waste shall be polypropylene.

- B. Hand held eyewash shall be connected to tempered water through cabinet-mounted thermostatic mixing valve system. The mixing valve assembly shall consist of a mixing valve with stop check strainers and temperature limit control in a surface mounted stainless steel cabinet with view port for thermometer indoor and lockset for cabinet. Mixing valve assembly shall be connected to 105°F inlet hot water and cold water and shall be set for 850°F water temperature with a maximum temperature of 900°F. Mixing valve shall not discharge any flow upon failure of cold water supply in order to avoid scalding. Mixing valve shall have an internal cold water bypass capable of delivering at least 3 GPM at 30 PSI upon failure of hot water supply. Valve assembly shall be Leonard Model TA-300-STSTL-EXP-VIEW with cylinder lock, Bradley model #: EFX8(S19-2000)-P-SS-W, Lawler Model 911E/F Unit No. 84909 with stainless steel surface mounted cabinet and a lockset or Powers ES150AEN00 with view port for thermometer.
- C. Hot and cold water stops shall be cast brass 1/2" IPS straight loose key stops Kohler K-7679, Chicago 45-LK, EBC VSH15BK or T&S Brass and Bronze Works B416 CP.

2.44 SCIENCE PHYSICS/ CHEMISTRY LABORATORY ROOM SERVICE ISLAND SINK TRIM

- A. Service Island, which includes cabinets, top, sinks, water, gas, air and vacuum trim, is furnished under this section. The installation of sinks, water, gas, air and vacuum trim are part of this section. Provide waste trim for all sinks. Each sink shall be provided with a sink outlet, sink overflow, and drum trap, including mechanical couplings. Sink outlet shall be of polypropylene plastic material similar to part #PP-21MT made by Town & Country or Orion. Sink overflow (Beehive strainer) which shall fit into sink outlet shall be polypropylene, part #PP-42M as manufactured by Town & Country or Orion. Trap shall be drum type, made of polypropylene, similar to ORION, model #DT1, and having 2" waste outlet. Threaded tailpiece and fittings for connecting sink outlet to trap and trap to acid waste shall be polypropylene.
- B. Hot and cold water stop shall be cast brass 1/2" IPS straight loose key stop Kohler K-7679, Chicago 45-LK, EBC VSH15BK or T&S Brass and Bronze Works B416 CP. Stop valve for gas, air and vacuum shall be an approved ball valve.

2.45 STUDENT SCIENCE TRIFACIAL LAB CENTER SINK TRIM

- A. Trifacial Lab Center, which includes cabinets, top, sink, water and gas trim, is furnished under this section. The installation of sink, water and gas trim is part of this section. Provide waste trim. Sink outlet shall be of polypropylene plastic material similar part #PP-21MT made by Town & Country or Orion. Sink overflow (beehive strainer) which shall fit into sink outlet shall be polypropylene, part #PP-42M as manufactured by Town & Country or Orion. Trap shall be drum type, made of polypropylene, similar to ORION, Model #DT1 with 2" waste outlet. Threaded pipe and fittings for connecting sink outlet to trap and trap to acid waste shall be polypropylene.
- B. Hot and cold water stop shall be cast brass 1/2" IPS straight loose key stop Kohler K-7679, Chicago 45-LK, EBC VSH15BK or T&S Brass and Bronze Works B416 CP. Stop valve for gas shall be an approved gas ball valve. Provide thermostatic mixing valve that complies with ASSE 1070. Mixing valve shall be similar to Acorn model #ST70, Powers LFe480-01 or other approved equal.

2.46 LAB SERVICE SINK TRIM

- A. Table, which includes sink cabinet, top, sink and water trim, is furnished under this section. The installations of sink and water trim are part of this section. Provide waste trim. Sink outlet shall be of polypropylene plastic material similar to part #PP-21MT made by Town &

Country or Orion. Sink overflow (beehive strainer) which shall fit into sink outlet shall be polypropylene, part #PP-42M as manufactured by Town & Country or Orion. Trap shall be drum type made of polypropylene, model #DT1 by ORION. Threaded pipe and fittings for connecting sink outlet to trap and trap to acid waste shall be polypropylene.

- B. Hot and cold water stop shall be cast brass 1/2" IPS straight loose key stop Kohler K-7679, Chicago 45-LK, EBC VSH15BK or T&S Brass and Bronze Works B416 CP. Provide thermostatic mixing valve that complies with ASSE 1070. Mixing valve shall be similar to Acorn model #ST70, Powers LFe480 or other approved equal.

2.47 LAB FIXED FUME HOOD SINK TRIM

- A. Fume hood, which includes cup sink, remote control fixtures and accessories, is provided under this section. The water, gas, compressed air, vacuum and waste trim are a part of this Section.
- B. Sink outlet and a drum trap shall be of polypropylene plastic material similar to model #DT1 made by ORION and having a 2" waste outlet. Threaded tailpiece and fittings for connecting sink outlet to trap and trap to acid waste shall be polypropylene. Provide thermostatic mixing valve that complies with ASSE 1070. Mixing valve shall be similar to Acorn model #ST70, Powers LFe480 or other approved equal.

2.48 LAB RINSE STATION SINK TRIM

- A. Table, which includes sink cabinet, top, sink and water trim, is furnished under this Section. The installations of sink and water trim are part of this section. Provide waste trim. Sink outlet shall be of polypropylene plastic material similar to part #PP-21MT by Town & Country or Orion. Sink overflow (beehive strainer) which shall fit into sink outlet shall be polypropylene, part #PP-42M as manufactured by Town & Country or Orion.
- B. Unit shall have a 2" drum trap made of polypropylene, model #DT1 by ORION.
- C. Hot and cold water stops shall be cast brass 1/2" IPS straight loose key stops Kohler K-7679, EBC VSH15BK or Chicago 45-L. Provide thermostatic mixing valve that complies with ASSE 1070. Mixing valve shall be similar to Acorn model #ST70, Powers LFe480 or other approved equal.
- D. Stop valve for gas shall be an approved gas ball valve.

2.49 LATEX CEMENT GROUT

- A. All cement grout used on plumbing fixture installations shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ-4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.
- B. Latex Portland cement grout compound shall be a compound of Portland cement grout and latex additive complying with ANSI A118.6.

2.50 SEALANT, SILICONE

- A. All sealants used on plumbing fixture installations shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ-

4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.

- B. Silicone sealant shall be one-part mildew resistant silicone sealant by Dow Corning 786 or General Electric Sanitary 1700, color white.

2.51 SCIENCE RESOURCE ROOM SINK TRIM

- A. Sink, which includes base cabinet and countertop, is provided under another section. Provide the faucet, water and waste trims.
- B. Sink shall be fitted with an ADA compliant single lever faucet similar to ELKAY model #LK 4324 FBC, having a 10" swing spout with restricted spray outlet.
- C. Thermostatic mixing valve having a body with provisions for fastening it to the wall, and with factory installed combination stop-check-strainer valve on both inlets and lock shield dome on thermostatic adjustment, shall be Acorn, model #ST70, Powers LFe480-01 or other approved equal. Valve shall be certified for compliance with ASSE 1070.
- D. Stop valve for hot and cold water supplies shall be Kohler K-7675, EBC VSH15BK or Chicago 442-LK.
- E. Unit shall have a 2" sediment trap having aluminum body, acid resistant coating inside and outside and stainless steel bucket. The solid interceptor: J.R Smith model 8714 or Wade W-5740-63 shall be flushed with the floor, or suspended using J.R. Smith 8730 or Wade W-5742-63-68.
- E. Provide a sink strainer for each bowl; strainer shall be type 304 stainless steel to fit 3½" bowl opening with 1½" tailpiece Elkay LK-18B or Just J-35SSF.

PART 3 - EXECUTION

3.01 CHAIR CARRIERS

- A. Chair carrier feet and anchor foot, where provided, shall be securely fastened to the structural slab, utilizing all support openings provided, with anchor bolts and shields.
- B. Chair carrier for water closets shall be connected to soil and vent piping as shown on Drawing.

3.02 SEALING

- A. Seal between fixture and wall and/or fixture and floor with silicone sealant.

3.03 FIXTURE HEIGHT

- A. Fixtures shall be installed at height as shown on Drawings.

3.04 FIXTURE INSTALLATION

- A. Fixtures shall be installed in accordance with manufacturer's installation instructions. Fixtures shall have their rim and backsplash set level.
- B. Unless otherwise specified or indicated on the Drawings, wall hung water closets shall be siphon jet type.

3.05 WALL HUNG WATER CLOSET

- A. Install water closet chair carrier.
- B. Install the exposed flushometer valve and wall plate as per manufacturer's instructions for accessible water closets with handle mounted on wide side of compartment. Connect flush valve to cold water supply and water closet.
- C. Seal between water closet and wall.

3.06 BARRIER-FREE WATER CLOSET

- A. Barrier-Free water closet shall be installed in accordance with Par. 3.05 for wall-hung water closet. Install the fixture chair carrier specified in Article 2.01 Par. B.
- B. Barrier-Free water closet shall be set at the specified height.

3.07 WALL HUNG URINALS (BARRIER-FREE AND NON-BARRIER-FREE)

- A. Install urinal support as per manufacturer's instructions.
- B. Install flushometer valve for accessible urinals with handle mounted on wide side of compartment. Connect flush valve to cold water supply and urinal.
- C. Seal between urinal and wall.

3.08 BARRIER-FREE URINAL

- A. Barrier-free urinal shall be installed in accordance with Par. 3.08 for wall hung except that the height shall be 17" from finished floor to rim.

3.09 LAVATORIES, CHINA

- A. Install new chair carrier.
- B. Install faucet or faucets and drain including tailpiece on lavatory.
- C. Install stop valves on hot and cold water supplies and trap on fixture waste.
- D. Install lavatory on chair carrier and connect tailpiece to trap. Also connect hot and cold water stops to faucet or faucets. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.

3.10 LAVATORIES, CHINA BARRIER-FREE

- A. Install new chair carrier
- B. Install faucet on lavatory.
- C. Install trap on fixture waste and connect to tailpiece.

- D. Connect hot and cold water supplies to faucet. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.
- 3.11 UNDER THE COUNTER LAVATORY, MULTIPLE STATION, REGULAR USE & BARRIER-FREE
- A. Install lavatories under the counter.
 - B. Provide each lavatory with a faucet.
 - C. Install traps on fixture waste and connect to tailpieces.
 - D. Fasten thermostatic mixing valve to the wall and connect hot and cold water supplies to stop valves and to faucets. Connect outlet of the thermostatic valve to the hot water connection of the faucet.
- 3.12 SINK AND DRINKING FOUNTAIN, BARRIER-FREE
- A. Mount sink and drinking fountain in the counter.
 - B. Install drains, faucet, bubbler, soap dispenser, regulating valve and bubbler.
 - C. Install trap on fixture waste.
- 3.13 ART ROOM SINKS
- A. Install carrier.
 - B. Install sink, faucet or faucets, and soap dispenser on unit.
 - C. Install sediment trap on fixture waste. Connect trap to sink drain or drains.
 - D. Install stops valve on cold water supply on single bowl sink. Single bowl sinks, make cold water connections to single lever faucet and metering faucet (grades 6 and above). Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.
 - E. Install soap dispenser.
- 3.14 SELF-RIMMING SINKS
- A. Mount faucet and drains on sink.
 - B. Install sinks in counter top, seal sink to counter top, and secure top to cabinet.
 - C. Install traps on fixture waste and connect trap to drains. Delete the trap if the sink is drained into a grease interceptor.
 - D. Install hot and cold water stop valve on respective supplies and connect faucet to hot and cold water stops. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.

3.15 SINGLE BOWL SINK, SELF-RIMMING, BARRIER-FREE

- A. Mount faucet and drain on sink.
- B. Install sinks in counter top, seal sink to counter top, and secure top to cabinet.
- C. Install traps on fixture waste and connect trap to drain.
- D. Fasten thermostatic mixing valves to the wall and connect to hot and cold water supplies. Connect outlet of thermostatic mixing valve to the hot water connection of the faucet.
- E. Install stop valves on cold water supply and connect to faucet.
- F. Install piping enclosure.

3.16 BATH TUB

- A. Mount waste outlet fittings on bathtub.
- B. Install trap on fixture waste and set tub into trap and support tub from wall.
- C. Connect water supplies to shower and tub valve. Connect shower head and bath spout to valve. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies.

3.17 DRINKING FOUNTAINS-WALL MOUNTED

- A. Install chair carrier
- B. Install drain with tailpiece on receptor.
- C. Secure fixture to chair carrier
- D. Install trap on fixture waste and connect to tailpiece.
- E. Install stop valve on cold water supply and connect to unit metering valve.
- F. Install bottom plate on unit.

3.18 DRINKING FOUNTAIN-PEDESTAL TYPE

- A. Mount drinking fountains on concrete pad and secure to pad with nuts and washers.
- B. Extend waste, install air gaps, and connect to tailpiece.
- C. Extend cold water supplies to stop. Connect cold water from stop to metering valve.

3.19 ELECTRIC WATER COOLER

- A. Install chair carrier.
- B. Install stop valve on cold water supply.
- C. Install traps on fixture waste.

- D. Secure fixture to chair carrier.
- E. Connect cold water from stop to cooler.
- F. Connect drain to trap.

3.20 DRINKING FOUNTAIN AND CUSPIDOR

- A. Turn over mounting boxes to masonry contractor.
- B. Mount angle drain on drinking fountain. Mount spreader and angle drain on cuspidor.
- C. Install traps on respective fixture wastes and connect to drains.
- D. Install stop on cold water supply. Extend cold water to metering valve. Provide a cold water connection between metering valve and spreader and manifold on the cuspidor.
- E. Install cuspidor in its mounting box and secure to box.
- F. Provide access to traps and valves.

3.21 BUILT-IN SHOWER

- A. Install trap on fixture waste. Connect shower drain to trap. Adjust strainer to required elevation. Install flashing and clamp membrane and flashing to drain.
- B. Install shower module to wall and connect to hot and cold water supplies. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies.
- C. Barrier-free shower, install grab bar and fold-up seat.
- D. Install shower curtain and curtain rod.

3.22 CABINET SHOWER

- A. Install trap on fixture waste and extend waste piping through floor.
- B. Install and level shower base on a bed of latex Portland cement grout.
- C. Caulk waste into shower base drain.
- D. Install polymer panels, corner brackets, handrails, and shower curtain rod.
- E. Install shower module to panels and connect to hot and cold water supplies. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies.
- F. Install shower curtain on rod.

3.23 EMERGENCY SHOWER-EYE AND FACE WASH TRIM

- A. Secure base of unit to floor using bolts and shields.
- B. Install split ring hanger between vertical pipe to showerhead and wall and split ring hanger between horizontal pipe to showerhead and ceiling.

- C. Install cabinet-mounted thermostatic mixing valve as per manufacturer's recommendations. Connect to hot and cold water supplies with stop valve.

3.24 HAND HELD EYEWASH

- A. Install cabinet-mounted thermostatic mixing valve as per manufacturer's recommendations. Provide with hot and cold water connections with stop valves.

3.25 ART-SCIENCE SINK TRIM

- A. Install sediment trap on fixture waste.
- B. Install combination faucet and gas cock on backsplash and drain on sink.
- C. Install stops on hot and cold water supplies.
- D. Install top with sink on cabinet and secure to cabinet.
- E. Connect sink drain to sediment trap.
- F. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.
- G. Connect gas cock to gas supply with gas ball valve.

3.26 WASH SINK

- A. Install "P" trap or sediment trap on fixture waste.
- B. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.
- C. Install metering faucets on backsplash.
- D. Install drain on sink.
- E. Install chair carrier.
- F. Mount wash sink on chair carrier and install pedestals under sink.
- G. Connect sink drain to trap.

3.27 SERVICE SINKS

- A. Install chair carrier.
- B. Install trap on fixture waste.
- C. Mount drain on sink.
- D. Install sink on chair carrier and connect drain to trap.
- E. Install hot and cold bibs on respective hot and cold water supplies on SS-1 and SS-2.
- F. Install combination faucet on backsplash and connect to hot and cold water supplies SS-3.

3.28 MOP SINK BASIN

- A. Install trap and fixture waste and extend waste thru floor.
- B. Set and level mop sink on a bed of latex Portland cement grout.
- C. Caulk waste into mop sink drain.
- D. Connect hot and cold water supplies to combination faucet.

3.29 DARK ROOM SINK, BARRIER FREE

- A. Install chair carrier.
- B. Install trap on fixture waste.
- C. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.
- D. Install faucet to sink backsplash and install drain in sink.
- E. Mount sink on chair carrier.
- F. Connect drain to trap.
- G. Install silver recovery unit in the sanitary waste piping, upstream of the acid neutralizing tank.

3.30 WASHFOUNTAIN

- A. Install chair carrier.
- C. Install pedestal mounting frame or plates on chair carrier.
- . Install trap on fixture waste
- D. Fasten thermostatic mixing valve to the wall and connect to hot and cold water supplies.
- E. Install pedestal side panels.
- F. Install bowl on pedestal and secure to chair carrier.
- G. Connect transformer to power wiring and secure to box.
- H. NOT USED
- I. Mount head to backsplash of bowl, connect spray heads to respective solenoids, and connect wiring from manual sensors to control panel.
- J. Install access panel on pedestal.

3.31 SCIENCE TRIM

- A. Mount sink on table and sink outlet on sink.

- B. Mount faucets on counter top.
- C. Mount gas, air and vacuum cocks on cabinet as shown on Drawings.
- D. Install the silicone iron trap on acid waste piping. For bottom connection, use the S Swivel Type and for side connection, use the P Swivel Type. Install split ring hanger between cabinet and trap.
- E. If Drawings indicate acid dilution basin, install diluting basin in cabinet and connect to fixture waste. Fill basin with marble chips.
- F. Install top on cabinet and secure to cabinet.
- G. Connect sink outlet to silicone iron/ or HDPE trap as shown on Drawings.
- H. Install stop valve on hot and/or cold water supplies and connect to respective faucets. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.
- I. Install ball valves on gas, air and vacuum supply and connect to turrets.
- J. Install mixing valves and solenoid valves on fixtures where required by this specification.

3.32 SCIENCE RESOURCE ROOM SINK TRIM

- A. Install faucet & drain on sink.
- B. Install sinks on countertop, seal sink to countertop and secure top to cabinet.
- C. Install sediment trap on fixture waste and connect trap to drain.
- D. Fasten thermostatic mixing valve to the wall and connect the hot & cold water supplies. Connect outlet of the thermostatic valve to the hot water connection of the faucet.
- E. Install stop valve on cold water supply and connect to faucet.

3.33 SPECIAL INSTALLATION PROCEDURE

- A. When included in the Disinfection and Water Quality Testing Plan (DWQTP) and such plan is approved by the Authority's Environmental and Industrial Hygiene Division, special installation procedures in accordance with the Article entitled "Procedure For Direct Replacement of Potable Water System Fixtures, Fittings and Appliances" in Section 220414 may be used in lieu of system disinfection. These procedures apply when potable water system components (e.g. faucets, bubblers, mixing valves, etc.) are installed or replaced as part of work that does not involve the replacement or installation of associated potable water piping.

3.34 COMMISSIONING OF PLUMBING FIXTURES

- A. Plumbing Contractor shall comply with the Commissioning Requirements of Contract for the thermostatic mixing valves.
- B. All domestic water piping testing and sterilization, drainage and vent piping testing, and plumbing fixtures installation shall be completed prior to commencement of the commissioning process.

3.35 TRI-LEVEL OUTDOOR DRINKING FOUNTAIN

- A. Mount the pedestal type outdoor drinking fountain on a concrete base foundation that is at least 14" thick. Secure the unit with anchors that are firmly attached to the mounting concrete base.
- B. Provide freeze resistant valve and connect the water supply line.
- C. If required, install a fixture trap in the waste piping as mandated by the Plumbing Code.

3.36 BI-LEVEL OUTDOOR DRINKING FOUNTAIN

- A. Mount the pedestal type outdoor drinking fountain on a concrete base foundation that is at least 14" thick. Secure the unit with anchors that are firmly attached to the mounting concrete base.
- B. Provide freeze resistant valve and connect the water supply line.
- C. If required, install a fixture trap in the waste piping as mandated by the Plumbing Code.

END OF SECTION

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SECTION 230000

GENERAL PROVISIONS FOR HEATING, VENTILATING, AND AIR CONDITIONING WORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide labor, materials, tools, machinery, equipment, and services necessary to complete the HVAC Work under this Contract. All systems and equipment shall be complete in every aspect and all items of material, equipment and labor shall be provided for a fully operational system and ready for use. Coordinate the work with the work of the other trades in order to resolve all conflicts without impeding the job progress.
- B. Examine the Architectural, Structural, Plumbing and Electrical Drawings and other Divisions, and Sections of the Specifications in order to determine the extent of the Work required to be completed under this Division. Failure to examine all the Contract Documents for this Project will not relieve the Contractor of his/her responsibilities to perform the Work required for a complete fully operational and satisfactory installation.
- C. The Work includes but is not limited to the following systems, equipment and services.
- D. Start-up services shall be included in the bid.
- E. All systems, equipment and services specified herein shall be provided complete and ready for use.
- F. General Contractor and Mechanical Contractor are to facilitate the coordination of the Direct Digital Control (DDC) features provided by all trades, vendors, and equipment manufacturers and the Temperature Control Contractor (TCC) for a complete seamlessly integrated system of operation. Before submitting any equipment shop drawings for approval, the HVAC Contractor, Automatic Temperature Controls Contractor and the Equipment Vendor and Manufacturer shall coordinate the controls required for the system.
- G. HVAC Contractor shall comply with the Commissioning Requirements of all related specification sections for all new HVAC equipment and temperature controls system. Testing of HVAC systems and initial rough balancing of systems shall be completed prior to commencement of the required Functional Performance Testing as defined in specification sections. The written tests results and balancing reports and signoffs by Inspectors and/or project managers and/or Architect/Engineer of Record (AEOR) for the tests results shall be submitted to the Commissioning Authority.
- H. During construction, the HVAC Contractor shall comply with the indoor air quality (IAQ) requirements as required by the State and City requirements.

1.2 SUBMITTALS

- A. General: Unless indicated otherwise in the specific technical section, if a particular product specified in the technical section is being provided, manufacturer's qualifications and samples (except as listed below), are not required to be submitted. Manufacturer's product data, installation instructions, samples requiring color or texture approval, samples showing thickness and type of material, shop drawings, and calculations are to be submitted.

Schedules, startup manuals, operation and maintenance manuals, and shop drawings are always required to be submitted.

- B. The following Submittals are required for all Sections of Division 23-Heating, Ventilating, and Air Conditioning. Specific "Supplemental Submittals" or additional information to that listed below that are required to be submitted are defined in each individual technical section.
 - 1. Product Data: Submit manufacturer's product data for equipment including catalog sheets or cuts, specifications, capacity, performance charts, test data, materials, dimensions, weights, furnished specialties and accessories; and installation instructions. Submit start-up instructions where applicable.
 - 2. Shop Drawings: Submit manufacturer's shop drawings detailing equipment assemblies and indicating dimensions, weight, loadings, required clearances, method of field assembly, components, location, and size of each field connection.
- C. Where indicated in the Supplemental Submittals of the technical sections, the following submittals are defined as follows:
 - 1. Maintenance Data: Submit maintenance data and parts list. Include this data and the product data in the maintenance manual in accordance with the requirements of Division 1.
 - 2. Test Report: Submit factory certified test results prior to shipping.
 - 3. Certificates: Submit written affidavit stating that the Contractor has started up and demonstrated (in the presence of the owner's Representative and required Department of Education personnel, including Maintenance Representative) that the equipment is operating properly as designed.
- D. Piping, Ductwork, and Wiring Diagrams: Submit a complete wiring diagram, ductwork layout, and piping layout of all equipment. All parts of the installation shall be indicated exactly as installed and shall be properly identified. HVAC Identification, all piping, all valves shall be clearly shown and labeled.
- E. Coordination Drawings: Provide complete coordination Drawings showing interface of all mechanical trades with the Architecture of the Building. All copies are to be signed. The Contractor is to keep a copy of the signed coordination drawing on the site.
- F. Miscellaneous Submittals
 - 1. HVAC Painting Schedule: Provide a complete schedule of all items to be painted.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: If a particular product specified in the technical section is not being provided, provide manufacturer's qualifications.

Provide manufacturer's qualifications that indicate that the firms are regularly engaged in manufacture of equipment, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

- B. Codes and Standards: All equipment furnished and installed shall meet or exceed the referenced Standards and Codes in all respects – installation, performance, etc.

References and industry standards listed herein and in other HVAC Sections are applicable to the Work specified in the Section. Unless more restrictive criteria is explicitly called-out for in other HVAC Specifications or mandated by the NY Construction Codes, the requirements described in the referenced standards below shall be deemed applicable to the Work. This includes language in the documents in the form of a recommendation or suggestion, which shall be deemed as mandatory.

1. NFPA
2. New York Construction Codes (including Building Code BC, Mechanical Code MC and Fuel Gas Code FGC)
3. ASHRAE
4. IECC
5. SMACNA
6. ELECTRICAL IEEE STANDARDS
7. STATE DEC REGULATIONS
8. ASME
9. ANSI
10. ABMA
11. UL
12. Local City Requirements
13. NEBB
14. ARI
15. AMCA
16. ADC
17. NEMA
18. NEC
19. ASTM
20. FCI

All appliances regulated by the New York Construction Codes shall be listed and labeled. Testing of material shall be in accordance with MC301.5. Whenever the Construction Codes or the Rules of the Department of Buildings requires that material be listed or labeled and material proposed to be used is not so listed or labeled, the use of such material shall be subject to prior approval by the Owners and School and such material shall be used only to the extent set forth in such approval.

1.4 ACCESSIBILITY

- A. Install access for servicing and maintenance and install equipment such that they can be accessed for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.
- B. Extend all grease fittings to an accessible location.
- C. For access doors to valves, dampers and all other HVAC type of items, accessories and equipment, concealed in walls, furrings and hung ceilings; Refer to architectural specifications. Door shall permit full access to the equipment.

- D. Per Sections MC 306.1 and FGC 306.1, appliances shall be accessible for inspection, service, repair and replacement without disabling the function of a fire-resistance-rated assembly or removing permanent construction, other appliances, venting systems or any other piping or ducts not connected to the appliance being inspected, serviced, repaired or replaced. A level working space at least 30" deep and 30" wide shall be provided in front of the control side to service an appliance. Clearance shall also be provided as required by the Electrical Code.
- E. Per Section MC 1004.3, clearances shall be maintained around boilers, generators, heaters, tanks and related equipment and appliances so as to permit inspection, servicing, repair, replacement and visibility of all gauges. When boilers are installed or replaced, clearance shall be provided to allow access for maintenance and repair per the boiler's listing and manufacturer's installation instructions. Passageways for inspection around all sides of boilers shall have an unobstructed width of not less than 18" unless the boiler's listing or department approval or manufacturer's installation instructions state otherwise.

1.5 ROUGHING-IN

- A. Verify final locations for roughing work with field measurements and with the requirements of the actual equipment being connected. Coordinate with Construction drawings.

1.6 MECHANICAL INSTALLATIONS

- A. Coordinate HVAC equipment and materials installation with other building components.
- B. Verify all dimensions by field measurements.
- C. Arrange for chases, slots, and openings in other building components to allow for HVAC installations.
- D. Coordinate the installation of required supporting devices and size of sleeves to be set in poured concrete and other structural components as they are constructed.
- E. Sequence, coordinate, and integrate installations of HVAC materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning and entrance prior to the close of the building.
- F. Coordinate the cutting and patching of building components to accommodate the installation of HVAC equipment and materials.
- G. Where mounting heights are not detailed or dimensioned, install HVAC services and overhead equipment to provide the maximum headroom possible.
- H. Install HVAC equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting and minimum of interference with other installations. The equipment, dampers, controls, etc. that are not accessible for commissioning or future maintenance, the system must be revised to create access, unless the contractor can demonstrate without removing equipment, piping, conduit, etc. that the item is accessible.
- I. Coordinate the installation of HVAC materials and equipment above ceilings with suspension system, light fixtures, and all other installations and accessories.

- J. Provide all rigging, disassembly and reassembly of equipment including the furnishing and installation of dunnage and all other required and necessary accessories. Supports for ductwork/pipes/etc. supported by the roof deck shall utilize manufactured supports or pipes that will permit effective roofing. Use of irregular shaped units such as strut channels is not permitted.
- K. For purposes of clearness and legibility, HVAC Drawings are essentially diagrammatic and size and location of equipment are drawn to scale wherever possible. The Drawings indicate size, connection points and routes of ductwork and pipe. It is not intended, however, that all offsets, rises and drops are shown. Provide ductwork and piping as required to fit structure, avoid obstruction, and retain clearances, headroom openings and passageways. Piping/ductwork installed over any means of egress and access passageways must be 8'-0" clear inclusive of insulation.
 - 1. Location of items passing through roofing/ waterproofing membranes shall be in strict accordance with recommendations of the NRCA (National Roof Contractors Association) Manual to allow for proper flashing of items, including, but not limited to, the following:
 - a. No penetrations shall be made within 12" of any walls, parapets, roof curbs, expansion joints or any other projections (clear distance between penetration or equipment curb face shall be 12" minimum).
 - b. Provide manufactured curb chases where multiple small pipes enter at one location.
 - c. Piping/ductwork/equipment supports that penetrate membranes shall be round or square/rectangular to allow proper flashing. Use of "kindorf" type supports is not permitted to penetrate membranes.
 - 2. Piping/ductwork at equipment must be done in a manner such that access around equipment is not impeded, such as at equipment platforms.

1.7 PRE-INSTALLATION CONFERENCE

- A. Before the HVAC Work is scheduled to commence, a conference will be called by the Owner and School's Representatives at the site for the purpose of reviewing the Drawings and the Specifications and discussing requirements for the Work. The conference shall include, at a minimum, the Contractor, the HVAC Contractor, the Architect, the Inspector and the Owner and School's Representatives. Contractors/installers of other trades may also be required to attend to discuss coordination with their work. The Contractor shall send a conference agenda to all attendees prior to the scheduled date of the conference.
- B. The HVAC Contractor shall attend pre-installation conferences of other trades for coordination of the work.

1.8 COORDINATION DRAWINGS

- A. Provide coordination drawings. Coordination drawings shall be completed in accordance with the Contractor's Work Schedule so as not to delay the progress of the Project, for example, the installation of any floor slab in which the placing of mechanical equipment (sleeves, inserts, conduits, and all other accessory items) is involved. The HVAC contractor shall cooperate with the P&D, Fire Protection Systems, and Electrical contractors in the

development of the coordination drawings. Drawings shall be submitted prior to installation of the MEP systems.

- B. The coordination drawings shall be prepared in the following manner: The HVAC contractor shall prepare a set of CAD drawings (or BIM if agreed by the Contractor and all other trade contractors) drawn to the scale of 3/8"=1'-0", indicating thereon mechanical equipment, ductwork, water piping, refrigerant piping, plus structural and architectural background details. Ensure that access for commissioning and replacement/maintenance of equipment, valves, gauges, dampers, controls, etc. is accounted for in the preparation of the drawings. The HVAC contractor shall deliver the CAD files to the Plumbing and Drainage contractor, who will draw the P&D work to scale on the coordination drawings. Then the HVAC Subcontractor shall deliver the coordination set to Fire Protection Systems contractor, who shall superimpose the Fire Protection work on the drawings. Then the HVAC Subcontractor shall deliver the CAD files to Electrical contractor, who shall superimpose the Electrical work on the drawings. The elevation, location, support points, seismic restraint locations, load imposed on the structure at support and at the seismic restraint location, anchor points, and size of all lines shall be indicated. All beam and slab/deck penetrations shall be indicated and sizes shall be coordinated with the structural steel and metal deck shop drawings. HVAC Contractor shall provide shop drawings for all roof deck openings required for installation of HVAC systems. Roof and floor slab/deck opening shop drawings shall be dimensioned from the centerline of the nearest structural column and coordinated with the approved HVAC equipment, sheet metal shop drawings, structural steel and metal deck framing plan, etc. The specified order in which the Subcontractors impose their work on the coordination drawings is not intended to grant priority to any one trade contractor in the allocation of space. At the completion of this phase, hold a coordination meeting to eliminate any interference among the trades that the drawings indicate and to avoid any conflicts in installing the Work. Should any problems of coordination require architectural or structural change of design, this change shall be submitted to the Authority for approval.
- C. If any trade installs any Work before coordinating with the Work of other trades, that Trade shall make necessary changes to correct the condition without extra cost to the Authority. This requirement for "Coordination Drawings" shall not be construed as authorization to make any unauthorized changes to the Drawings. All Design Drawings space allocations shall be maintained, such as ceiling height, chase walls, equipment room size, and all other items and accessories, unless prior written authorization is received from the Authority to change them.
- D. After the CAD files have been coordinated, and all necessary changes have been made, each Subcontractor shall sign a print of the coordination drawings, attesting to the agreement that the work is clear.
- E. Furnish (in writing, with copies to the AEOR and the Authority) any information necessary to permit the Work to be installed satisfactorily and with the least possible interference or delay.

1.9 CUTTING AND PATCHING

- A. Do not endanger or damage installed Work through procedures and processes of cutting and patching.
- B. Arrange for repairs required to restore the work, because of damage caused as a result of HVAC installations.

- C. No additional compensation will be authorized for cutting and patching Work that is necessitated by defective or non-conforming installations.
- D. Perform cutting, fitting, and patching of HVAC equipment and materials required to:
 - 1. Remove and replace defective work.
 - 2. Remove and replace work not conforming to requirements of the Contract Documents.
 - 3. Remove samples of installed work as specified for testing.
 - 4. Install equipment and materials in existing structures.
 - 5. Cut, remove and legally dispose of selected HVAC equipment, components, and materials as indicated, including, but not limited to removal of HVAC piping, heating units and trim and other HVAC items made obsolete by the new work.
 - 6. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Locate identify and protect HVAC services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas.

1.10 MATERIALS

- A. Refer to architectural work specifications for requirements. The following paragraph supplements this Section.

In addition, since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements are the minimum standards acceptable.

1.11 EQUIPMENT NOISE AND VIBRATION

- A. Provide equipment and systems that, as defined herein, shall be quiet and free of apparent vibration in operation.
- B. The vibration shall not be apparent in occupied areas of the building. Both the balancing of rotating machinery and the installation of vibration isolation at various locations are required. Provide seismic restraints as detailed in Specification Section.
- C. Obtain equipment that is quiet in operation as compared to other available equipment of its size, capacity, and type; install equipment so that a minimum amount of noise and/or vibration is transmitted to the building; and fabricate the duct system so that air noises generated in the system are held to an absolute minimum.
- D. Precautions deemed necessary to provide a quiet installation shall be done as part of the Work of this Project. After the system is in operation, make changes to equipment or Work installed so that the noise criteria defined in the New York Administrative Code.
- E. Adjust all the equipment RPM, noise production and vibration in order to avoid any production of resonance in any system.

- F. Noise producing mechanical equipment located within 100 feet of habitable room windows shall be tested at the equipment for compliance with the design STC rating of the equipment.
- G. For outdoor or roof mounted equipment, the noise levels at the property line shall not exceed the limits of the maximum permissible sound levels by New York Administrative Code (NYAC). If such situation arise, provide sound attenuators or sound barrier enclosures to the noise emitting equipment to mitigate this issue at no additional cost to the owner.

1.12 EQUIPMENT GUARDS

- A. Provide easily removable expanded metal guards for all belts, couplings, exposed fan inlets and outlets, and other moving parts of machinery. Provide tachometer openings in the guards at least 2" in diameter, for all belt-driven or variable speed machinery. Equipment guards shall comply with OSHA requirements.
- B. Per Sections FGC 306.6 and MC 304.11, guards shall be provided where appliances, equipment or other components that require service and roof hatch openings are located within 10 feet of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches above the floor, roof or grade below. The guard shall extend not less than 30 inches beyond each end of such appliances, fans or other components and roof hatch openings and the top of the guard shall be located not less than 42 inches above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch-diameter sphere and shall comply with the loading requirements for guards specified in the Building Code.

1.13 ELECTRICAL CHANGES TO MECHANICAL EQUIPMENT

- A. If any changes made in equipment from the Basis of Design are submitted and accepted, especially as to the sizes of the motors, notify Electrical Contractor. Coordinate changes with Electrical Contractor and AEOR.

1.14 DELIVERY, STORAGE, AND HANDLING

- A. Handle equipment carefully to prevent damage, breaking, denting, and scoring. Do not install damaged units or components; replace with new.
- B. Store equipment in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- H. Comply with manufacturer's rigging and installation instructions for unloading equipment and moving them to final location.

1.15 RECORD DOCUMENTS

- A. Refer to the architectural specifications for requirements. The following paragraph supplements the requirements of those Sections:

Mark Drawings to indicate revisions and date of revisions. Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

1.16 GUARANTEES, WARRANTIES, BONDS, AND MAINTENANCE CONTROL

- A. Refer to architectural specifications for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.
 - 1. Compile and assemble the warranties specified for HVAC work into a separated set of documents, tabulated and indexed for easy reference.
 - 2. Provide complete warranty information for each item to include product or equipment including duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.
 - 3. Unless otherwise noted in the specific sections, warranties for the equipment, workmanship and materials shall be provided for the period of one year. Exceptions include, but are not limited to, the five-(5) year warranty provided for the refrigeration compressors.
 - 4. Manufacturers', not Contractors' warranties, shall be provided for all HVAC equipment and accessories.
 - 5. All warranties are to start from the date of Substantial Completion.

1.17 OPERATIONS, TRAINING, AND MANUAL

- A. Refer to architectural specifications for procedures and requirements for preparation and submittal of operation and maintenance manuals of each HVAC equipment. Refer to individual equipment specifications for maintenance manual additional requirements. In addition, include the following information:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassemble; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.
- B. Bind all the other Sections maintenance manuals in a single final Operating and Maintenance Manual.
- C. Refer to architectural specifications and individual equipment specifications for the additional training requirements.

1.18 PAINTING

- A. Paints and coatings used in the interior of buildings shall be in compliance with Architectural Specifications requirements, Department of Environmental Conservation, State of New York, governing the emission of Volatile Organic Compounds and meet the applicable VOC limits

of the California Air Resources Board (CARB) 2007, Suggested Control Measures for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 113, effective June 3, 2011. Exterior paints and coatings shall comply with SCAQMD Rule #1168 of July 1, 2005.

- B. All adhesives and sealants shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in LEED Version 3.0, Indoor Environmental Quality Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005.
- C. Painting for materials and method of application and follow all the requirements specified in the Section and herein below.
 - 1. Primer Paint
 - a. Steel: Low VOC waterborne epoxy similar to Tnemec Series 27 WB Typoxy or equal approved by AEOR. .
 - b. Galvanized ductwork: Acrylic primer such as Tnemec 115 Unibond DF or equal approved by AEOR. Where final color is safety yellow, tint primer yellow.
 - c. Ferrous metal over 290°F: Inert multi-polymeric matrix capable of withstanding elevated temperatures and sever thermal cycling (-300 to 1200°F) similar to Tnemec Endura-Heat DTM Series 1528 or equal approved by AEOR.
 - 2. Finish Paint
 - a. Interior Application: Low VOC semi-gloss acrylic polymer similar to Tnemec Series 1028 EnduraTone or equal approved by AEOR.
 - b. Exterior Application: Low VOC semi-gloss polyurethane similar to Tnemec Series 1081 Endura-shield or equal approved by AEOR.
- D. Painting Schedule
 - 1. Paint the following work where exposed in equipment rooms or in occupied spaces:
 - a. Equipment
 - b. Uninsulated metal piping
 - c. Uninsulated plastic piping
 - d. Pipe hangers and supports
 - e. Metal conduit
 - f. Plastic conduit
 - g. Tanks that do not have factory-applied final finishes

- h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material
 - 2. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces. Finish painting is not required for copper materials, stainless steel or aluminum ductwork, stainless steel vent piping, or piping with stainless steel or aluminum jacket.
 - 3. Paint Systems
 - a. Steel Substrates: One coat of steel primer paint and 2 coats of finish.
 - b. Galvanized Metal Steel Substrates: One coat of galvanized steel primer paint and 2 coats of finish.
 - c. Insulation Covering Substrates: Once coat of low VOC latex primer and 2 coats of finish
 - d. Ferrous Metal over 290°F for non-factory painted boilers and engine exhaust pipes: two coats of high-temperature primer.

E. Color Coding

- 1. All color schemes, minimum length of marker color field and minimum letter height shall be in accordance with ANSI/ASME Standard A13.1-2015, "Scheme for the Identification of Piping Systems".
- 2. Equipment: Gray, except for:
 - a. Non-factory painted boilers, fuel oil burning equipment and steam generation equipment including hangers, supports, valves, traps and miscellaneous iron work in contact with pipe - paint in aluminum color
 - b. Insulation coverings on breechings inside boiler room and condensate tanks - paint in white.
- 3. Piping Colors (all legends to use white lettering unless otherwise noted)

<u>PIPE</u>	<u>PIPE COLOR</u>	<u>LEGEND</u>
Air-Instrument Controls (Pneumatic Tubing)	Blue	Air-Inst Cont
Drain Line	Orange with Black Text	Drain
Hot Water Heating Supply	Orange with Black Text	H.W. Htg Sup
Hot Water Heating Return	Orange with Black Text	H.W. Htg Ret
Dual Temperature Supply	Orange with Black Text	D.T. Sup
Dual temperature Return	Orange with Black Text	D.T. Ret

<u>PIPE</u>	<u>PIPE COLOR</u>	<u>LEGEND</u>
Gravity Condensate Return	Green	Gravity Cond Ret
Pumped Condensate Return	Green	Pumped Cond Ret
Pumped Condensate	Green	Pump Cond
Pumped Recirculating	Green	Pump-Recirc.
Vent Line	Green	Vent
Kitchen Exhaust Ducts Exposed to Outside Atmosphere (if not Stainless Steel)	Aluminum Color	None
Refrigerant Pipe: Liquid	Green	Refr Liq
Refrigerant Pipe Suction	Green	Refr Suc
Non Potable Water	Orange with Black	Non Pot Wtr

1.19 ADJUSTING AND CLEANING

- A. Alignment: Check alignment, and where necessary, realign equipment within recommended tolerances by the manufacturer and in presence of manufacturer's service representative and the Authority.

1.20 FUEL OIL REMOVAL

- A. All fuel oil at the school shall be removed from the school by the Contractor as directed by the Authority. Removal of the fuel oil will be to relocate the fuel oil to another school or legal disposal thereof.

1.21 TORCH BURNING OPERATION

- A. The storing and use of oxygen and combustible gases in conjunction with torch burning apparatus is subject to the Rules and Regulations of the Division of Fire Prevention of the Fire Department of the City, latest Fire Prevention (F.P.) Directive. Fire watches shall be provided during all operations using torches for burning, cutting or welding.
- B. Contractor shall apply for and obtain permits for the use and storage of such equipment on school premises. The operator of such equipment shall have a certificate of fitness issued by the Fire Department.
- C. The cost of permits, certificates, fire watches, apparatus and other items required in the torch burning operation shall be borne by the Contractor at no additional cost to the Owners.

1.22 SEISMIC BRACING

- A. The Building Code classifies schools as Structural Occupancy/Risk Category III in BC Table 1604.5 of the 2014 NYC Building Code.
- Calculations (including the combining of tensile and shear loadings) to seismic bracing designs shall be stamped by Contractor's Registered Professional Engineer with at least five years of seismic design experience in non-structural building components in New York State.
 - The Contractor shall retain a registered professional engineer who shall provide all required shop drawings (signed and sealed). Contractor's engineer shall also field

inspect all installations of vibration isolators and seismic bracing and shall submit affidavit that all isolators/bracing have been installed in accordance with the signed/sealed coordinated shop drawings.

1.23 BMS/DDC COORDINATION

- A. Refer to HVAC specification sections. Coordinate with General Contractor as to actual scope to be included in the HVAC and Temperature Control Work and delineation with the Electrical subcontractor's work.

1.24 INSPECTIONS/TESTS

- A. The Special Inspections are required by the Building Code for the HVAC Trade:

<u>Item</u>	<u>Code Section</u>
Smoke Control Systems	BC 1704.2
Testing of Smoke Control	BC 1705.18
Fire-Resistant Penetrations and Joints	BC 1705.17
Seismic Isolation and Energy Dissipation Devices	BC 1705.12

- D. Tests of Mechanical Systems shall be performed in accordance with the following requirements:

<u>Item</u>	<u>Code Section</u>
Smoke Control Systems	MC 513.3
Noise Control	NYAC
Refrigeration Systems	MC 1108
Hydronic Piping Systems	MC 1208

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until conditions are suitable.

3.2 INSTALLATION

- A. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

- B. Support: Install equipment on 4" high concrete pad when installed on floor, with vibration isolators and restraints as required.
- C. Accessories: Install equipment accessories not installed at factory and shown on the Drawings.
- D. Connections: Connect all equipment and accessories as recommended by manufacturer for a complete installation.
- E. Contractor shall not leave sharp exposed metal edges (bottom of threaded rods, mechanical equipment supports, etc.) that could otherwise present safety hazards to the building's occupants/work staff.
- F. Central Furnaces: Not Used.
- G. All penetrations made into other trades work are to be sealed to air tight/watertight condition. Ensure that all penetrations into ductwork have been sealed so that they are airtight. Access doors shall be of such construction as to make an airtight seal that will pass ductwork pressure testing. Penetrations through insulated systems, such as refrigerated rooms/equipment, etc., shall be insulated and sealed on both sides of penetration. Sealant on interior side of such insulated spaces/equipment shall be silicone recommended by manufacturer.

3.3 START-UP AND DEMONSTRATION/TRAINING/SERVICE

- A. Start-Up and Demonstration/Training: The Contractor shall start-up and demonstrate in the presence of the Authority's Representative and required Department of Education (DOE) personnel, including Maintenance Representative, the proper operation of all equipment provided in this Contract. The Contractor shall perform necessary Interdisciplinary Tests and Functional Performance Tests (FPT) as listed in each technical Specification Section required by the Contract. The Contractor shall also provide training to the Authority's and DOE's designated Representatives. Refer to architectural specifications for additional requirements.
- B. Service: Provide the services of a competent field service representative to furnish service to the facility during construction and during the warranty period. Service must be performed within 48 hours from the time of notification (24 hours for emergencies).

3.4 ADJUSTING AND CLEANING

- A. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5 SPARE PARTS

- A. Provide a set of spare parts that may be normally required, such as belts, filters, etc. that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

3.6 TESTING

- A. The Contractor shall furnish energy, fuel, oil, water, air, light and electrical instruments as required for all testing.

END OF SECTION

SECTION 230010
HVAC DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Labor, materials, equipment and incidentals required and remove and dispose of the HVAC systems, including ductwork, piping, insulation, controls and equipment, in the existing buildings as required, indicated on the Drawings and as specified herein.
- B. Provide all HVAC demolition work associated with the removal of abandoned equipment from the existing facilities, including disconnecting and removing all piping and ductwork.
- C. Provide all HVAC demolition work associated with removal of temperature control equipment, panels, wiring, piping and tubing.
- D. Provide all work associated with the removal of equipment for the existing and new facilities.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 GENERAL

- A. The demolition and removal work shall be coordinated with the construction schedule for new work and the demolition work of other contracts. Where applicable, no demolition or removal work shall be started in any area until the asbestos inspection and removal has been completed in that area.
- B. Removal of existing HVAC systems have not been detailed on the Drawings. Perform site survey to review existing site conditions and left-over existing systems and equipment. Trace out ductwork and piping systems to be removed and perform the removal work as required to provide complete removal of the existing systems.
- C. Provide continuous service on all systems affected by the demolition except where Owner may permit a temporary shutdown. Where a shutdown cannot be allowed, provide temporary connections as required to maintain the services.
- D. In general, the work includes removal and disposal of:
 - 1. Abandoned equipment, ductwork, piping, insulation including their hangers, supports.
 - 2. All piping that is to be removed shall be removed back to the next live branch or main and plugged or capped whether or not indicated on the Drawings.

3.2 WORK INCLUDED

- A. Demolition shall include:
 - 1. HVAC supply and return piping.
 - 2. Associated piping, ductwork, controls and related components.

3.3 PHASING WORK

- A. Where necessary, provide phasing plan layout and description to the Owner and AEOR (Architect/Engineer of Records).

3.4 TEMPORARY SYSTEMS

A. GENERAL

- 1. Provide temporary equipment required to perform construction work including ventilation systems, exhaust fans, heating and cooling at no additional cost to the authority. Contractor should perform detailed site survey of all existing systems and scope of work where temporary systems are required prior to bidding the project.
- 2. Provide all the labor, material and equipment to install, operate and maintain a complete temporary system.
- 3. Provide documentation, permits and warranty as required.

3.5 DISPOSAL OF MATERIALS AND EQUIPMENT

- A. Except as indicated herein or otherwise directed by the Owner, all material and equipment removed under this Section shall become the property of the Contractor and shall be removed from the site and disposed of by the Contractor. Provide the Owner with receipts verifying acceptable disposal of any legally regulated materials and equipment.
- B. The following items shall be removed, cleaned and moved to a location on the site for storage, or reuse as directed by the Owner:
 - 1. Any items directed to be retained by Owner.

END OF SECTION

SECTION 230504
VIBRATION ISOLATION FOR HVAC SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide a complete system of vibration isolation for each item of HVAC, Plumbing and Drainage, and Electrical equipment and apparatus as specified herein, as shown on the Drawings and as needed for a complete and proper installation.

1.02 RELATED SECTIONS

- B. Division 22, 23 AND 26 Sections.

1.03 SUPPLEMENTAL SUBMITTALS

- A. Product Data: Submit Manufacturer's Product Data for the vibration isolating supports required for each item of HVAC, Plumbing and Drainage, and Electrical equipment.
 - 1. Submit schedule showing manufacturers' mounting sizes and guarantee deflections.
- B. Shop Drawings: Submit Shop Drawings for the vibration isolating supports required for each item of HVAC, Plumbing and Drainage, and Electrical equipment, showing details of intermediate structural steel members and method of attachment required for installation of vibration isolating devices.
- C. Calculations: Provide for all connections of equipment to the structure as described in Article 3.02. Drawings and calculations must be stamped by the Contractor's New York State registered professional engineer.
- D. Qualifications
 - 1. Manufacturer
 - 2. Contractor's design professional
- E. Manufacturer's certification as specified in the Field Quality Control Article.
- F. Maintenance data.

1.04 SUPPLEMENTAL QUALITY ASSURANCE

- A. Manufacturer: Isolator/Bracing manufacturer shall be regularly engaged in the manufacturing of vibration isolating and thermal expansion bracing materials, whose products have been in satisfactory use in similar service for not less than five years.
- B. The Contractor shall engage the services of a third-party Registered Professional Engineer (not a direct employee), who shall have a minimum of four years design experience in non-structural building components and shall be licensed in New York

State.

- C. Manufacturer's Regulating Requirements: Contractors shall determine vibration isolation sizes and locations per the criteria defined in Article 3.02.C.
- D. Where vibration isolation of equipment and appliances is employed, supplemental restraint shall be used to accomplish the support and restraint.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Approved manufacturers:

Mason Industries, Inc.
Vibration Eliminator Co.
Vibration Mountings & Controls Inc.
Korfund Dynamics Co.

2.02 MATERIALS

- A. Spring Mounts

- 1. Housed Spring Mounts: Spring type mounts shall consist of cast telescoping housings containing one or more steel springs. The mount shall be provided with built-in leveling bolt(s), resilient inserts of neoprene to act as guides for upper and lower housings and with ribbed neoprene acoustical pads bonded to the bottom of the lower housing. The lower housing shall have slotted holes in the base, to permit fastening of the mount to the floor.
- 2. Free standing spring mounts shall be laterally stable without housing. Each mount shall be provided with a leveling bolt, a ribbed neoprene pad on the underside of the base, and means of securing the spring base to the floor when specified. Free standing spring mounts shall be used where a floating pad system or an inertia block is specified.

- B. Neoprene-in-Shear Mounts: Each neoprene-in-shear type mount shall consist of a steel top plate and steel base plate completely enclosed in oil resistant neoprene. Top plate shall have a threaded bolt hole for attachment of equipment to mount. Base plate shall have bolt holes, to permit fastening of the mount to the floor when specified. Underside of base plate shall have ribbed, neoprene construction. Single neoprene-in-shear mounts shall have a maximum deflection of 0.25". Double neoprene-in-shear mounts shall have a maximum deflection of 0.50".
- C. Hanger Type Isolators: Hanger type isolators shall consist of a steel housing incorporating a single or double neoprene-in-shear element or a steel spring, or a combination of these two isolators, as needed to achieve the required static deflection. Provide threaded rods for attachment of hanger to overhead structure and to equipment.
- D. Steel Bases

1. Integral structural steel bases for equipment shall be rectangular in shape, and each member shall be of wide flange beam or channel shaped cross-section. Bases for equipment having motors in the X or Y position may be of "L" shape configuration. Depth of section shall be equal to minimum of 1/10th of the longest span of the equipment. Built-in adjustable motor slide rails shall be provided as an integral part of the base. Joints shall be continuously welded.
 2. Structural steel bases under equipment shall be wide flange beams of size specified, or shown on the Drawings. Two beams shall be provided for larger equipment, one under each side along the length of the unit and extending 6" beyond the ends. A steel bearing plate, 3/8" thick, shall be welded to the top flange of the beams at the location of each vibration isolator. The isolator shall be bolted to the bearing plate.
- E. Inertia Blocks: An inertia block shall consist of a rectangular shaped reinforced concrete block on which pumping equipment shall be mounted and which shall be supported on spring isolators above the floor. The pouring form for the block shall be made of 6" (minimum height) steel channels welded together and shall include reinforcing bars running in two directions, welded in place or welded wire fabric. Anchor bolts for the pump's base shall be secured within the pouring form. The number and location of brackets for mounting isolating springs shall be determined by vibration isolation manufacturer. Pouring form shall include space for the pump inlet base elbow. Design and fabrication of the pouring form, including all of its parts, shall be the responsibility of the vibration isolation manufacturer. Pump support shall be designed to provide 95% (minimum) vibration isolation.
- F. Floating Pad System: Floating pad system shall be constructed in the manner indicated on the Drawings and as specified. The floating pad shall be isolated from the building structure by means of 2" high neoprene isolators, factory bonded to the underside of 1/2" thick exterior grade plywood. Placement and density of isolators shall be in accordance with load requirements and with recommendation of vibration isolation manufacturer. Line interior face of the curb with 1" thick light density cork. Cover the plywood form with a sheet of polyethylene film, overlapping the cork boards and curbs. Pour a lightweight concrete slab on top of the polyethylene film, inside the corkboards. After the concrete has set, remove the excess polyethylene film, and fill the joint between the slab and the curb with a mastic seal.

PART 3 - EXECUTION

3.01 PREPARATION

- A. For vibration isolation equipment installed indoors, all metal parts, including rails and bases, shall be painted at the factory with one coat of primer paint and one coat of aluminum paint. Other means or rust resisting painting may be accepted, subject to prior approval.
- B. Vibration isolation equipment installed outdoors shall have all steel parts hot dipped galvanized, all bolts cadmium plated, and all springs cadmium plated and neoprene coated.
- C. Vibration isolation equipment installed outdoors shall be designed and installed to resist wind loads in accordance with the Building Code.

3.02 SUPPLEMENTAL INSTALLATION

A. At each equipment location, provide the required deflection under the imposed load to produce uniform loading and deflection even when equipment weight is not evenly distributed. Jack inertia blocks and bases into position and wedge in place before spring loading; leveling bolts shall not be used as jacking screws. After equipment is in place and springs are loaded through leveling bolts, remove wedges and jacks. Isolators shall be suitable for the lowest operating speed of the equipment.

B. Where the floor is waterproofed or finished with waterproof cement, install vibration isolation in such manner that the waterproofing is not damaged.

C. Isolation equipment shall be in accordance with the following table:

Lowest RPM	Inches Deflection (Min.)	% Efficiency (Min.)	Type
1750 & over	.25	95	Single neoprene- in-shear
1200-1749	.50	95	Double neoprene- in-shear
1000-1199	.75	95	Spring
570-999	1.25	90-95	Spring
520-569	1.5	90	Spring
330-519	2.0	80-90	Spring
Up to 329	3.5	80	Spring

D. Install combination spring and double deflection neoprene position hangers on all refrigeration piping located in the Equipment Room.

E. Install combination spring and double deflection neoprene position hangers on the suction and discharge piping at each circulating pump. Each hanger shall be located on the pump side of the flexible hose connection.

F. Each liquid chiller unit shall be installed on the concrete pad on freestanding spring type isolators having a static deflection of at least 1". Isolators shall provide a minimum isolating efficiency of 95%.

G. Use housed spring mounts on certain air mixing equipment and chillers located in cellar or basement.

- H. Cooling towers, evaporative condensers, fluid coolers and air cooled condensers located on a roof or floor above grade shall be installed on vibration isolators providing a minimum isolation efficiency of 90 percent at fan motor RPM with a maximum static deflection of 4" and shall incorporate a leveling device and resilient pad having a minimum thickness of 1/4". Vibration cutoff switches shall be provided.
- I. The minimum horizontal isolation required for equipment piping shall be installed as follows:
1. Metal piping connected to power driven equipment shall be resiliently supported from or on the building structure from the power driven equipment for a distance of the maximum of 50 pipe diameters or the first three pipe hangers, whichever is the longest length. The isolators shall be pre-compressed spring and neoprene type hangers. Pre-compressed spring and neoprene type hangers must also be used in all transverse braced isolated locations. Horizontal runs in all other locations throughout the building shall be isolated by spring and neoprene hangers that need not be pre-compressed. Floor supported piping shall rest on isolators such as Mason Industries SLR spring mounts (or approved equal).

The resilient isolators shall have a minimum static deflection of 1" for all piping with a 4" or larger in actual outside diameter and 1/2" (12.7 mm) for piping with less than 4" in actual outside diameter.

Piping connected to fluid pressure-reducing valves shall be resiliently isolated for a distance of 50 pipe diameters from pressure reducing valves and isolators shall provide a minimum static deflection of 1/2".

 2. Equipment such as heat exchangers, absorption refrigeration machines, or similar equipment, that is located on any floor or roof other than a floor on grade, and that is not power driven but is connected by metal piping to power driven equipment, shall be resiliently supported from or on the building structure, for a distance of the maximum of 50 pipe diameters or the first three pipe hangers from the equipment, whichever is the longest length. The resilient supports shall be vibration isolators having a minimum static deflection of 1" and shall incorporate approved resilient pads having a minimum thickness of 1/4".

Hangers shall be located as close to the overhead structure as practical. Where piping connects to mechanical equipment, install expansion joints or stainless steel hoses if expansion joints are not suitable for the service.

J. Riser isolation: Risers shall be suspended from spring and neoprene hangers or supported by spring mountings, anchored with all-directional anchors equipped with neoprene isolation and washers, and guided with vertical sliding guides. Steel spring deflection shall be a minimum of 0.75". Consideration shall be given to those expansion locations where additional deflection is required to limit load changes to + 25% of the initial load. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, and spring deflection changes. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.

- K. All fan equipment with motors in excess of 1/2 horsepower located on any roof or floor other than a floor on grade shall be mounted on or from vibration isolators. Fan equipment with motor drives separated from the fan equipment shall be supported on an isolated integral rigid structural base supporting both the fan and motor. Fan equipment with motor drives supported from the fan equipment shall be mounted directly on vibration isolators. Each isolator shall have provision for leveling. Isolators shall incorporate resilient pads having a minimum thickness of 1/4". The vibration isolators shall provide a minimum isolation efficiency of 90 percent at fan rotor rpm with a maximum deflection of 2". Fans and compressors of 3 horsepower or less assembled in unitary containers may meet this requirement with isolators internal to the container providing the isolators meet the above minimum isolator efficiencies.
- L. All pumps of 3 horsepower or more located on any floor other than a floor on grade shall be supported on vibration isolators having a minimum isolation efficiency of 90 percent at the lowest disturbing frequency. Each isolator shall incorporate a leveling device and a resilient pad having a minimum thickness of 1/4".
- M. Compressors and drives located on a floor other than a floor on grade shall be mounted on vibration isolators having a minimum isolation efficiency of 90 percent at the lowest disturbing frequency. Each isolator shall incorporate a leveling device and a resilient pad having a minimum thickness of 1/4".
- N. Duct Connections to Fan Equipment: Flexible connections shall be installed between fan equipment and connecting ductwork.
- O. Ceiling Suspended Packaged HVAC units with Compressors: Equipment such as heat pumps, AC units, or similar equipment, that is suspended from a structure shall be resiliently supported from or on the building structure. Vibration isolators shall have a minimum isolation efficiency of 90 percent at the lowest disturbing frequency.

3.03 SCHEDULE

- A. Provide vibration isolation supports for HVAC equipment as indicated in this schedule. Contractor shall submit a schedule for approval by Engineer of Record indicating the type of support for each item of Plumbing & Drainage Equipment and each item of Electrical Equipment.

Equipment	Location	Type of Support
Centrifugal fan, belt driven	floor mounted	integral steel base with isolators
Air Handling Unit	floor mounted	springs on 6" W.F. beams
A.C. single zone unit (vertical)	floor mounted	springs on 6" W.F. beams
A.C. single zone unit (horizontal)	floor mounted	springs on 10" W.F. beams
Air Handling Unit	overhead supported	spring and double deflecting neoprene

		hangers
Pump, all H.P.	cellar/basement	none required
Pump, 3 H.P. or more	upper floor	inertia block
Pump, under 3 H.P.	upper floor	none required
Pipe, refrigerant	equipment room	spring and D.D.* hanger
Pipe, hot and/or chilled water	at pumps	spring and D.D.* hanger

*D.D. = Double Deflecting

3.04 FIELD QUALITY CONTROL

- A. On completion of the vibration isolation system herein specified, the representative of the vibration isolation manufacturer shall inspect the completed systems and report in writing any installation error, improperly selected isolation devices, or any other faults that could affect performance. Submit a report indicating steps taken to properly complete the isolation work. Both reports shall be reviewed by the Authority for final approval.

END OF SECTION

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SECTION 230523
VALVES (HVAC)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide labor, materials, equipment, accessories, services and test necessary to complete and make ready for operation, all valves shown on the Drawings and hereinafter specified in other Division 23 Sections (HVAC).

1.02 RELATED SECTIONS

- A. Division 23 Sections

1.03 SUPPLEMENTAL SUBMITTALS

- A. Product Data

Submit manufacturer's product data including valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, required clearances and installation instructions.

- B. Shop Drawings

Submit valve schedule showing manufacturer's figure number, location, and valve features for each required valve. Include list indicating valve and its application in the schedule.

1.04 SUPPLEMENTAL QUALITY ASSURANCE

- A. Codes and Standards

1. MSS Compliance: Mark valves in accordance with MSS-25: Standard Marking System for valves, fittings, flanges and unions and all other applicable MSS Standards.
2. ANSI Compliance: For face-to-face and end-to-end dimensions.
3. UL and FM Compliance: Provide valves used in fire protection piping which are UL-listed and FM approved.
4. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
5. Testing of material and equipment shall be in accordance with the Administrative Code (reference MC 301.5).

- B. Valves of one type throughout the Project shall be of the same manufacturer. Valve parts of same manufacturer, size and type shall be interchangeable.

1.05 DEFINITIONS

- A. CWP: Cold Working Pressure
- B. WSP: Working Steam Pressure
- C. NRS: Non-Rising Stem
- D. RS: Rising Stem
- E. OS&Y: Outside Screw and Yoke
- F. WOG: Water Oil Gas
- G. IBBM: Iron Body Bronze Mounted

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide all the valves shown on the Drawings (HVAC Work) and necessary for the control and easy maintenance of all piping and equipment. Valves shall be first quality, have proper clearance, followers in the packing glands, and shall seal tight at the specified test pressure. Each valve shall have the maker's name or brand, the figure or list number and the guaranteed working pressure cast on the body and cast or stamped on the bonnet. Valves which are concealed in hung ceilings or in furring and any other places shall be made accessible by means of access doors provided in the ceilings and furrings. The access doors shall be constructed as specified in Section 08305: Access Doors and shall be not less than 12" x 12", unless otherwise shown on the Drawings.
 - 1. Working Pressure: Valves shall be designed for water of not less than 200 psi and 350 psig hydrostatic tests.
 - 2. Wheels: Shut-off valves shall have self-cooling type metal hand wheels except where specified otherwise. For valves other than outside screw and yoke type gate valves, the valve stem shall be extended through the wheel and be provided with hexagon nuts to secure the wheel in place.
 - 3. Chain and Sprockets: Where the Drawings indicate valves to be chain operated, they shall be provided with operating chains, sprockets and guides supplied by Crane Co., or Jenkins Bros. Chains shall hang within 5' of the floor. Provision shall be made for fastening the chains out the way.
- B. All valves shall be designed for packing under pressure with valve open or closed.
- C. Solder end valves for refrigerant service shall be suitable for brazing.

2.02 MATERIALS

- A. Body
 - 1. Cast Iron: ASTM A126, Class B, higher strength cast iron.
 - 2. Bronze: For use up to 150 psig WSP (Working Steam Pressure), ASTM B62 and over 150 psig to 300 psig WSP, ASTM B61.
 - 3. Cast Steel: ASTM A216 Grade WCB.
 - 4. Forged Steel: ASTM A105, Grade 2.

5. Ductile Iron: ASTM A536, Grade 65-45-12.

B. Stem

1. Cast Manganese Bronze: ASTM B584.
2. Cast Silicon Brass: ASTM B584.
3. Rolled Silicon Brass: ASTM B98 Alloy D.
4. Rolled Aluminum Bronze: ASTM B150 Alloy 1.
5. Rolled Manganese Bronze: ASTM B138 Alloy A (half hard).
6. Naval Brass: ASTM B21 Alloy A or Alloy C (hard).
7. Carbon Steel: As specified for particular type of valve.
8. Stainless Steel: As specified for particular type of valve.

C. Trim: As specified for particular type of valve.

2.03 GATE VALVES

A. All gate valves shall be of the solid wedge disk type.

1. Bronze Gate Valve:

- a. Class 125, 125 psig WSP, 200 psig WOG, bronze body with integral seat and screw-in or union bonnet.
- b. Class 150, 150 psig WSP, 300 psig WOG, bronze body with integral seat, union bonnet (rising stem), threaded bonnet (non-rising stem), threaded ends
- c. Class 300, 300 psig WSP, 600 psig WOG, bronze body with union or bolted bonnet and stainless steel seat; threaded ends; rising or non-rising stem.

2. Iron Gate Valve: Class 125, 125 psig WSP, 200 psig WOG, Iron Body Bronze Mounted (IBBM), bolted bonnet, Outside Screw and yoke (OS&Y), flanged ends.

B. Hose gate valves shall be 125 psi, 3/4", standard weight bronze with cap.

C. Manufacturers

Crane Co.
Hammond Valve Corp.
NIBCO, Inc.
Crane Co.; Crane Valve Group; Stockham Division.
Milwaukee Valve Company
Lunkenheimer/Cincinnati Valve Company

Walworth Mfg. Co.
Smith-Cooper International
Conbraco Industries, Inc.; Apollo Valves.
Crane Co.; Crane Valve Group; Jenkins Valves.

2.04 GLOBE VALVES

- A. Except valves in pneumatic and automatic temperature control piping and pneumatic and automatic valves, no globe valve of size larger than 1/2" shall be used, unless otherwise specified or shown on the Drawings. Where globe valves are approved, they shall be of the same grade called for other valves.

2.05 CHECK VALVES

- A. Check valves shall be of heavy pattern, straightway, re-grinding type with renewable seat, ground seat and approved type renewable discs. The discs for check valves, of size larger than 2" may be bronze faced.
- B. Swing Check Valves: horizontal swing, Y-pattern, cast-bronze body and cap or Dezincification Resistant (DZR) Lead-Free Brass Body and Cap, bronze or DZR Brass disc with rubber seat or composition seat, threaded or soldered end connections or cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections. Face discs for cold water service can be Buna-N or Teflon.
- C. Silent Check Valves: cast-iron body, bronze trim, stainless steel spring and flanged end connections.
- D. Lift check valves shall be globe style, streamline, spring loaded.
- E. Manufacturers

Crane Co.
Hammond Valve Corp.
Mueller Steam Specialty
NIBCO, Inc.
Crane Co.; Crane Valve Group; Stockham Division.
Milwaukee Valve Company
Walworth Mfg. Co.
Lunkenheimer/Cincinnati Valve Company
Crane Co.; Crane Valve Group; Jenkins Valves.
Jomar Valve

2.06 COCKS

- A. Gauge cocks shall have all brass construction, "T" or lever handles with screwed ends. Asbestos packed cocks will not be approved.

2.07 PLUG VALVES: Not Used.

2.08 VALVES FOR CONVECTORS AND UNIT VENTILATORS : Not Used.

2.09 VALVES FOR REFRIGERANTS SERVICE

- A. Valves shall have forged DZR brass or bronze bodies conforming to ASME B31.5 Code for Refrigerant Piping.
 - 1. Valves with brazing or flare connections, in sizes up to and including 5/8" OD shall be of packless metal diaphragm type and 3/4" OD larger, for use in hard temper tubing with brazing connections shall be of packed type with wing cap. Packed valves shall be backseating to permit repacking under pressure and the wing cap shall have a socket formed in top, so that it may be inverted and used to turn stem.
 - 2. Check valves: Spring loaded type with bronze body, bronze disc, neoprene or Teflon seat, bronze bonnet with stainless steel spring.
- B. Manufacturers
 - Alco Control Division
 - Henry Valve Co.
 - Sporlan Valve Co.

2.10 FORGED OR CAST STEEL VALVES: Not Used.

2.11 VALVE OPERATORS

- A. Provide suitable handwheel for gates, globes or angles, and drain valves.
- B. Provide valves located more than 7' from floor in equipment room areas with chain operated sheaves. Extend chains to about 5' above floor and hook to clips arranged to clear walking aisles. Provide extended valve shafts, 4" min to keep chain away from pipe insulation.

2.12 VALVE FEATURES

- A. Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined for installation requirements.
- B. Bypass: Comply with MSS SP-45, and except as otherwise indicated, provide manufacturer's standard bypass piping and valving.
- C. Drain: Comply with MSS SP-45, and provide threaded pipe plugs.
- D. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5, (steel), or ANSI B16.24 (bronze).
- E. Threaded: Valve ends complying with ANSI B2.1.
- F. Butt-Welding: Valve ends complying with ANSI B16.25.
- G. Socket-Welding: Valve ends complying with ANSI B16.11.

- H. Solder-Joint: Valve ends complying with ANSI B16.22.
- I. Flangeless: Valve bodies manufactured to fit between flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (Bronze).

2.13 BALL VALVES

- A. Ball valves shall be two-piece full ported 600 W.O.G. bronze body or Dezincification Resistant (DZR) Brass body, solid blow-out proof stem, teflon seats, chrome plated bronze or brass ball and teflon seals, corrosion resistant steel lever handles with vinyl grips, balancing stop with screw or solder ends. Screw end ball valve shall be Apollo Valves 77-100 Conbraco Industries, Inc., Crane 9211, Milwaukee BA-400, Hammond 8301A, NIBCO T-585-70, Stockham T-255-BR-R, Dwyer Series BV2MB, Smith-Cooper 1728155Series or Jomar Valve T-100NE and solder end ball valve shall be Apollo Valves 77-200 Conbraco Industries, Inc., Crane 9212, Milwaukee BA450, Hammond 8311, NIBCO S-585-70, Stockham S-255-BR-R, Smith-Cooper 1728156Series or Jomar Valve S-100NE. Ball valves should be used for up to 2" sizes only.
- B. Ball Valves for Press-fit Copper Fittings shall be two-piece bronze or brass body with full port, chrome or brass plated ball, blow-out proof stem and PTFE or RTFE seats, rated at 250 psi minimum with press fitting ends. Ball Valves shall be Viega Model 2970.10, NIBCO PC585-70; Apollo Valves 77W-140 Series or Jomar Valve JP-100. Ball valves shall have a metal lever handle.
- C. Ball valves made of brass alloy must contain dezincification resistant inhibitors and be thermally treated (annealed). Valves must be 3rd party tested by a Nationally Recognized Testing Lab in accordance with ISO 6509-1 and exhibit less than 200 microns of dezincification in accordance with ISO 6509-2.

2.14 GROOVED END VALVES: Not Used.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Except as otherwise indicated, comply with the following requirements:
 - 1. Install valves where required for proper operation of piping and equipment including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
 - 2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Nonrising stem valves shall be used only where headroom prevents full extension of rising stems. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
 - 3. Install gate valves for shut-off; to isolate equipment, parts of systems, and vertical risers and any banked system of coils and to separate each coil.

4. Hose gate valves: Provide hose gate valves to drain the pipe at the low points of the system.
 5. Install globe for throttling service and control device.
 6. Use tapered lubricated plug valves in water systems for throttling service and at the discharge of all pumps. Use nonlubricated plug valves only when shut-off or isolating valves are also provided.
 7. Provide tapered lubricated 1" drain gate valves at main shut-off valves, and at all low points of piping and apparatus.
 8. Provide 1" gate vent valves at all high points in the piping system.
 9. Provide lift check valves at the discharge of all pumps as shown on the Drawings.
 10. Outside Screw and Yoke Type: Gate valves in lines leading from the boilers to the boiler steam header, in boiler blow-off lines, and at other points so specified or shown on the Drawings shall have outside screw and yoke (OS&Y) with bronze rising stem.
- B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- C. Mechanical Actuators: Install mechanical actuators with chain operators where indicated on the Drawings. Extend chains to about 5'6" on the floor and hook to clips to clear aisle passage.

3.02 ADJUSTING AND CLEANING

- A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.03 MINIMUM VALVE REQUIREMENTS

- A. Shutoff valves shall be installed on the supply and return side of all heat exchangers.
- B. Shutoff valves shall be installed on the building supply and return of central utility systems and district heating and cooling systems.
- C. Shutoff valves shall be installed on the connection to any pressure vessel.
- D. Shutoff valves shall be installed on both sides of a pressure-reducing valve.
- E. Shutoff valves shall be installed on connections to mechanical equipment and appliances. This requirement does not apply to components of a hydronic system such as pumps, air separators, metering devices and similar equipment.

3.04 VALVE APPLICATION SCHEDULE

- A. Instrument Air, 1" and less: Screwed ends; Class 125, 125 psig WSP, 200 psig WOG, bronze body gates with flared or ferrule copper tubing adapters.
- B. Refrigerants - Suction, Liquid and Hot Gas, Up to 4¹/₈" O.D.: Brazing end stop valve of the globe or angle design. Check valve of spring operated, guided piston type with flared ends in sizes thru 5/8"OD, and solder type ends in sizes through 7/8" OD, with bolted bonnet or cover plate, and solder type ends in sizes 1¹/₈"OD through 4¹/₈" OD.
- C. Refrigerants - Purge, Drain and Charging, Up to 4¹/₈" O.D.: Solder ends, valve of angle or globe design, with packless metal diaphragm with flared ends, and removable seal cap chained to valve body.
- D. All main piping shall have air automatic air vents, similar to Sarco 13W at high points.

3.04 VALVE MODEL NUMBERS

A. Swing Check valves – 3" and Less

Manufacturer	Ends	Class 125		Class 125		Class 150	
		Threaded	Ends	Solder	Ends	Threaded	Ends
Crane	37		1340			141TF	
Hammond		IB904	IB912		IB946		
Nibco	T-413B	S-413B		T-433Y			
Stockham		B-319Y	B-309Y		B-321		
Milwaukee		509		1509		510T	
Lukenheimer	2144		2145			230-70	
Walworth		W506		3406SJ		W512	
Apollo	161TF	161S		164T			
Jenkins	996AJ	997AJ		4092J			
Jomar Valve	T-511	S-511		T-511			

Class 300:

Manufacturer	Threaded
Crane	76E
Hammond	IB949
Nibco	T-473-B
Stockham	B-375
Milwaukee	507
Lukenheimer	554-Y
Walworth	3428
Apollo	168T
Jenkins	4962J

B. Swing Check valves – 2" and Up

Manufacturer	Class 125

Crane	373	
Hammond		IR1124
Nibco	F-918	
Stockham		G-931
Milwaukee		F-2974A
Lukheimer	1790	IBBM
Walworth		W928F
Apollo	910F	
Jenkins	587J(624CJ)	

C. Silent Check valves – 2½" and Up

Manufacturer Class 250

Crane	39E	
Hammond		IR322
Nibco	F-968-B	
Stockham		F-947
Milwaukee		F2970M
Lukheimer	N/A	
Walworth		W8970F
Apollo	920F	
Jenkins	339RJ(339J)	

D. Forged Steel Valve – 2 inch and Less:

Gate Valve Class 800

Manufacturer	Threaded OS&Y	Socket Weld OS&Y
RP&C	EF56D	EF57D
Newco	18TFS2	18SFS2
Vogt	12111	SW12111

Piston Check Valve Class 800

Manufacturer	Threaded	Socket Weld
RP&C	LF90A	LF91A
Newco	48TFS2	48SFS2
Vogt	701	SW701

END OF SECTION

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SECTION 230553
HVAC IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Provide all the mechanical (HVAC) identification work shown in the Drawing Schedules, specified in Specification Sections and needed for a complete and proper installation. Product specific requirements are contained herein. The types of identification devices specified in this Section include the following:

Painted Identification Materials
Plastic Pipe Markers
Underground-Type Plastic Line Marker
Plastic Duct Markers
Valve Tags
Valve Schedule Frames
Plastic Equipment Markers
Plasticized Tags
Plastic Labels
Access Panel and Door Markers
Key Identification Tags
Key Identification Schedules

1.2 RELATED SECTIONS

- A. Architectural Specifications
B. 23 Series Specifications
C. 26 Series Specifications

1.3 SUPPLEMENTAL SUBMITTALS

- A. Shop Drawings: Provide list of identification wording, symbols, letter size, and color-coding.
- B. Schedules:
1. Submit valve schedule for each piping system, typewritten and reproduced on 8½" x 11" bond paper. Include valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves that are intended for emergency shut-off and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for the maintenance manuals specified in Division 1.
 2. Submit key identification schedule typewritten and reproduced on 8½" x 11" bond paper. Include location of equipment and/or unit that utilize the respective key and variations for identification (if any). Furnish extra copies for the maintenance manuals specified in Division 1.

1.4 SUPPLEMENTAL QUALITY ASSURANCE

- A. Codes and Standards

1. ANSI Standards: Comply with ANSI A13.1-2015 for lettering size, length of color field, colors, and viewing angles.

PART 2 - PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

- A. Provide manufacturer's standard products of categories and types required for each application as referenced in other Specification Sections (HVAC), shown on the Drawings and/or Schedules. Where more than single type is specified for application, selection is the Authority's option, but provide single selection for each product category.
- B. Paintings and coatings used in the interior of building to cover insulation for identification purposes shall not exceed the VOC content limits established in the Green Seal Standard GS-11 Paints, first edition, May 20, 1993.
- C. Paints and coatings used in the interior of building for identification purposes of piping shall not:
 - a. Exceed the VOC content limits established in the Green Seal Standard GS-11 Paints, first edition, May 20, 1993.
 - b. Exceed the VOC content limit of 250 g/L established in the Green Seal Standard GC-03, Anti-Corrosive Paints, second edition, January 7, 1997.
- D. All adhesives and sealants used for tags and charts shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.
- E. Painted Identification Materials:
 1. Stencils: fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1-2015.
 - a. Stencil Paint: exterior type stenciling enamel except as otherwise indicated on the Drawings; either brushing grade or pressurized spray-can form and grade.
 - b. Identification Paint: enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ANSI A13.1-2015 for colors or as selected by the Project Architect.
- F. Plastic Pipe Markers:
 1. Snap-On Type: Pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1-2015 or as selected by the Project Architect.
 2. Provide 1" thick molded fiberglass insulation with jacket for the plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125°F or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
 3. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360° around pipe, fastened by snap-on application of pre-tensioned semi-rigid plastic pipe marker.
 4. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height,

fastened by strapped-to-pipe (or insulation) application of semi-rigid type, with stainless steel bands.

5. Lettering: Pre-printed nomenclature that best describes piping system in each instance, as shown on the Drawings or as selected by the Project Architect or Engineer in cases of variance with name shown or specified.
 - a. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

G. Plastic Duct Markers:

1. Laminated plastic, color-coded duct markers. Conform to the following color code if not specified:

Green: Cold air.

Yellow: Hot air.

Yellow/Green: Supply air.

Blue: Exhaust, outside, return, and mixed air.

For hazardous exhausts, use colors and designs recommended by ANSI A13.1-2015.

2. Nomenclature: Include the following:

Direction of air flow

Duct service (supply, return, exhaust, and all other items and accessories)

Duct origin (from).

Duct destination (to).

Design cfm.

- H. Underground-Type Plastic Line Markers: Permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried pipe.

- I. Valve Tags: Not used.

- J. Valve Schedules Frames: Not used.

K. Plastic Equipment Markers:

1. Laminated plastic, color-coded equipment markers. Conform to the following color code if not specified otherwise:

Green: Cooling equipment and components.

Yellow: Heating equipment and components.

Yellow/Green: Combination cooling and heating equipment and components.

Brown: Energy reclamation equipment and components.

Blue: Equipment and components that do not meet any of the above criteria.

For hazardous equipment, use colors and designs recommended by ANSI A13.1-2015.

2. Nomenclature: Include the following matching terminology on schedules and Drawings as closely as possible:
 - Name and plan number
 - Equipment service
 - Design capacity
 - Other design parameters such as pressure drop, entering and leaving conditions, rpm, and all other items and accessories
 3. Size: approximate 2½" x 4" markers for control devices, dampers and valves; and 4½" x 6" for equipment.
- L. Plasticized Tags: Pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing, approximately 3¼" x 5⁵/₈", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples: DANGER, CAUTION, DO NOT OPERATE).
- M. Plastic Labels: Printed labels created with label printer/maker similar to Brother P-Touch for marking white iron of ceiling grid for equipment and access concealed by the hung ceiling. Labels shall be 1/2" high black letters on clear background.
- N. Key Identification Tag: Provide identification tag on every key provided as part of the maintenance materials specified in their respective sections. Tags shall be plastic stamped or engraved with 1/4" high letter for abbreviated name of unit and/or equipment and 1/2" for the number and with 5/32" hole for fastener. The tag shall be of the same color as the equipment with black lettering. Provide 2" square or round tags. Tag Fasteners: solid brass chain (wire link or beaded type), or solid brass S-hooks of the size required for proper attachment of tags to valves, and manufactured specifically for that purpose.
- O. Lettering and Graphics:
1. Coordinate names, abbreviations and other designations used in the identification work with corresponding designations shown on the Drawings or Schedules, or specified. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of systems and equipment.
 2. Multiple Systems: Where multiple systems of same generic name are shown on the Drawings or Schedules and specified, provide identification that indicates individual system number as well as service (as examples: Boiler No. 2, Air Supply No. 1).
- P. Approved Manufacturers
- Allen Systems, Inc.
 - Brady (W.H.) Co.; Signmark Div.
 - Industrial Safety Supply Co., Inc.
 - Seton Name Plate Corp.
 - Brimar Industries, Inc.
 - Marking Services Inc.
 - EMED Co., Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordination: Where identification is to be applied to surfaces that require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- B. Ductwork Identification:
 - 1. Identify air supply, return, exhaust and intake ductwork with duct markers or painted identification materials and provide arrows showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork color).
 - 2. Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures (shaft, underground or similar concealment), and at 50' spacings along exposed runs.
 - 3. Access Doors: Provide plastic duct markers on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information.
 - 4. Concealed Doors: Where access doors are concealed above acoustical ceilings or similar concealment, provide plastic labels installed on the exposed white iron adjacent to the acoustical ceiling tile that when removed will provide access to the access door. Provide plastic duct marker on the door itself as described in 3 above.
- C. Piping System Identification: Install pipe markers and color bands and include arrows to show direction wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
 - 1. Near each valve and control device
 - 2. Near each branch, excluding short take-offs for terminal units; mark each pipe at branch, where there could be question of flow pattern.
 - 3. Near locations where pipes pass through walls or floors/ceilings or enter non-accessible enclosures.
 - 4. Near major equipment items and other points of origination and termination.
 - 5. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
 - 6. On piping above removable acoustical ceilings except omit intermediately spaced markers.
- D. Underground Piping Identification: During back-filling/top-soiling of each exterior underground piping system, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16", install single line marker.
- E. Valve Identification:
 - 1. Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, and shut-off valves at HVAC terminal devices and similar rough-in connections of units. List each tagged valve in valve schedule for each piping system.

- a. Tagging Schedule: Comply with requirements of "Valve Tagging Schedule" at end of the Section.
 2. Mount valve schedule on frames located in machine rooms where indicated or, if not otherwise indicated, where directed by the Authority.
 3. Where more than one major machine room is shown on the Project, mount valve schedule in each major machine room, and repeat only main valves that are to be operated in conjunction with operations of more than single machine room.
- F. A permanent factory-applied nameplate(s) shall be affixed to appliances (reference Section MC 301.8 and 301.9 of the 2018 Mechanical Code) on which shall appear in legible lettering, the manufacturer's name or trademark, the model number, serial number and the seal or mark of the approved agency. A label shall also include the following:
1. Electrical equipment and appliances: Electrical rating in volts, amperes and motor phase; identification of individual electrical components in volts, amperes or watts, motor phase; Btu/h output; and required clearances.
 2. Absorption units: Hourly rating in Btu/h; minimum hourly rating for units having step or automatic modulating controls; type of fuel; type of refrigerant; cooling capacity in Btu/h; and required clearances.
 3. Fuel-burning units: Hourly rating in Btu/h; type of fuel approved for use with the appliances; and required clearances.
 4. Electric comfort heating appliances: Name and trademark of the manufacturer; the model number or equivalent; the electric rating in volts, ampacity and phase; Btu/h (W) output rating; individual marking for each electrical component in amperes or watts, volts and phase; required clearances from combustibles; and a seal indicating approval of the appliance by an approved agency.
- G. Mechanical Equipment Identification:
1. Install plastic equipment marker near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device in their respective sections. Provide signs for the following general categories of equipment and operational devices
 - a. Main control and operating valves, including safety devices
 - b. Meters, gauges, thermometers and similar units
 - c. Strainers, filters, humidifiers, water treatment systems, thermostatic traps and similar equipment
 - d. Primary balancing dampers, mixing boxes
 2. Provide permanent factory-applied nameplate(s) for all appliances as defined in Article 3.01.F above including but not limited to the following:
 - a. Fuel-burning units including boilers, furnaces and heaters units
 - b. Pumps, compressors, chillers, condenser and similar motor-driven units
 - c. Converters, heat exchangers, coils, evaporators, heat recovery units and similar equipment

- d. Fans, blowers and VAV terminals
 - e. Packaged HVAC central-station, zone-type units, heat pumps, air handling units, heating and ventilating units
 - f. Tanks and pressure vessels
- 3. Plastic equipment marker lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2', 1/2" high for distances up to 6', and proportionally larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.
 - 4. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
 - 5. Optional Use of Plasticized Tags: At the Authority's option, where equipment to be identified is concealed above acoustical ceiling or similar concealment, plasticized tags shall be installed within concealed space to reduce amount of text in exposed sign (outside concealment).
 - a. Operational valves, dampers and similar minor items located in non-occupied spaces (including machine rooms) shall be identified by plasticized tags.
 - 6. Key Identification Tag: Provide an identification tag on each and every key provided under this project and deliver to the Custodian or Building Manager and DOE Maintenance Representative. Follow the valve tagging schedule specified herein for the numbering.
- H. Concealed Equipment, Dampers, Access Doors, etc.
- 1. Equipment, dampers, access doors, filters, etc. concealed above the hung ceiling shall have plastic labels placed on the white iron of the hung ceiling before the ceiling tiles are installed to allow easy location of the devices once the hung ceiling is installed.
 - 2. Devices shall be labeled by type and the number utilized on the final approved drawings to identify the device (if item is numbered).

3.2 VALVE TAGGING SCHEDULES

- A. Numbers: Arrange the numbering of valves in the following manner:
- 1. In Basement, Cellar, or Pipe Space below First Floor - No. 1 to No. 999
 - 2. In First Story - No. 1000 to No. 1999.
 - 3. In Second Story - No. 2000 to No. 2999.
 - 4. In Third Story - No. 3000 to No. 3999.
 - 5. In Fourth Story - No. 4000 to No. 4999.
 - 6. In Fifth Story - No. 5000 to No. 5999.
 - 7. On Roof or in Roof Penthouse or Bulkhead-No. R1 to No. R999.
- B. In no case shall a number applying to one story, be assigned to a valve located in another story.

C. For other information, refer to the Drawings.

END OF SECTION

SECTION 230592
CLEANING AND TESTING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide Cleaning and Pressure/Operational Testing for the HVAC Work done on this Project, as specified herein, and as needed for a complete and proper installation. Equipment and systems Interdisciplinary/Functional Performance Testing is defined in the respective Specification Sections. All testing is to be performed by the Contractor unless specifically indicated otherwise.

1.02 RELATED SECTIONS

- A. Division 23 Sections

1.03 SUPPLEMENTAL SUBMITTALS

- A. Product Data: List of instruments to be used for each test. Include instrument calibration requirements as specified.
- B. Quality Control Submittals
 - 1. Submit Field Cleaning/Test Results for the Following:
 - a. Piping Pressure Tests
 - b. Refrigeration Systems: Pressurization Tests and Operational Tests
 - c. Ductwork Pressure Leakage Tests
 - d. Smoke Control Systems: Not used.
 - e. Commercial Cooking Appliances: Not used.
 - f. Post Cleaning Report
 - g. Air Leakage Test for Smoke Barrier Penetrations
- C. Refrigerant: Submit the record of the weight in pounds of refrigerant charged into each system to the Authority.
- D. Test Schedule and Procedures Plan: Submit time schedule and copy of the step-by-step testing procedures for each system. Isolating valves and flanges, vent fittings and pressure gauges utilized during the testing shall be indicated on the submitted appropriate shop drawings.

1.04 SUPPLEMENTAL QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Perform testing of factory-fabricated equipment in accordance with all the City agencies having jurisdiction.

2. Perform field-testing of piping systems in accordance with all the City agencies having jurisdiction and as specified.

1.05 PROJECT CONDITIONS

- A. Protection: During Test Work, protect controls, gauges and accessories that are not designed to withstand test pressures. Do not utilize permanently installed gauges for field-testing of systems.

1.06 SEQUENCING AND SCHEDULING

- A. Transmit written notification of proposed date and time of all tests to the Authority at least 5 days in advance of such tests.
- B. Perform Cleaning and Testing Work in the presence of the Authority.
- C. Pressure test piping systems inside buildings, at the roughing-in stage of installation, before piping is enclosed by construction work and at other times as directed. Perform test operations in sections as required and directed, to progress the Work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested. Contractor can utilize valves required to be installed in the permanent piping systems, or temporary valves or caps as required to perform the Work. The contractor is responsible to provide all isolation valves/flanges required in order to perform the pressure testing. Testing valves/flanges shall be indicated on the submitted shop drawings. Contractor shall also provide all vents required to vent the air out of the piping prior to performing a hydrostatic test. Fittings for pressure gauges shall be located at the top of the risers. Vent fittings and pressure gauge fittings shall be shown on the submitted shop drawings.
- D. 120-Hour Operational Tests:
 1. For mechanical systems that are not connected to or part of a Building Management System, the 120 hour test, which is to be performed by the Contractor, may be performed in multiple time periods which need not be contiguous provided that the total of all the time periods accumulates to at least 120 hours in the occupied mode. The following procedure shall be employed: The setup of the 120-hour Operational Testing shall be witnessed by the Authority. The setup will be verified that all data required to be monitored will be trended. All trended data shall remain within the accepted tolerance levels for the duration of the test. A separate chart recorder or data logger shall be used to trend monitored data.
 2. For mechanical systems that are connected to or part of a Building Management System, the 120-hour test shall consist of multiple contiguous occupied and unoccupied periods to verify that the systems perform the required sequence of operations in both the occupied and unoccupied time periods. The Contractor shall set up the system for the 120-hour test. The setup of the 120-hour Operational Testing shall be witnessed by the Authority and the Authority's Facilities Management Systems Integrator (FMSI). The FMSI shall verify that all data required to be monitored will be trended so that a hard copy printout is available for the period of two hours prior to occupancy to 2 hours after occupancy with samples taken every hour, as defined in Sequence of Operation.
- E. Accepted Tolerance Levels:

During occupied and unoccupied periods, the control loops under test shall maintain control of the process variable within the following tolerances:

- Room Temperature Loops +1°F
- Room Humidity +5% rated error of transmitter

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Certified Test Equipment and Instruments: Type and kind shall be as required for the particular system under test. All gauges, instruments and test devices shall be provided with a certificate of calibration and calibration curve or letter indicating that a minimum of five (5) test points have been calibrated. The certificate and letter must show date of last calibration. The calibration date must be within a year of the testing date.
- B. Test Media: Provide as specified for the particular piping or system under test.
- C. Cleaning Agent (chemical solution, steam, water): As specified for the particular piping, apparatus or system being cleaned.
- D. Glycol: Permanent type anti-freeze as manufactured by Dow Chemical Co. or Union Carbide.

PART 3 - EXECUTION

3.01 PRELIMINARY WORK

- A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering the systems. Prevent if possible and remove stoppages or obstructions from piping and systems.
- B. Thoroughly clean compressed air, control air, refrigerant pipe and similar systems prior to pressure or vacuum testing.

3.02 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall provide gas, refrigerant, energy, fuel, oil, water, air, light and electrical instruments as required for all testing, including testing associated with Special Inspections (unless otherwise noted).
- B. Although the Authority will select Special Inspection Firms and pay for all Special Inspection services, the Contractor shall furnish labor, material, and instruments necessary to conduct all acceptance tests at no additional cost to the Authority including testing associated with Special Inspections. Contractor shall provide access for Special Inspections and testing laboratory services.

3.03 PRESSURE TESTS – PIPING: Not Used.

3.04 TESTING OF EQUIPMENT, APPARATUS AND APPURTENANCES

- A. Relief Valves: Increase pressure in equipment or apparatus to relief valve setting to test opening of valves at required relief pressures.
- B. Damper: The dampers, deflectors, and other items and accessories, shall be tested and adjusted during the balancing of systems work. For details of damper adjustments, see Section 15993: Balancing of Systems.

- C. Test gauges. An indicating test gauge shall be connected directly to the boiler or pressure vessel where it is visible to the operator throughout the duration of the test. The pressure gauge scale shall be graduated over a range of not less than one and one-half times and not greater than four times the maximum test pressure. All gauges utilized for testing shall be calibrated and certified by the test operator. Reference Section MC 1011.2.

3.05 HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS - CLEANING AND OPERATIONAL TESTING

A. Glycol Systems:

1. Cleaning: Flush systems and apparatus, upon completion of pressure and miscellaneous tests. Completely open valves and flush each system with clean water, prior to chemical cleaning. Repeatedly flush at short intervals until twice the system water capacity has been flushed through. Chemically clean systems immediately following flushing operations. Circulate a solution consisting of trisodium phosphate, in a proportion of one pound of chemical to every 50 gallons of the glycol solution in the system. Completely fill system with cleaning solution; vent system and place in operation, with automatic controls operating and valves fully open. Allow system to reach design operating temperature or an operating temperature designated by the Authority. Circulate the solution through the system for a minimum of 4 consecutive hours; immediately drain system and flush with clean water until the pH at the farthest drain matches the clean water input. Keep strainers unplugged during cleaning operations. Remove and clean strainer screens prior to operational test. Refill system with the glycol solution (30% propylene glycol).
2. Operational Test: Run system in an automatic mode for a minimum of 120-Operational hours (after the Final Balancing as defined in Section 15993).

3.06 REFRIGERATION SYSTEMS

- A. As per Section MC 1108.1, every refrigerant-containing part of every system that is erected on the premises, except compressors, condensers, vessels, evaporators, safety devices, pressure gauges and control mechanisms that are listed and factory tested, shall be tested and proved tight after complete installation, and before operation. Tests shall include both the high-and low-pressure sides of each system at not less than the lower of the design pressures or the setting of the pressure relief device(s). The design pressures for testing shall be those listed on the condensing unit, compressor or compressor unit name-plate, as required by ASHRAE 15-2001.

All positive pressure tests shall be run for one-hour duration without any observed leakage. Release pressure, repair any leaks and retest each system as necessary until no leaks occur.

Exceptions:

1. Gas bulk storage tanks that are not permanently connected to a refrigeration system.
2. Systems using an A1 refrigerant erected on the premises with copper tubing not exceeding $\frac{5}{8}$ -inch (15.8 mm) OD, with wall thickness as required by ASHRAE 15, shall be tested in accordance with Section MC 1108.1, or by means of refrigerant

charged into the system at the saturated vapor pressure of the refrigerant at 70°F (21°C) or higher.

3. Limited-charge systems equipped with a pressure relief device, erected on the premises, shall be tested at a pressure not less than one and one-half times the pressure setting of the relief device. If the equipment or appliance has been tested by the manufacturer at one and one-half times the design pressure, the test after erection on the premises shall be conducted at the design pressure.
- B. As per Section MC 1108.1.1, where a compressor is used as a booster to obtain an intermediate pressure and discharges into the suction side of another compressor, the booster compressor shall be considered a part of the low side, provided that it is protected by a pressure relief device.
- C. As per Section MC 1108.1.2, in field-testing systems using centrifugal or other nonpositive displacement compressors, the entire system shall be considered as the low-side pressure for field test purposes.
- D. As per Section MC 1108.2, tests shall be performed with an inert-dried gas including, but not limited to, nitrogen and carbon dioxide. Oxygen, air, flammable gases and mixtures containing such gases shall not be used.

Exceptions:

1. The use of air is allowed to test R-717, ammonia, systems provided that they are subsequently evacuated before charging with refrigerant.
 2. Mixtures of dry nitrogen, inert gases, or a combination of them with nonflammable refrigerants in concentrations of a refrigerant weight fraction (mass fraction) not exceeding 5 are allowed for tests.
- E. As per Section MC 1108.3, the means used to build up the test pressure shall have either a pressure-limiting device or a pressure-reducing device and a gauge on the outlet side.
 - F. As per Section MC 1108.4, a certificate of test shall be provided for all systems containing 55 pounds (25 kg) or more of refrigerant. The certificate shall give the name of the refrigerant and the field test pressure applied to the high-side and the low side of the system. The certification of test shall be signed by the installer and shall be made part of the public record.
 - G. Dehydration: Following the positive pressure tests, dehydrate each system with a vacuum pump. Draw and hold an initial vacuum of 500 microns for five (5) minutes. Break this vacuum by pressurizing with dry nitrogen to 50 psig. Draw and hold a second vacuum of 250 microns for five (5) minutes. Verify vacuum obtained with a mercury (HG) column or an electronic vacuum gauge.
 - H. Refrigerant Charging:
 1. Introduce refrigerant of type and quantity required through a filter/drier installed in the temporary charging line.
 - a. Prevent moisture and other contaminants from entering the system.
 2. Charge liquid refrigerant through a charging valve provided in the high-pressure side of the system.

- a. Small amounts of gaseous refrigerant may be charged through the compressor suction service valve port.
 3. No bubbles shall appear at the moisture-liquid indicator when the system is fully charged and operational. Do not overcharge.
 4. Record the weight in pounds of refrigerant charged into each system.
- I. Operational Test: Run system in an automatic mode for a minimum of 120-Operational hours.

3.07 DUCTWORK LEAKAGE TESTING

A. Leakage Tests

1. All leakage tests for all systems shall be conducted in accordance with SMACNA HVAC Air Duct Leakage Test Manual, 2nd Edition-2012 and in accordance with Section C403.11.2.3 of the 2018 IECC and Section 6.4.4.2 of ASHRAE 90.1, allowing only 4 cfm/100 SF at 1" WC. For all ductwork leakage tests, the actual testing pressure shall be the maximum of 3" WC or the external static pressure of the unit as listed on the Drawing Schedule.
 2. One-hundred percent (100%) of all riser ductwork, inclusive of all supply risers and all return risers associated with each unit that supplies air to the spaces, shall be tested regardless of operating pressure.
 3. For ductwork associated with each unit that supplies air to the spaces (i.e. any unit supplying air such as AHU, RTU, etc.), perform leakage tests on 25% of the horizontal supply ductwork operating in excess of 3-inch WC, and, regardless of pressure, perform leakage tests on 25% of the horizontal supply ductwork upstream of VAV boxes, displacement induction units and chilled beams. Also perform leakage tests on 25% of all outdoor ductwork inclusive of all supply ductwork and all return ductwork per Section 6.4.4.2 of ASHRAE 90.1 associated with each unit that supplies air to the spaces. All indoor horizontal supply ductwork and all outside ductwork randomly selected by the Designer of Record as the 25% representative testing ductwork for each air handling unit shall not undergo any additional sealing prior to the ductwork leakage testing once the 25% representative testing ductwork has been identified.
 4. For all leakage tests, documentation shall be furnished demonstrating that 100% of all supply and return riser ductwork and representative sections totaling at least 25% of the duct area as noted above have been tested and that all tested sections meet the requirements. Positive pressure leakage testing is acceptable for negative pressure ductwork per Section 6.4.4.2 of ASHRAE 90.1-16. Any observed failures occurring with the testing of 25% of the duct area for units that supply air to the spaces shall result in subsequent 100% testing of all ducts associated with that air supply unit.
- B. Per Section MC 513.10.2, Smoke Control duct materials and joints shall be capable of withstanding the defined probable temperatures and pressures to which they are exposed. Smoke Control ductwork shall be leak tested to 1.5 times the maximum design operating pressure. Measured leakage shall not exceed 5% of design flow.
- C. Grease Duct Test per Section MC 506.3.2.5: Prior to the use or concealment of any portion of a grease duct system, a leakage test shall be performed. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the

ductwork from being visually inspected on all sides. The duct installer shall be responsible for providing the necessary equipment and performing the grease duct leakage test. A duct leakage test, in accordance with this section, shall be performed for the entire duct system, including the hood-to-duct connection. The duct work shall be permitted to be tested in sections, provided that every joint is tested.

To determine the tightness of the grease duct construction, a smoke test shall be made in accordance with the following conditions and requirements:

1. The test shall be performed in the presence of the special inspector.
2. The grease duct shall be filled with a thick penetrating smoke produced by one or more smoke machines, or smoke bombs. A static pressure equal to or not less than 2" wg shall be maintained throughout the test. The test shall be applied for a length of time sufficient to permit the inspection of the grease duct.
3. If the test shows any evidence of leakage or other defects, such defects shall be corrected in accordance with the requirements of this chapter, and the test shall be repeated until there is no visible smoke observed.

3.08 SMOKE CONTROL SYSTEMS : NOT USED.

3.09 VENTILATION SYSTEM SERVING COMMERCIAL COOKING APPLIANCES

- A. Per Section MC 507.16 and Section 6.5.7.2.4 of ASHRAE 90.1-2016, a performance test shall be conducted upon completion and witnessed by a representative of the Fire Department before final approval of the installation of a ventilation system serving commercial cooking appliances. The test shall verify the rate of exhaust airflow required by Section MC 507.13, makeup airflow required by Section MC 508, and proper capture and containment performance as specified in Section MC 507 and Section 6.5.7.2.4 of ASHRAE 90.1-2016. The permit holder (i.e. the Contractor) shall furnish the necessary test equipment and devices required to perform the tests.

3.10 NOISE CONTROL

- A. Exterior mechanical equipment (located outside of the building in a yard or court or on a roof, or located inside a building but open to the exterior of the building) shall comply with the requirements of Sections MC 928.2.1 and 928.2.2 and with the applicable requirements of Sections of the NY Administrative Code.
- B. Although the Authority will select the Acoustical Special Inspector to verify compliance with Section MC 928 and pay for all Special Inspection services, the Contractor shall furnish labor and material necessary to conduct all acceptance tests at no additional cost to the Authority. Contractor shall provide access for Special Inspections and testing laboratory services, including but not limited to providing the manpower to run the HVAC units while the Acoustical Special Inspector takes the necessary field measurements. For this Acoustical Special Inspection, the Special Inspector will provide all sound level measuring instruments.

In addition, contractor shall run applicable equipment necessary to conduct internal noise measurements in the Auditorium, Gymnasium, Library, and three randomly selected classrooms.

3.11 HVAC SYSTEM CLEANING

- A. The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system as defined herein.
- B. The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts to the air handling unit (DOAS), the interior surfaces of the DOAS, mixing box, coil compartment, condensate drain pans, dehumidifiers, supply air ducts, fans, fan housing, fan blades, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system. The HVAC system shall also include other components such as dedicated exhaust and ventilation components and make-up air systems.
- C. Prior to the commencement of any cleaning work, the HVAC contractor shall perform a visual inspection of the HVAC system to determine appropriate methods, tools, and equipment required to satisfactorily complete the cleaning. The cleanliness inspection should include air handling units and representative areas of the HVAC system components and ductwork. In HVAC systems that include multiple air handling units, a representative sample of the units should be inspected. The cleanliness inspection shall be conducted without negatively impacting the indoor environment through excessive disruption of settled dust, microbial amplification or other debris.
- D. Debris removed during cleaning shall be collected and precautions shall be taken to ensure that debris is not otherwise dispersed outside the HVAC system during the cleaning process.
- E. Particulate Collection: Where the particulate collection equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the particulate collection equipment is exhausting outside the building, mechanical cleaning operations shall be undertaken only with particulate collection equipment in place, including adequate filtration to contain debris removed from the HVAC system. When the particulate collection equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.
- F. Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be visibly clean. Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.
- G. Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.
- H. Rigid fiberglass duct systems shall be resealed in accordance with North American Insulation Manufacturers Association (NAIMA) recommended practices. Only closure techniques that comply with UL Standard 181 or UL Standard 181a are suitable for fiberglass duct system closures.
- I. Air distribution devices (registers, grilles & diffusers): The contractor shall clean all air distribution devices.

- J. Air handling units, terminal units (VAV boxes, etc.), blowers and exhaust fans: The contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (including ceiling return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed. Contractor shall:
 - 1. Clean all air handling units (AHU) internal surfaces, components and condensate collectors and drains.
 - 2. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.
 - 3. Clean all coils and related components, including evaporator fins.
- K. For duct systems, Contractor shall mechanically clean all duct systems to remove all visible contaminants.
- L. Mechanical Cleaning Methodology

Source Removal Cleaning Methods: The HVAC system shall be cleaned using source removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select source removal methods that will render the HVAC system visibly clean, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.

- 1. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.
 - 2. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.
 - 3. All vacuum devices exhausting air outside the facility shall be equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.
 - 4. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those, which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.
- M. Methods of Cleaning Fibrous Glass Insulated Components
 - 1. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable National Air Duct Cleaners Association (NADCA) and NAIMA standards and recommendations.

2. Cleaning methods used shall not cause damage to fibrous glass components.

N. Damaged Fibrous Glass Material

1. Evidence of damage: If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.
2. Replacement: Contractor shall remediate exposed damaged insulation in air handlers and/or ductwork requiring replacement.
3. Replacement material: In the event fiberglass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL 181 and SMACNA.

O. Cleaning of coils

1. Any cleaning method may be used which will render the coil visibly clean. Coil drain pans shall be subject to non-porous surface cleaning. The drain for the condensate drain pan shall be operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

P. Antimicrobial Agents and Coatings

1. Antimicrobial agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.
2. Application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.
3. When used, antimicrobial treatments and coatings shall be applied in strict accordance with the manufacturer's written recommendations and EPA registration listing.
4. Antimicrobial coatings shall be applied according to the manufacturer's written instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than "fogged" downstream onto surfaces.

Q. Cleanliness Verification

1. General: Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.
2. Visual Inspection: The HVAC system shall be inspected visually to ensure that no visible contaminants are present.

- a. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the owner reserves the right to further verify system cleanliness.
- b. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

3. Verification of Coil Cleaning

- a. Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

R. Post-Cleaning Report

At the conclusion of the cleaning, the Contractor shall provide a report to the Authority and Architect/Engineer of Record indicating the following:

1. Success of the cleaning project, as verified through visual inspection.
2. Areas of the system that were found to be damaged and/or needed repair which were remediated by the Contractor.

3.12 SEQUENCE OF NETWORK SYSTEM INTERDISCIPLINARY/FUNCTIONAL PERFORMANCE TESTS, BALANCING AND OPERATIONAL TESTS

A. The sequence of events shall be as follows:

1. Contractor shall start up all systems and do an initial (rough) balance.
2. After the Contractor's successful testing of the Building Management System/Direct Digital Control System (BMS/DDC), the Contractor shall Commission/Demonstrate to the Commissioning Authority all equipment and verify that the sequence of operations is achieved. The Interdisciplinary/ Functional Performance Test forms for correctly functioning systems will be signed by the Commissioning Authority. After the completion of above, this portion of the work may be considered to be Substantially Complete, subject to the review of the Architect/Engineer of Record.
3. Following Steps 1 and 2, the Contractor shall perform a Final Balance as defined in Balancing of Systems specification section.
4. The Contractor shall then perform the applicable Seasonal 120-hour Operational Tests as described herein.
5. The Contractor shall complete the Final Balance of Step 3 and the applicable Seasonal 120-hour Operational Test of Step 4 within sixty (60) days of being awarded Substantial Completion. Contractor shall be required to operate and maintain all HVAC equipment controlled by the Building Management System/Direct Digital Control (BMS/DDC) System if the Final Balance and applicable 120-hour Operational Test are not completed within sixty (60) days after Substantial Completion. The work shall not be considered to be final until the remaining next Seasonal 120-hour Operational Test has been approved.

6. Note that two separate 120-hour Operational Tests shall be performed; one for heating systems and another for cooling systems.

END OF SECTION

SECTION 230593
BALANCING OF SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This specification section shall be followed for the requirements for the final adjusting and balancing of air and hydronic fluid distribution systems, including the equipment and devices associated with each system to produce the design objectives.
- B. The Work shall include checking installations for conformity to design, setting final flow and fan and pump speed, adjusting equipment and devices, recording data, preparing and submitting final balancing reports, and recommending modifications to the mechanical installations.
- C. The following related work is specified in other Sections, and is not part of the Work of this Section:
 - 1. Installation and start-up of equipment and devices
 - 2. Pressure testing of piping and leakage testing ductwork systems.
 - 3. Electrical hook-up and wiring of equipment and devices
- D. Sequence of Network System Interdisciplinary/Functional Performance Tests, Balancing and Operational Tests shall be as follows:
 - 1. Contractor shall start up all systems and do an initial (rough) balance.
 - 2. After the Contractor's successful testing of the Building Management System/Direct Digital Control System (BMS/DDC) the Contractor shall Commission/Demonstrate to the Commissioning Authority all equipment and verify that the sequence of operations is achieved.
 - 3. Following successful completion of Steps 1 and 2, the Contractor shall perform a Final Balance as defined herein.
 - 4. The Contractor shall then perform the applicable Seasonal 120-hour Operational Tests.
 - 6. The Contractor shall complete the Final Balance of Step 3 and the applicable Seasonal 120-hour Operational Test of Step 4 within sixty (60) days of being awarded Substantial Completion. Contractor shall be required to operate and maintain all HVAC equipment controlled by the Building Management System/Direct Digital Control (BMS/DDC) System. If the Final Balance and applicable 120-hour Operational Test are not completed within sixty (60) days after Substantial Completion. The work shall not be considered to be final until the remaining next Seasonal 120-hour Operational Test has been approved.
- E. Retain the services of an independent testing, adjusting, and balancing firm meeting the qualifications specified to be the single source of responsibility to test, adjust, and

perform a final balance of the building mechanical systems specified and identified in this Project.

1.02 PERFORMANCE REQUIREMENTS

- A. Procedures, measurements, instruments and final reports for adjusting and balancing work shall comply with the applicable provisions of the codes, standards, recommendations of the following:
 - 1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
 - 2. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) HVAC SYSTEMS Testing, Adjusting & Balancing Manual (latest edition)
 - 3. National Environmental Balancing Bureau (NEBB)
 - 4. Associated Air Balance Council (AABC)
 - 5. Testing, Adjusting and Balancing Bureau (TABB)
 - 6. New York Construction Codes
- B. The final air delivery or intake of each diffuser, grille and register shall be as designed or within 10% of the airflow rates shown on the Drawings.
- C. The final fan airflow rate and static pressure rise across the fan shall be within 10% above the design value at design speed.

1.03 JOB CONDITIONS

- A. Contractor shall have the balancing specialist review all the work with the respective manufacturers of the equipment and devices involved and shall coordinate all the Work. The balancing specialist shall examine the Drawings and Specifications to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper adjusting and balancing of systems and equipment.
- B. Provide balancing dampers, pressure taps, gauges, valves, and any other items and components as required for a properly balanced system, whether or not specified herein or shown on the Drawings, all at no additional cost to the Authority. Adjustment or replacement of parts recommended by the balancing specialist shall be made in strict accordance with the respective manufacturer's recommendations.
- C. General Contractor shall have the Temperature Control Contractor set the adjustment of the automatically operated dampers, control valves and all the other items and accessories to operate as required by the balancing contractor.

1.04 SUPPLEMENTAL QUALITY ASSURANCE

- A. Persons performing the Work of this Section shall be certified by NEBB, AABC or TABB and shall have experience on at least 2 projects involving same complexities to those required under this Contract. The testing, adjusting and balancing firm shall have a

Professional Engineer registered in the State of NY (on staff or a sub-consultant of the testing, adjusting and balancing firm) who shall sign and seal all the reports.

1.05 SUPPLEMENTAL SUBMITTALS

- A. Qualification Data: Firms performing the work of this Section shall be on the "HVAC Certified Testing and Balancing Firms" list of the Authority's Contractor Qualification Unit.
- B. Submit blank forms of reports indicating all data to be included and step-by-step procedures. All forms submitted shall be the standard forms issued by NEBB or AABC or as illustrated in the SMACNA HVAC SYSTEMS Testing, Adjusting & Balancing Manual. Custom made forms are not acceptable.

Sample of Report Forms:

Submit standard report forms according to AABC, NEBB or SMACNA standards as an example of the forms that will be submitted when the balancing report is completed. Forms shall include but not be limited to the following information:

- 1. Title Page:
 - a. Company name
 - b. Company address
 - c. Company telephone number
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
- 2. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model
 - d. Serial number
 - e. Range
 - f. Calibration date
- 3. System Diagrams: Include schematic layouts of air, hydronic and steam distribution systems. Present each system with single-line diagram and include the following:
 - a. Quantities of outside, supply, return, and exhaust airflows
 - b. Water and steam flow rates
 - c. Duct, outlet, and inlet sizes
 - d. Pipe and valve sizes and locations
 - e. Terminal units, including VAV
 - f. Balancing stations
 - g. Position of balancing devices

4. Air Moving Equipment: (Supply Fans)
 - a. Location
 - b. Manufacturer
 - c. Model
 - d. Airflow, specified and actual
 - e. Return airflow, specified and actual
 - f. Outside airflow, specified and actual
 - g. Total static pressure (total external), specified and actual
 - h. Inlet pressure
 - i. Discharge pressure
 - j. Fan RPM
5. Exhaust Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model
 - d. Airflow, specified and actual
 - e. Total static pressure (total external) specified and actual
 - f. Inlet pressure
 - g. Discharge pressure
 - h. Fan RPM
6. Electric Motors:
 - a. Manufacturer
 - b. HP/BHP
 - c. Phase, voltage, amperage; nameplate, actual, no load
 - d. RPM
 - e. Service factor
 - f. Starter size, rating, heater elements
7. V-Belt Drive:
 - a. Identification/location
 - b. Required driven RPM
 - c. Driven sheave, diameter and RPM
 - d. Belt, size and quantity
 - e. Motor sheave, diameter and RPM
 - f. Center to center distance, maximum, minimum, and actual
8. Duct Traverse (single measurements without traversing the ducts are not acceptable):
 - a. System zone/branch
 - b. Duct size
 - c. Area
 - d. Design velocity
 - e. Design airflow
 - f. Test velocity
 - g. Test airflow
 - h. Duct static pressure

- i. Air temperature
 - j. Air correction factor
- 9. Variable Air Volume Boxes: Not Used.
- 10. Air Distribution Test Sheet:
 - a. Air outlets and inlets number
 - b. Room number/location
 - c. Outlets and inlets type
 - d. Outlets and inlets size
 - e. Area factor
 - f. Design velocity
 - g. Design airflow
 - h. Test (final) velocity
 - i. Test (final) airflow
 - j. Percent of design airflow
- 11. Outlets and Inlets Unit Data:
 - a. Manufacturer
 - b. Type, constant, variable, single duct
 - c. Identification/number
 - d. Location
 - e. Model
 - f. Size
 - g. Minimum static pressure, specified
 - h. Minimum design airflow, specified and actual
 - i. Maximum design airflow
 - j. Maximum actual airflow
 - k. Inlet static pressure, actual
- 12. Rooftop Units
 - a. Location
 - b. Manufacturer
 - c. Model
 - d. Total Output capacity MBH, specified and actual
 - e. Inlet gas pressure, specified and actual
 - f. Heating Capacity, specified and actual
 - g. Air Conditioning Capacity, specified and actual
 - h. Airflow, supply specified and actual
 - i. Outside airflow, specified and actual
 - j. Return airflow, specified and actual
 - k. Entering-air temperature.
 - l. Leaving-air temperature.
 - m. Total system static pressure, specified and actual
 - n. Fans RPM
 - o. Discharge static pressure
 - p. Sheave make, size in inches, and bore.
 - q. Sheave dimensions, center-to-center, and amount of adjustments in inches.

13. Pump Data:
 - a. Identification/number
 - b. Manufacturer
 - c. Size/model
 - d. Impeller
 - e. Service
 - f. Design flow rate, pressure drop, BHP
 - g. Actual flow rate, pressure drop, BHP
 - h. Discharge pressure
 - i. Suction pressure
 - j. Total operating head pressure
 - k. Shut off, discharge and suction pressures
 - l. Shut off, total head pressure
 14. Chillers: Not Used.
 15. Air Cooled Condensers and Condensing Units:
 - a. Identification/number
 - b. Location
 - c. Manufacturer
 - d. Model
 - e. Design and actual pressure drop, flow and temperatures.
 16. Cooling Coil Data: Not Used.
 17. Heating Coil Data: Not Used.
 18. Duct Leak Test (as described in SMACNA):
 - a. Description of ductwork under test
 - b. Duct design operating pressure
 - c. Duct test static pressure, actual
 - d. Duct capacity, airflow
 - e. Test apparatus
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated
 - f. Test orifice differential pressure
- C. Submit copies of the marked-up Contract Drawings and Certificate of Conformance Certification that assures that the balancing specialist has performed their contracted services in accordance with the applicable agency's (NEBB, AABC or TABB) standards and procedures. Copies of Contract Drawings shall be marked up and indicate outlet/inlet diffuser, register and grille identification.
- D. Submit certified reports signed by the registered professional engineer referred to in Article 1.04.A. Submit final testing and balancing results on applicable report forms, as approved and as furnished by the agency that is certifying the independent member firm performing the Work. The certifying agencies' Instrument Calibration Report should be

included in the submission of the completed final balancing forms. Lack of submission of the certifying agencies' Instrument Calibration Report shall be cause for rejection. The reports shall be certified proof that the systems have been tested, adjusted and balanced; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems. Each final system report form shall bear the signature of the person performing the Work and the signature of the registered professional engineer referred to in Article 1.04.A. Include in final reports uncorrected installation deficiencies noted during the process of adjusting and balancing and applicable explanatory comments.

1.06 SCHEDULING

- A. Perform balancing Work in the presence of the Authority's Representative. The Authority's Construction Inspection Division reserves the right to spot check the installation to verify compliance.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

- A. Unless otherwise shown on the Drawings, use same products as originally installed for patching holes in insulation, ductwork and housings that have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Do not proceed with adjusting and final balancing until unsatisfactory conditions have been corrected in a manner approved by the balancing specialist and the Authority.
- B. Examine the air systems to see that they are free from obstructions. Determine that all dampers, grilles and registers are open, that moving equipment is lubricated, that clean filters are installed, pneumatic and automatic controls are functioning, and perform other inspection and maintenance activities necessary for proper operation of the systems.
 - 1. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.
- C. Examine the hydronic and steam systems to see that they are free from abnormal obstructions, and that all piping, valves and equipment have been properly made fully operational. Determine that all equipment and control systems are performing correctly by functional testing.

3.02 BALANCING AND ADJUSTING - GENERAL REQUIREMENTS

- A. Notify the Authority when any deficiencies are detected, whether associated with design, installation, or equipment.
- B. Balancing specialist shall perform all the procedures and compile all the data for all air, hydronic and steam systems. All standard forms (NEBB, AABC, or SMACNA) approved by the certifying agency (NEBB, AABC or TABB) shall be completed as applicable to the

particular project. Missing or incomplete forms shall be justification to reject the balancing report.

- C. Data shall include a schematic diagram locating the air inlets, air outlets, variable-air volume boxes, roof-top units, fans, equipment, dampers and regulating devices for air systems, a schematic diagram for location of balancing valves, flow indicators, equipment, and devices for hydronic systems and a schematic diagram for location of equipment, and devices for the steam systems.
- D. All instruments used shall be accurately calibrated and maintained in good working order.
- E. Balancer shall work with the Temperature Controls Contractor (TCC) to verify that the TCC provided software yields the same flow results as reflected in the final balancing report.

3.03 AIR BALANCING

- A. The final adjusting and balancing of air systems shall include but not be limited to the following:
 - 1. Record and adjust fan rpm to design requirements.
 - 2. Record motor full load amperes.
 - 3. Make pitot tube traverse of main supply and return ducts and obtain actual flow rate of fans. Single measurements without traversing the ducts are not acceptable.
 - 4. Record system static pressure, velocity pressure and total pressure.
 - 5. Adjust system for design supply, transfer and return airflow rate.
 - 6. Adjust system for minimum and maximum (economizer) design flow rates of outside air.
 - 7. Record return air temperatures.
 - 8. Record entering mix air temperatures.
 - 9. Record leaving air temperatures.
 - 10. Adjust all main supply, return, relief, and exhaust air ducts to proper design flow rate.
 - 11. Adjust each diffuser, grille and register.
 - 12. Each grille, diffuser and register shall be identified as to location and area on the schematic diagram.
 - 13. Size, type and manufacturer of diffusers, grilles and registers and all tested equipment shall be identified and listed in the final report. Manufacturer's data on all equipment shall be used to make required calculations for adjusting and

balancing. Readings of diffusers, grilles and registers shall include design required and resultant velocity, required and resultant flow rate after adjustments.

14. All diffusers, grilles and registers shall be adjusted to minimize drafts in all areas.
 15. Dampers shall be permanently marked after air balance is complete so that they can be restored to their correct position, if disturbed later.
 16. Openings in ductwork for pitot tube insertion shall be sealed with snap-in plugs after air balance is complete.
- B. Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
1. Set outside-air dampers at minimum, and return air dampers at a position that simulates full-cooling load.
 2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 3. Measure total system airflow. Adjust to within indicated airflow.
 4. Set terminal units at maximum airflow and adjust to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units.
 5. Set terminal units at minimum airflow and adjust to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
 6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets.
 7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
 8. Record the final fan performance data.

3.04 HYDRONIC SYSTEMS

The adjusting and balancing of hydronic systems shall include but not limited to the following:

- A. Examine water in systems and determine if water has been treated and cleaned.
- B. Check expansion tank to determine that it is not air bound.

- C. Purge all air vents at high points of water systems, check automatic air vents and determine if they are operating properly.
- D. Coordinate with Temperature Controls Contractor for required cooling and heating temperature controls and corresponding automatic valve operation settings.
- E. Open all normally open valves to full open position. Set automatic valves to full coil flow.
- F. Complete air balance shall have been accomplished before final water balance begins.
- G. Check water pumps for pump rotation and for proper flow rate delivery against manufacturers' pump curves.
- H. Set all balancing valves for required flow delivery at mains and branch mains to cooling and heating elements.
- I. Upon completion of final flow readings and adjustments of balancing valves, mark all settings and record data, so that they can be restored to their correct final "balanced" position, if disturbed later.
- J. After required cooling and heating temperature controls and balancing valve operation settings are made, recheck pump flow requirements and readjust system as required.
- K. Record pressure drop through coil at set flow rate of coil for full cooling and on full heating. Set pressure drop across bypass valve to match coil pressure drop.
- L. Record and check the following items at each cooling and heating element:
 - 1. Inlet water temperatures and static pressure at connections.
 - 2. Leaving water temperatures and the pressure drop of each coil.
 - 3. Flow rate through coil with control valve manually wide open.
- M. Record operating suction and discharge pressures of each pump and final total dynamic head and rated amperage versus actual amperage of pump motors.
- N. Record entering and leaving water temperatures and flow through all equipment and devices.
- O. Check and record all flow rates at all locations in the piping system with flow meters.

3.05 STEAM SYSTEMS: Not Used.

END OF SECTION

SECTION 230719
PIPING INSULATION (HVAC)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide thermal insulation on the piping (HVAC) required on this Project, as needed for a complete and proper installation. All insulation materials shall be free of asbestos.

1.02 RELATED SECTIONS

- A. Division 23 Sections

1.03 SUPPLEMENTAL SUBMITTALS

- A. Schedule listing items to be insulated, description of insulation and finishing procedures

1.04 SUPPLEMENTAL QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least three years successful installation experience on projects with mechanical insulations similar to that required for this Project.

- B. Code and Standards

1. Insulation characteristics: Per Sections MC 1204.1 and MC 1204.2 of the Mechanical Code, pipe insulation installed in buildings shall conform to the requirements of the Energy Conservation Code of New York, shall be tested in accordance with ASTM E84 or UL 723 per Section MC 604.3 and shall have a maximum flame spread index of 25 and a smoke developed index not exceeding 450. Insulation installed in an air plenum shall comply with Section MC 602.2.1. Section MC 602.2.1 requires that materials exposed within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E84 or UL 723 per Section MC 604.3. Hydronic piping shall be insulated to the thickness required by the Energy Conservation Code of New York.
2. All insulation material shall be in accordance with the above ASTM E84 requirements or UL 723, using the specimen preparation and mounting procedures of ASTM E2231 per Section MC 604.3.
3. Comply with ASTM, ASHRAE and New York Energy Conservation Code Standards.
4. Testing of material shall be in accordance with the Administrative Code (reference Section MC 301.5).

1.05 TEMPERATURE REQUIREMENT

- A. Apply adhesive, sealers, coating, and all other items and accessories at the proper temperature as recommended by the manufacturer. If ambient conditions are not

acceptable, provide temporary heat as required for proper installation without any delay to the Project completion.

1.06 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields
- B. Coordinate clearance requirements with piping installer for insulation application. Establish and maintain clearance requirements for installation of insulation and any field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Approved Manufacturers:

Armacell LLC.
CertainTeed Corp.
Knauf Insulation
Johns Manville
The Dow Chemical Company (Building Materials)
Owens-Corning Fiberglas Corp. (including Owens Corning Evolution and VaporWick)
Pittsburgh Corning Corp.
Rubatex Corp.
3M VentureClad
Polyguard Products Inc.
Roxul
HITLIN Visionary Industrial Insulation

2.02 MATERIALS

- A. Adhesives and Sealants for Insulation: All adhesives and sealants used on interior building insulation shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Foam insulation materials shall not use CFC or HCFC agents in the manufacturing process.

D. Pipe Insulation

1. One-piece molded sectional fiber glass insulation made from inorganic glass fibers bonded with a thermosetting resin and shall have a nominal 4-pound density with a thermal conductivity (k) per Table C403.11.3 of the 2018 IECC and Tables 6.8.3-1 and 6.8.3-2 of ASHRAE 90.1-2016. Insulations shall have factory-applied all-service jacket (ASJ) and adhesive used to adhere the jacket to the insulation. Insulation shall be suitable for use on piping up to 450°F operating temperature.
2. Preformed polyisocyanurate closed cell insulation with a k-factor of 0.19 at 75°F mean temperature and factory applied Polyvinylidene Chloride (PVDC) vapor retarder film for use in the chilled water supply and return lines and refrigerant lines the equal to Trymer 2000 with Saran Vapor Retarder by The Dow Chemical Company. Vapor retarder, Polyguard Zero-Perm is also acceptable. The insulation thickness shall provide equivalent thermal resistance as defined in Article 3.04.C.
3. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation made from inorganic glass fibers bonded with a thermosetting resin with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth. This type of wicking insulation shall be applied inside as an alternate to the cold piping (chilled water supply and return, refrigerant) systems. Provide Knauf PermaWick Pipe Insulation or Owens Corning VaporWick Pipe Insulation (or equal).
4. Fiber Free Elastomeric Foam: closed-cell material having a thermal conductivity of 0.25 at 75°F mean temperature.
5. Mineral Wool High Temperature Insulation: inorganic fibers derived from basalt volcanic rock with a thermosetting resin binder rated up to 1200°F in accordance with ASTM C447. Maximum flame spread rating shall be 5 and smoke developed rating of 0 when tested in accordance with ASTM E84, UL723, CAN/ULC-S102-M. Mineral wool shall be rated as non-combustible in accordance with ASTM E136 and CAN4-S114-M. Mineral wool shall be fungi resistant in accordance with ASTM C1338. Mineral wool water vapor sorption shall be less than 1% by weight, less than 0.02% by volume at 120°F and 95% RH in accordance with ASTM C1104. (Johns Manville MinWool-1200 Pipe, Roxul ProRox PS960NA (formerly known as Techton 1200) or equal).
6. Asbestos free rigid hydrous calcium silicate block, minimum 15-pound density insulation, K of 0.50 at 300°F per ASTM C533.

E. Jackets

1. Factory-applied: ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing. PVDC-SSL

Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip. For cold water pipe insulation, the jackets shall be the vapor barrier type, ASJ, PVDC, or polyester aluminum Zero-Perm products.

2. PVC Plastic: Zeston, one-piece molded type fitting covers and jacketing material, gloss white. Connections: Tacks, pressure sensitive color matching vinyl tape.
3. For indoor pipe insulation applications, vapor barrier jacket for insulation shall be a laminated five-ply self-adhesive material, high puncture and tear resistant; zero permeability; manufactured with mold inhibitors such as Alumaguard Lite, Alumaguard "All Weather" LT, VentureClad 1577CW, VentureClad 1577CW-E or equal. Per Section C403.11.3.1 of the 2018 IECC, adhesive type materials are not permitted for piping insulation exposed to weather. For outdoor pipe insulation applications, jackets for insulation shall be made of 0.016" aluminum or stainless steel held with friction type, Z-locks, 12" apart. Per Section 6.4.4.1.1 of ASHRAE 90.1-16, insulation exposed to weather shall be suitable for outdoor service, e.g., protected by aluminum or sheet metal cover. Cellular foam insulation shall be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation that can cause degradation of the material.

F. Insulation and accessories for valves, fittings, flanges etc. shall include the following:

1. One-pound density fiberglass blanket.
2. Segments of pipe insulation.
3. Pre-molded fiberglass fittings.
4. No. 20 gage galvanized steel or annealed wire.
5. Insulating cement.
6. In lieu of using coated pre-molded fittings for insulating fittings, valves etc., Zeston premolded 20-mil thick, high impact ultraviolet-resistant one-piece PVC fitting covers and precut Hi-Lo-Temp insulation inserts as manufactured by Johns Manville are acceptable. For chilled water pipes and refrigerant pipes/tubing, the use of prefabricated insulation for valves, fittings, flanges etc. manufactured by The Dow Chemical Company is acceptable. For cold piping systems (chilled water supply and return lines, refrigerant lines), the use of the wicking type insulation for valves, fittings, flanges etc. manufactured by The Owens Corning is acceptable.

G. Bands, staples, tapes, wires, cements, adhesives, sealers and protective finishes: As specified herein or as recommended by insulation manufacturer for proper uses on piping insulations.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Before applying the insulation, all tests specified in Division 1 and Division 15 Sections should have been completed acceptable to the Authority's Representative. However, thermal insulation can be applied to pipes prior to these tests providing that all fittings are left bare to permit detection and possible leaks.

3.02 SUPPLEMENTAL INSTALLATION

- A. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.
- B. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- C. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D. Maintain integrity of vapor-barrier jackets on pipe insulation and protect to prevent puncture or other damage.
- E. Valves shall be insulated up to packing unit.
- F. Fire Seal Application: Where pipes pass through fire walls, fire partitions, fire rated pipe chase walls or floors above grade, insulation shall pass through and a UL classified assembly shall be provided.
- G. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
- H. The temperature of the jacket shall not exceed 200°F.
- I. Paper laminated jackets shall be permanently treated to retain the flame spread and smoke developed rating. Chemicals used for treating paper jacket laminates shall not be water-soluble and shall be unaffected by water and humidity.
- J. Fiberglass insulation joints shall be sealed with butt strips that are compatible with the required facing. Stapling shall not be required to complete the closure. Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed. On cold systems, vapor barrier shall be provided. All penetrations and exposed ends of insulation shall be sealed with mold resistant vapor barrier mastic.
- K. Insulation on all cold surfaces shall be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation.
- L. All surface finishes are to be extended to protect all surfaces, ends and raw edges of insulation.
- M. General valves, fittings, etc. shall be insulated as follows:

1. For pipe sizes smaller than 4" wrap firmly under a minimum of a 3:1 compression, with 1-pound density fiberglass blanket, to a thickness equal to adjoining insulation. Secure with No. 20-gage galvanized or annealed steel wire. Finish with a smooth coat of insulating cement.
 2. For pipe sizes 4" and larger, fit segments of pipe insulation equal in thickness to adjoining insulation and secure with No 20-gage galvanized or annealed steel wire. Finish with a smooth coat of insulating cement.
 3. In lieu of the foregoing methods, the use of pre-molded fiberglass fittings of the same thickness of adjoining pipe insulation will be accepted. Finish with a smooth coat of insulating cement.
 4. In lieu of the foregoing methods, the use of preformed PVC fitting covers with factory precut Hi-Lo Temp insulation insert of the same thickness as adjoining pipe insulation will be accepted. Valves, fittings, etc. shall be insulated by applying the proper factory precut Hi-Lo Temp insulation insert to the pipe fitting, valve, etc. The ends of the Hi-Lo Temp insulation insert shall be tucked snugly into the throat of the fitting, valve etc. and the edges adjacent to the pipe covering tufted and tucked in, fully insulating the pipe fitting, valve, etc. 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 shall then be applied and shall be secured with pressure sensitive 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.
 5. For cold piping systems (chilled water supply and return lines, refrigerant lines) when using the wicking type of insulation: Valves, fittings, etc. shall be wrapped continuously with wicking material prior to installing insulation to ensure a continuous path. Valves, fittings, etc. shall be insulated to the same thickness as the adjoining insulation. Apply as per manufacturer's instructions. Seal all joints with VaporWick Sealing Tape.
- N. Cold Piping: Install the fiberglass, polyisocyanurate closed cell or wicking type insulation with factory supplied vapor barrier jacket. The use of staples on vapor barrier jacketed insulation is not permitted. The use of self-adhesive vapor barrier jacket on cold water piping systems will be accepted for interior applications. The use of elastomeric closed cell fiber free foam is also acceptable.
- O. Hot Piping: Install the fiberglass insulation with factory supplied jacket. Butt all joints firmly together and smoothly secure all jacket laps and joints strips with lap adhesive. Valves, fittings, etc. shall be insulated as specified in the Article 3.02.L.
- P. Insulation for the dual temperature piping shall be of the thickness specified for hot piping, and shall have the vapor barrier jacket specified for cold piping.
- Q. Emergency/Standby Generator Exhaust Pipe and Muffler shall be insulated using pre-molded mineral wool fiber insulation or asbestos free rigid hydrous calcium silicate block insulation of the thickness specified in accordance with the manufacturer's approved instructions to achieve a surface temperature not exceeding 200°F per MC 811.1.3. Insulation shall be firmly applied in place with all joints butted tightly and mechanically

fastened in place by wiring using 16-gauge nickel copper alloy or copper clad steel wire on maximum 6-inch centers. Stainless Steel or aluminum 0.016" thick roll jacketing shall be secured with 1/2" by 0.020" thick stainless steel or aluminum bands on maximum 12-inch centers. Fittings, valves, tees, flanges, connections, etc. shall be insulated with mitered segments of pipe insulation glued together with Super Calstik adhesive and wired in place. These fittings then shall be covered with the roll jacketing.

R. Insulation and Protection at Points of Support

1. Install inserts made from rigid calcium silicate pipe insulation at all points of support. Inserts shall be not less than 12" long and of thickness equal to adjoining insulation. A jacket shall be installed over the insert with longitudinal laps and butt strips for circumferential joints smoothly secured with insulation adhesive. Jacket shall provide vapor barrier where required.
2. Install galvanized steel shields between supports and inserts. Shields shall be formed to fit the insulation and shall extend up to the centerline of the pipe and of the length specified for the inserts. Supports shall not pierce the insulation and all vapor barriers shall be unbroken and continuous.
3. In lieu of the foregoing methods, the use of factory fabricated saddle and shields specified in Section 15510 will be accepted.

S. Outdoor Piping

1. All exposed pipes shall be insulated in accordance with the hot or cold piping Paragraphs as required and shall further be protected with a weatherproof finish. Install aluminum or stainless steel jacket. Joints shall be sealed along the longitudinal seam and circumferential joints with butt strips, minimum 2" wide. Insulation shall be of the waterproof construction.
2. Fitting and valves shall be insulated with segments of the molded insulation and shall be covered using preformed aluminum or stainless steel fittings identical in composition to the jacket. All joints shall overlap 1" and shall be completely weather proof.

- T. Frostproofing: When the Drawings indicate piping to be frostproofed, it shall be insulated with two layers of molded fiberglass insulation with an outdoor pipe type of jacket. The final insulation shall be protected with a casing of 0.016" thick aluminum or stainless steel applied with aluminum or stainless lock-type bands, 12" apart. Where the piping is installed within a furred enclosure, the casing shall be omitted.

3.03 PROTECTION AND REPLACEMENT

- A. Replace damaged insulation during construction that cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Insulation worker shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

3.04 SCHEDULE OF PIPE INSULATION

- A. The following piping systems shall be insulated:
1. Cold water, make-up water, supply and return piping for hot, chilled, refrigerant and dual temperature water systems. Bonnets of valves in hot, chilled and dual temperature water piping shall also be insulated.
 2. Condensate drain line from unit ventilator and fan coil unit drain pan.
 3. Refrigerant piping**
 4. Sprinkler risers concealed in exterior of the building.
 5. Emergency/Standby Generator exhaust pipe and muffler.
- B. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets, flexible connections and expansion joints.
- C. Required Thickness (per Table C403.11.3 of the 2018 IECC and Tables 6.8.3-1 and 6.8.3-2 of ASHRAE 90.1-2016)

Fluid Operating Temperature Range and Usage (°F)	Insulation Conductivity BTUin/hrft ² °F	Insulation Conductivity Mean Rating Temperature °F	Nom Dia <1"	Nom Dia 1" to < 1.5"	Nom Dia 1.5" to < 4"	Nom Dia 4" to 8"	Nom Dia <= 8"
>350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140**	0.22-0.28	100	1.0	1.0	1.5	1.5	1.5
40-60**	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
<40	0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

For piping smaller than 1.5" and located in partitions within conditioned spaces, reduction of the above thicknesses by 1" shall be permitted (before the thickness adjustment required for insulation having a conductivity outside the stated conductivity range) but not to a thickness less than 1".

For insulation outside the stated conductivity range, the minimum thickness shall be determined by footnote b of Table C403.11.3 (footnote 'a' of ASHRAE 90.1-16 Tables 6.8.3-1 and 6.8.3-2).

MISCELLANEOUS:

System Temp, F	Pipe 1" & Below	Pipe 1¼" to 2"	Pipe 2½" to 4"	Pipe Above 4"
=====				
Emergency/Standby Generator Exhaust Pipe and Muffler		*	*	*

* Thickness shall be in accordance with the manufacturer's approved instructions for pre-molded mineral wool fiber insulation or asbestos free rigid hydrous calcium silicate block insulation to provide a surface temperature not exceeding 200°F.

** ASHRAE 90.1-16 Article 6.4.4.1.3 Exception 2 and 2018 IECC Section C403.11.3 Exception 3 state piping that conveys fluids having a design operating temperature range between 60°F and 105°F need not be insulated. ASHRAE 90.1-16 Article 6.4.4.1.3 Exception 3 states that liquid refrigerant piping need not be insulated since heat gain or heat loss will not increase energy usage. Consequently, liquid refrigerant piping need not be insulated unless the lines run on the roof of a building at roof level where the surrounding space is warmer than the refrigerant.

END OF SECTION

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SECTION 230720
DUCTWORK INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide thermal insulation on the ductwork installed and required on this Project shown on the Drawings, specified herein and needed for a complete and proper installation.

All insulation materials shall be free of asbestos.

1.02 RELATED SECTIONS

- A. Division 23 Sections

1.03 SUPPLEMENTAL SUBMITTALS

- A. Submit schedule showing manufacturer's product number, k-value, thickness and furnished accessories for each duct system requiring insulation.

1.04 SUPPLEMENTAL QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least three years successful installation experience on projects with mechanical insulations similar to that required for this Project.
- B. Flame/Smoke Ratings: Provide mechanical insulation with flame spread index of 25 or less and smoke developed index of 50 or less, as tested by ASTM E84 method or UL 723, using the specimen preparation and mounting procedures of ASTM E2231 as defined in the Mechanical Code. Insulation shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service or a minimum of 250°F per Section MC 604.3 of the Mechanical Code.
- C. Code and Standards: Comply with New York Construction Code, New York Energy Conservation Code (NY IECC) and ASHRAE 90.1.
- D. Identification: External duct insulation and factory-insulated flexible duct shall be legibly printed or identified at intervals not greater than 36" with the name of the manufacturer, the thermal resistance *R*-value at the specified installed thickness and the flame spread and smoke-developed indexes of the composite material per Section MC 604.7.
- E. Testing of material shall be in accordance with Section of the Administrative Code (reference Section MC 301.5).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Approved Manufacturers:
Babcock & Wilcox; Insulating Products Div.

Certain Teed Corp.
Knauf Insulation.
Johns Manville
Owens-Corning Fiberglass Corp.
Pittsburgh Corning Corp.
Rubatex Corp.
3M VentureClad
Polyguard Products

2.02 MATERIALS

- A. Adhesives and Sealants for Insulation: All adhesives and sealants used on interior building insulation shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table 1 of LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.
- B. Fiberglass Board Type: 3-lb minimum density, thermal conductivity not exceeding 0.23 at 75°F mean temperature, factory applied facing of aluminum foil reinforced with fiberglass yarn mesh and laminated to 40 lb kraft paper chemically treated to give the permanent flamespread and smoke-developed characteristics required. The use of plain (unfaced) fiberglass board on ductwork serving only as heating supply ducts is also acceptable provided it meets the flamespread and smoke-developed characteristics required.
- C. Fiberglass (Blanket) Flexible Type: 1-lb nominal density, thermal conductivity not exceeding 0.29 at 75°F mean temperature; factory applied foil reinforced kraft facing as specified for the fiberglass board.
- D. Calcium or Magnesium Silicate Block: Asbestos free rigid hydrous calcium or magnesium silicate block shall be lightweight with thermal conductivity not exceeding 0.42 at 200°F mean temperature.
- E. Calcium-Magnesium-Silicate (CMS) Wool Wrap: CMS wool wrap blanket insulation shall be flexible, high temperature rated, two-hour/zero-clearance and shall be (per Buildings Bulletins 2009-028, 2010-021 and 2015-013) tested and listed to ISO 6944, "Fire-Resistance Test for Ventilation Ducts", ASTM E814/UL 1479, Fire Test of Through-Penetration Firestop", and ASTM E84, Standard Test Method for Surface of Building Material". Fire-rated flexible duct wrap insulation shall consist of foil scrim encapsulated blanket of various thicknesses. The material is directly applied to the duct surface and is used to achieve a fire-resistance rating. Flexible fire-rated duct insulation shall be labeled. All shipments and deliveries of materials shall be accompanied by a certificate or label certifying that the materials shipped or delivered are equivalent to those tested and approved. Fire-rated flexible duct wrap insulation shall not have a flame spread rating of more than 25 and a smoke developed rating of more than 50 pursuant to ASTM E84.
- F. Jackets for Ductwork Insulation: ASTM C921; Type I for ductwork with temperatures below ambient; Type II for ductwork with temperatures above ambient. (Type I-Vapor Barrier, Type II-Water Vapor Permeable).

- G. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and all other items and accessories recommended by insulation manufacturer for applications indicated.
- H. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and all other items and compounds recommended by insulation manufacturer for applications indicated.
- I. Vapor Barrier Jacket
 - 1. Interior Applications: Vapor barrier jacket shall be a laminated five-ply self-adhesive permanent acrylic system; high puncture, tear resistant; zero permeability; manufactured with mold inhibitors: VentureClad 1577CW, VentureClad 1577CW-E Grade or Alumaguard Lite or Alumaguard "All Weather" LT or equal.
 - 2. Outdoor applications: Provide jackets made of 0.016" aluminum or stainless steel held with friction type, Z-locks, 12" apart.
- J. Factory-Built Grease Duct per Section MC 506.3.10.3: A factory built grease duct shall consist of a sealed, liquid tight, prefabricated double walled steel with ceramic fiber insulation between the inner flue and outer casing designed and evaluated in accordance with UL 2221 "Fire Resistive Grease Duct Enclosure Assembly" and UL 1978 "Grease Duct". Factory-built grease ducts shall be labeled. All shipments and deliveries of materials shall be accompanied by a label certifying that the materials shipped or delivered are equivalent to those tested and approved.

PART 3 - EXECUTION

3.01 COMPLETION OF TESTS

- A. Before applying the insulation, all tests specified in Division 01 and Division 23 Sections should have been completed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Authority.

3.02 SUPPLEMENTAL INSTALLATION

- A. Omit insulation if duct is internally lined with acoustic material of sufficient thermal conductivity providing a conductive resistance as required by the NY IECC. Materials used as internal insulation and exposed to the air stream in ducts shall be shown to be durable when tested in accordance with UL 181. Exposed internal insulation that is not impermeable to water shall not be used to line ducts or plenums from the exit of a cooling coil to the downstream end of the drain pan (Reference Section MC 604.13). Omit insulation on ductwork where shown on the Drawings.
- B. Duct coverings shall not penetrate a wall or floor required to have a fire resistance rating or required to be fireblocked per Section MC 604.6. Linings shall be interrupted at the area of operation of a fire damper and at a minimum of 6" upstream of and 6" downstream of electric resistance and fuel burning heaters in a duct system. Metal nosings or sleeves shall be installed over exposed duct liner edges that face opposite the direction of airflow per Section MC 604.8.

- C. Fiberglass board shall be used to insulate ductwork that is exposed in fan or equipment rooms or is outdoors.
- D. Flexible type duct insulation shall be used to insulate ductwork that is installed in concealed spaces (hung ceilings, furred spaces, pipe and duct spaces, crawl spaces and tunnels).
- E. Facing and Finishing
 - 1. Exposed Ducts: Insulation on ductwork exposed to view in Boiler Room, Boiler Room Area, Custodian's Workshop, Equipment and Mechanical Rooms, and Receiving Room shall have facing or finish as specified herein: Facing or finish shall be reinforced with metal corner beads and shall have a glass cloth finish installed in the following manner: Brush a full coat of lagging adhesive/vapor retardant coating on all surfaces of the ductwork insulation. Imbed glass cloth in the wet coating, smoothing to avoid wrinkles. Overlap cloth seams 4", locating seams so as to be hidden from view, wherever practicable. Apply a second coat of lagging adhesive.
 - 2. Concealed Ducts: Insulation on warm air ductwork installed within pipe and duct spaces, storerooms, hung ceilings, furred spaces, or pipe tunnels shall have no additional finishing, other than the foil- reinforced-kraft facing. All cold air ductwork for the above spaces shall be provided with two coats of a vapor retardant coating at least 1/16" thick with a layer of glass cloth in between or self-adhesive vapor barrier jacket.
- F. Installation of Board Type Insulation
 - 1. Insulation shall be applied with edges tightly butted. It shall be impaled on pins welded to the duct and secured with speed clips impaled over the pins. Pins shall be cut off close to speed clips. On horizontal ducts, pins shall be spaced not less than one per square foot for the bottom surface, and not less than one per two square feet on the sides and top surface. On vertical ducts, the pins shall be spaced not less than one clip per two square feet of duct surface. For faced insulation cold air ductwork, point all joints and cracks with vapor barrier coating, and seal all joints and speed clips with a 3" wide strip of foil-reinforced-kraft facing adhered with vapor barrier/insulation adhesive. The use of pressure sensitive tape of the same facing material also is acceptable for this purpose. For cold air ductwork, the laminated self-adhesive vapor barrier jacket will be accepted.
 - 2. Where the welded pin method cannot be used because of space or size restriction, the use of stick clips will be approved and the insulation shall be additionally secured to the duct with insulation adhesive. The adhesive shall cover the entire surface of the sheet metal when applied to underside of horizontal duct, but may be applied in strips for application to top and sides with a minimum of 50% coverage. Insulation shall be additionally secured with No. 16 gage soft annealed or galvanized steel wire on not more than 12" centers. Continuous metal, corner angles shall be used to protect edges of the insulation.
- G. Installation of Flexible Type Insulation: Flexible type insulation shall be cut slightly longer than the perimeter of the duct to insure full thickness at corners. Insulation shall be applied with edges tightly butted, and seams stapled approximately 6" on centers with

outward clinching staples. Insulation shall be additionally secured with No. 16 gage soft annealed or galvanized steel wire on not more than 12-inch centers. When the width of a horizontal duct is 24" or more, the insulation shall also be fastened with welded pins or stick clips spaced on 18-inch centers on the bottom surface of the duct. All joints and clips shall be taped and sealed with 3" wide strips of foil-reinforced-kraft facing applied with insulation adhesive. The use of pressure sensitive tape of the same facing material also is acceptable for this purpose. For cold air ductwork, vapor barrier coating or laminated self-adhesive vapor barrier jacket will be accepted.

H. Insulation for Kitchen Range Hood Exhaust Duct

Per Section MC 506.3.10.3 a factory-built insulated double walled grease duct is an alternative material to code requirements for minimum duct material thickness (Section MC 506.3.1.1), clearance to combustible material (Section MC 506.3.6) and the requirement for rated shaft enclosure (Section MC 506.3.10 Exception 4). A factory-built insulated double walled grease duct may be used from the Kitchen Range Hood to the exhaust fan.

Factory-Built Grease Duct Assemblies: As per Section MC 506.3.10.3, factory-built grease duct assemblies incorporating integral enclosure materials shall be listed and labeled for use as commercial kitchen grease duct assemblies in accordance with UL 2221. Duct penetrations shall be protected with a through-penetration firestop system classified in accordance with ASTM E814 or UL 1479 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated. Such assemblies shall be installed in accordance with the listing and the manufacturer's installation instructions.

Single walled exhaust duct from the Kitchen Range Hood shall be insulated between the hood and the first penetration for safety reasons to avoid possible personnel injury utilizing calcium or magnesium silicate blocks as indicated below. Additionally, insulate the ductwork from the first penetration to the exhaust fan per Section MC 506.3.10.1 Exception 2 (where the shaft exhaust provisions of Section MC 506.3.10 are not required) in accordance with the following: Secure 2" thick calcium or magnesium silicate blocks with 16-gauge galvanized steel wire. Over this, fasten 2" mesh hexagonal galvanized wire lath, and apply a 1/2" thick coating of insulating and finishing cement troweled to a smooth, hard finish. Provide galvanized steel corner beads at all outside corners. (Reference Section MC 506.3.6 Exception 4)

Alternately, insulate the ductwork from the first penetration to the exhaust fan per Sections MC 506.3.10.1 Exception 1 and MC 506.3.10.2 (where the shaft exhaust provisions of Section MC 506.3.10 Exception 4 are not required) with fire-rated wrap insulation.

Ducts which in practice may accumulate combustible deposits on their inside face such as Kitchen exhaust duct and grease duct shall not utilize fire-rated flexible duct wrap insulation (unless manufacturer submits documentation that their duct wrap is provided in accordance with the national standards specified in Article 2.02).

Field-applied Grease Duct Enclosure (Exposed Duct Wrap): As per Section MC 506.3.10.2, commercial kitchen grease ducts constructed in accordance with Section MC 506.3.1 shall be enclosed by a field-applied grease duct enclosure that is a listed and labeled material, system, product or method of construction specifically evaluated for

such purpose in accordance with ASTM E2336. The surface of the duct shall be continuously covered on all sides from the point at which the duct originates to the outlet terminal. Duct penetrations shall be protected with a through-penetration firestop system classified in accordance with ASTM E814 or UL 1479 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated. Such systems shall be installed in accordance with the listing and the manufacturer's installation instructions. Exposed duct wrap systems shall be protected where subject to physical damage.

If Exceptions 1 (wrap) or 2 (cal-sil or mag-sil) of Section MC 506.3.10.1 are not taken or MC 506.3.10.3 (factory-built grease duct) provisions are not followed, then the duct shall be enclosed from the first point of penetration to the outlet terminal in accordance with the Building and Mechanical Code requirements for shaft construction (Sections BC 707 and MC 506.3.10.1).

Shaft Enclosure: As per Section MC 506.3.10.1, commercial kitchen grease ducts constructed in accordance with Section MC 506.3.1 shall be permitted to be enclosed in accordance with the Building Code requirements for shaft construction. Such grease duct systems and exhaust equipment shall have a clearance to combustible construction of not less than 18", and shall have a clearance to noncombustible construction and gypsum wallboard attached to noncombustible structures of not less than 6". Duct enclosures shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings.

- I. Outdoor ductwork shall be insulated with fiberglass board and subsequently covered with 0.016" aluminum or stainless steel jackets held with friction type, Z-locks, 12" apart. Joints shall be sealed along the longitudinal seam and circumferential joints with butt strips, minimum 2" wide. Per Section C403.11.1 of the IECC, adhesive tape shall not be permitted for insulation exposed to weather. Access doors and other items requiring maintenance or access shall be removable and sealable.
- J. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- K. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
- L. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated such as rated penetrations.
- M. Fire-Rated Flexible Duct Wrap for fire resistive duct assemblies for Smoke Control, Stairwell and Vestibule Pressurization; exhaust hood ducts as per Section BC 424 Non Production Chemical Labs and NFPA 45 Section 8.10.3.1; cross-over floor ducts (conventional HVAC ducts that traverse a floor from one shaft to another); and ventilation applications where a damper would interfere with the intended operation of the duct: Where the fire-rated flexible duct wrap assembly penetrates a fire-rated assembly, the resulting opening around the ventilation system shall be fire stopped with a firestop system tested in accordance with ASTM E814/UL 1479 as per Section BC 713. The F and T rating of the firestop system shall be equal to or greater than the hourly insulation rating of the fire resistive duct assembly and F rating of the firestop system shall be equal to or greater than the hourly integrity and stability rating of the fire resistive duct assembly. Fire-rated flexible duct wrap insulation shall not be accepted as an alternative to shaft enclosures around the ducts penetrating through different floor assemblies where

required by Section BC 712.4 and the New York Fire Code. The fire resistive duct assembly shall be protected from the point of penetration of a fire resistance rated ceiling, wall, floor or any concealed spaces to the outlet terminal. The stability, integrity and insulation rating for the fire resistive duct shall be equal to or greater than the highest fire resistance rating of any assembly penetrated, or a minimum of 2 hours.

Ducts lined on the inside with combustible material shall not utilize fire-rated flexible duct wrap insulation (unless manufacturer submits documentation that their duct wrap is provided in accordance with the national standards).

3.03 INSULATION REPAIR

- A. Repair damaged or removed sections of duct insulation, both previously damaged/removed and damaged/removed during construction. Use insulation of same type and thickness as existing insulation, install new jacket lapping and sealed over existing.

3.04 PROTECTION AND REPLACEMENT

- A. Replace damaged insulation that cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Insulation Worker shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

3.05 SCHEDULES OF DUCTWORK INSULATION

- A. Insulation Omitted - Do not insulate the following:
 - 1. Access door, test hole fittings, damper quadrants, except as otherwise specified. The adjoining insulation shall be neatly finished around such devices.
 - 2. Exhaust ductwork need not be thermally insulated, except the portion of the duct between motorized spill damper and spill louver.
 - 3. Omit insulation on ductwork where shown on the Drawings.
- B. Exposed Ducts/Plenums in Workshop, Equipment and Mechanical Rooms, Receiving Room, and Exposed Kitchen Warming Pantry Hood Exhaust
 - 1. Insulate
 - a. All outside air intake plenums not pre-insulated at the factory
 - b. Outdoor air intake ducts in their entirety.
 - c. Exhaust duct from motorized spill damper to spill louver.
 - d. Supply and return ducts
 - e. Heating plenums not pre-insulated at the factory

- f. Exposed Warming Pantry Hood exhaust beginning at the hood exhaust
2. Insulate the above with rigid fiberglass board, 2" thick.
- C. Cold Duct Work
 1. Insulate concealed supply and return ductwork in its entirety from the fans (or blower unit) to room terminal inlets and outlets.
 2. Insulate the above with flexible fiberglass 2" thick.
 3. Cold ductwork (with conventional 55°F duct temperatures or less in the cooling mode) shall be insulated. Additionally, coat with two coats of a vapor retardant coating at least 1/16" thick with a layer of glass cloth in between or use self-adhesive vapor barrier jacket as an alternate to the vapor retardant coating.
- D. Kitchen Range Hood Exhaust Ductwork
 1. Insulate with Calcium or Magnesium Silicate 2" thick or with fire-rated wrap with the thickness as indicated in the listing approval or provide grease duct enclosure from the first penetration to the exhaust fan per MC 506.3.10 designed in accordance with BC 707 for rating as long as duct enclosure does not alter other construction.
- E. Smoke Control, Stairwell and Vestibule Pressurization and Ventilation Applications Where a Damper Is Not Required (Such as Fume Hood Exhausts)
 1. Horizontal Penetrations: Fire-rated flexible duct wrap insulation.
 2. Vertical Penetrations: Fire-rated flexible duct wrap insulation but with shaft enclosure where required by BC 712.4 and the New York Fire Code.
- F. Concealed Hot Ductwork
 1. Insulate the following:
 - a. Concealed supply and return ductwork between fan discharge, heating unit discharge, and room terminal inlets and outlets.
 - b. Concealed Warming Pantry hood exhaust ending at its connection to the flue on the roof.
 2. Insulate each system specified above with the following:
 - a. Flexible Fiberglass: 2" thick, application limited to concealed locations.
- G. Concealed Dual Temperature Ductwork
 1. Insulate hot/cold supply and return ductwork between fan discharge or HVAC unit discharge and room terminal inlets and outlets.
 2. Insulate system specified above with the following:

- a. Flexible Fiberglass: 2" thick, application limited to concealed locations.
- H. Exposed Dual Temperature Ductwork
 - 1. Hot/cold supply and return ductwork shall be insulated with rigid fiberglass board, 2" thick.

END OF SECTION

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SECTION 232113
HVAC PIPING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide pipes, pipe fittings, pipe specialties, and pipe supports as shown on the Drawings, and as needed for a complete and proper installation. Product specific requirements are contained herein and related specification sections.

1.02 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Steam and Condensate Piping : Not Used.

- B. Heating Hot Water Piping

Operating Pressure	125 psig
Operating Temperature	150° - 250°F
Design Code (ANSI)	B31.9

- C. Chilled Water Piping: Not Used.

- D. Condenser Water Piping : Not Used.

- E. Dual Temperature Water Piping

Operating Pressure	125 psig
Operating Temperature	40° - 250°F
Design Code (ANSI)	B31.9

- F. Refrigerant Piping

Operating Pressure	150 psig
Operating Temperature	40° - 120°F
Design Code (ANSI)	B31.5

- G. Fuel Oil Piping: Not Used.

1.03 RELATED SECTIONS

- A. Division 22 and 23 Sections

- B. Architectural and Structural Specification Sections

1.04 SUPPLEMENTAL SUBMITTALS

- A. Product Data

Provide product data for the following:

1. Piping and Fittings
2. Piping Specialties

3. Expansion compensation devices

4. Hangers and Supports

B. Shop Drawings

1. Provide shop drawings of all HVAC lines, including, but not limited to, showing all diameters, pitch, cleanouts, traps, routings, terminations, shut-off valves, vents, riser drains, etc.

2. Each submittal shall be complete in all aspects incorporating all information and data listed herein and all additional information required to evaluate the proposed piping material's compliance with the Contract Documents. Partial or incomplete submissions shall be returned to the Contractor disapproved without review.

3. Data to be submitted shall include but not be limited to:

a. Catalog Data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for the piping system and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.

b. Complete layout and installation drawings with clearly marked dimensions. Piece numbers which are coordinated with the tabulated pipe layout schedules shall be clearly marked. Scale and size of the drawings shall conform to the specifications in the General Conditions and Division 1. Piping layout drawings shall indicate the following information on pipe supports, location, support type, hanger rod size, insert type and the load in pounds.

c. Weight of all component parts.

d. Tabulated pipe layout schedule shall include the following information for all pipe and fittings, service, pipe size, working pressure, wall thickness, piece number and laying length.

e. All welds to be made in the field shall be prominently and individually marked on the shop drawing with a note, such as "Field Weld" and the pertinent weld data in accordance with AWS standards.

C. Schedules

Submit schedule showing pipe or tube weight, fitting and joint type for each piping system; size, location and feature for each piping specialty, expansion compensation, hanger and support.

1. Grooved joint coupling and fitting product submittals shall be specifically identified with the applicable manufacturer's style or series number.

D. Certifications

1. Welding Certifications: Submit reports as required for piping work.

2. Brazing Certifications: Submit reports as required for piping work.

3. For expansion bolts installed in concrete, submit ICC certification for use in cracked concrete.

1.05 SUPPLEMENTAL QUALITY ASSURANCE

A. Codes and Standards

1. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work and ASME Boiler and Pressure Vessel Code, Section IX, Part QW Welding or in accordance with AWS B2.1 Specifications for Welding Procedure and Performance Qualification per Chapter 12 of the Mechanical Code.
2. Certify welding of piping work using Standard Procedure Specifications by, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).
3. Brazing: Certify brazing procedures, brazers, and operations in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Part QB Brazing for shop and job-site brazing of piping work or in accordance with AWS B2.2 standard for Brazing Procedure and Performance Qualification per Chapter 12 of the Mechanical Code.
4. Fluid Control Institute (FCI) Compliance: Test and rate "Y" type strainers in accordance with FCI 73-1: Pressure Rating Standard for "Y" Type Strainers. Test and rate other type strainers in accordance with FCI 78-1: Pressure Rating Standard for Pipeline Strainers Other than "Y" Type.
5. EJMA Compliance: Construct expansion compensation products in accordance with standards of the Expansion Joint Manufacturer's Association (EJMA).
6. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with:
MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69 Pipe Hangers and Supports - Selection and Application
MSS SP-89 Pipe Hangers and Supports - Fabrication and Installation Practices
Piping shall be supported at distances not exceeding the spacing specified in MC Table 305.4 or in accordance with the above MSS standards.
7. Comply with ANSI B31.1A, ASME Code for pressure Piping, and ASHRAE Equipment Guide.
8. New York State Construction Codes: Comply with the Building Code, Mechanical Code, Fuel Gas Code, Plumbing Code and Fire Code.

PART 2 - PRODUCTS

2.01 PIPES

- A. Pipe used shall be free from scale or rust. Each length of pipe shall be properly marked at the mill for proper identification with name or symbol of manufacturer. Dimensions for steel pipe shall be in accordance with the ANSI B36.10. Dimensions for red brass pipe shall be in accordance with ASTM B251.
- B. Steel Pipe
 1. Black or Galvanized; Standard Weight: Schedule 40 or Extra Heavy Weight: Schedule 80; ASTM A135 or ASTM A53 or ASTM A106.
 - a. Steel Pipe for Threading: ASTM A53 Type F, Type E or S; ASTM A135 or A106.

- b. Flanging: ASTM A53, Type E or S; ASTM A135 or ASTM A106. (Type F not permitted for flanging).
- c. Bending and Coiling: ASTM A53, Type F, Type E or S; ASTM A135 or ASTM A106.
- d. Grooved End Type: Schedule 40, ASTM A53, Type F, Type E or S; or ASTM A135 or ASTM A106.

2. Steel pipe shall be manufactured by:

Koppel Steel Corp.
North Star Steel Co.
Sawhill Tubular Co.
Sharon Tube Co.
U.S. Steel Co.
Wheatland Tube Company
EXLTUBE Inc.

C. Brass Pipe

- 1. Semi-annealed seamless drawn; ASTM B43; 84 and 86% copper.
- 2. Brass pipe shall be manufactured by:

Anvil International
Mueller Industries
Phelps-Dodge Copper Products Corp.
Revere Copper & Brass, Inc.
Merit Brass Company.
Trenton Pipe Nipple Company

D. Copper Tubing

- 1. Hard-Drawn Temper; Water tubes shall be Type L or K per ASTM B88; Refrigerant lines shall be ACR tube per ASTM B280. Oil lines other than steel may be provided. If provided, lines shall be in accordance with MC Table 1302.3. Oil copper or copper-alloy tubing shall be Type K or Type L PVC Coated per ASTM B75; ASTM B88; ASTM B280.
- 2. Copper tubing shall be manufactured by:

Mueller Industries
NIBCO Inc.
Phelps-Dodge Copper Products Corp.
Revere Copper and Brass Inc.

E. Ductile Iron Pipe

- 1. Ductile iron pipe shall have an outer coating of coal tar and shall comply with the requirements of the latest Standard Specifications of ANSI A21.51 and AWWA C151; AWWA C115.

a. Thickness class of pipe shall be as follows: Water Service piping: thickness class 52 for 3" & 4" diameter pipe and thickness class 56 for pipe size greater than 4".

b. Ductile iron pipe shall also comply with the following requirements:

1) Marking: the weight and class and other designated markings required by ANSI specifications shall be stenciled at the foundry on all ductile iron pipe, fittings and specials.

Markings shall be painted conspicuously in white on the outside of each pipe length, fitting and special casting after the shop coat has hardened.

2) Cement Lining: Pipe shall be cement lined in accordance with ANSI, Standard A21.24, with thickness of lining to be 1/8" minimum. A plus tolerance of 1/8" shall be permitted on all sizes of pipe.

2. Manufacturers

U.S. Pipe and Foundry
American Cast Iron Foundry
Amstead Industries

2.02 FITTINGS

A. Steel, Malleable/Cast Iron

1. Steel Fittings, except couplings and unions, 2½" and less: Threaded pattern, standard weight, black cast iron, suitable for a working steam pressure of 125 psi, except as otherwise specified below.

2. Flanges, Welding Neck Type, Same Pressure Rating as Adjoining Pipe: ANSI/ASME B16.5. Welding flanges shall be socket type.

3. Weld Fittings, Carbon Steel: Butt Welding Type: ANSI/ASME B16.9: Allied Piping Products Co., Inc.'s Branchlets, Type 1 or 2 or Bonney Forge Corp.'s Weldolets; Socket Welding Type: ANSI/ASME B16.11 Allied Piping Products Co., Inc.'s Branchlets, Type 1 or 2 or Bonney Forge Corp.'s Thredolets or Sockolets.

4. Grooved End Type: Steel ASTM A53 Grade B or Ductile iron ASTM A536 Grade 65-45-12; with factory grooved ends designed to accept manufacturer's couplings.

5. Malleable Iron, Steam Pattern Threaded: ANSI/ASME B16.3 for 150 lb Class and 300 lb Class.

6. Cast Iron, Steam Pattern Threaded: ANSI/ASME B16.4, Flanged Fittings and Threaded Flanges: ANSI/ASME B16.1 for standard weight pipe: Class 125 and for extra heavy weight pipe: Class 250. Gray iron shall be in accordance with ASTM A126 per MC Table 1202.5.

7. Steel and malleable/cast iron pipe fittings shall be manufactured by:

Anvil International

CIFUNSA Marketing, Inc.
Smith-Cooper International
Tube-Line
Victaulic Co. of America
Ward Manufacturing
Weldbend Corporation
TYCO Grinnell Mechanical Products
Shurjoint Piping Products
The Viking Corporation

B. Brass

1. Malleable brass, threaded pattern; flanges, brass for use in brass pipe or copper tubing systems: Flanges shall conform to the Standards for fittings used in the systems. Brazing Flanges, with or without Pre-inserted Rings of Brazing Alloy: ASME B16.15, with hubs modified for brazing ends. Brass fittings shall conform to ASTM F1974 per MC Table 1202.5.

2. Brass Fitting shall be manufactured by:

Anvil International
Elkhart Products Corp.
Lee Brass/S. G. Flagg Co.
Mueller Industries
NIBCO Inc.
Smith-Cooper International

- C. Unions 3" Size and Under: Steel: malleable iron, 300 lb class, with brass to iron or brass to brass seats and bronze to bronze, bronze to iron, or brass to iron ground joint, except as otherwise specified. The pressure rating shall be indicated on the union.

1. Unions for Use in Brass Pipe or Copper Tubing Systems, 2" and under: Cast bronze, 150 lb Class, with bronze to bronze seats; with screw, brazing or solder ends, or with adapters as required.

2. Union shall be manufactured by:

Anvil International
E.M. Dart Co.
NIBCO Inc.
Smith-Cooper International
Weldbend Corporation
Ward Manufacturing LLC
The Viking Corporation

D. Fittings for Type "L" copper tubing

1. Fittings shall be wrought copper solder joint fittings suitable for brazing and shall be in accordance with ANSI B16.22. Type "L" fittings shall have a minimum working water pressure of 150 p.s.i.

- a. Flux for brazing Type L shall be equal to "Handy Flux" and shall comply with Navy Dept. Spec. 51F 4a.

- b. The silver brazing alloy for brazed Type L joints shall be similar to Handy & Harmon Sil-Fos brazing alloy having a silver content of not less than 15% and a flow point of 1300°F.
 - 2. Alternately, fittings for Type "L" copper tubing may be cast bronze threaded fittings, Class 125 working steam pressure, conforming to ASTM B62 and ASME B16.24.
 - 3. Grooved end fittings for Type "L" copper tube: ASME B16.22 wrought copper or ASME B16.18 bronze casting; dimensioned grooved ends designed to accept manufacturer's couplings.
 - 4. Alternately, hydronic fittings for cold and hot water piping and chilled water piping may be press fittings (press fit - pressure-sealed joints) by Viega ProPress, Elkhart Xpress, NIBCO Press System, Grinnell G-Press (or approved equal) up to and including 4" in diameter. O-rings: EPDM; Special Tools recommended and approved by the Manufacturer.
 - 5. Type "L" fittings shall be manufactured by:
 - Elkhart Products Corp.
 - Mueller Industries
 - NIBCO Inc.
 - Smith-Cooper International
 - Viega ProPress
 - Victaulic Co.
 - Anvil International
 - TYCO Grinnell Mechanical Products
 - Shurjoint Piping Products
- E. Fittings for Ductile Iron Pipe
- 1. Mechanical joints consisting of bell end with cast flange, cast iron gland, rubber gasket and necessary bolts and nuts shall conform to AWWA C110 and C153. Bolts shall be high-strength, low-alloy steel with minimum 45,000 psi yield strength and comply with AWWA C110 and C153. Unless otherwise specified, gasket material shall be rubber.
 - 2. Fittings and accessories for ductile iron pipe shall comply with the requirements of the latest Standard Specifications of ANSI A21.10 and ANSI A21.11. Mechanical joints shall be similar to Tyton Joint by U.S. Pipe.
- F. Mechanically formed tee-branch outlets (refer to Section MC 1203.3.8) may be used on aboveground copper tubing. The mechanically formed outlet shall be by T-Drill Industries, Inc. or approved equal. All joints formed in this manner shall be brazed in compliance with Section MC 1203.3.8.2 and manufacturer's recommendations. Soft soldered joints shall not be permitted.
- G. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.
- H. Grooved Joints - for Steel Piping: Rolled or cut grooves, Pipe: Carbon Steel, ASTM A53, or ASTM A106, EPDM gaskets; Housing: Ductile Iron. System shall be designed for flexible or rigid installation. Welded flanges shall be used at equipment connections, and for

maintenance removal sections. Manufacturers: Victaulic, Anvil International Inc, TYCO Grinnell Mechanical Products or Shurjoint Piping Products

1. Rigid Type: Housings shall be cast with offsetting, angle-pattern bolt pads or recessed tongue and grooves to provide system rigidity and support and hanging in accordance with ASME B31.1 and B31.9.
 - a) 2" through 8": Rigid coupling designed for direct installation onto grooved end pipe without prior field disassembly and no loose parts. Gasket shall be Grade "E" EPDM suitable for hot water up to 230°F. Victaulic Style 107 QuickVic, Anvil Slidelok 74, GRUVLOK Fig. 7401 Rigidlok, TYCO Grinnell Figure 772, Shurjoint Models Z07/7771 or approved equal.
 - b) 10" and 12": Standard rigid coupling with Grade "E" EPDM gasket suitable for hot water up to 230°F. Victaulic Style 07 Zero-Flex, Anvil GRUVLOK Fig. 7401 Rigidlok, TYCO Grinnell Figure 772, Shurjoint Models Z07/7771 or approved equal.
 - c) 14" to 60": Two ductile iron housing segments with flat bolt pads for metal-to-metal contact with wedge-shaped key profile. Grade "E" EPDM FlushSeal gasket suitable for hot water up to 230°F. Victaulic Style W07, Anvil GRUVLOK Fig. 7401-2, TYCO Grinnell Figure 772, Shurjoint Models Z07/771/7707L or approved equal.
2. Flexible Type: Use in locations where vibration isolation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three couplings for each connector shall be placed in close proximity to the source of vibration.
 - a) 2" through 6": Flexible coupling designed for direct installation onto grooved end pipe without prior field disassembly and no loose parts. Gasket shall be Grade "E" EPDM suitable for hot water up to 230°F. Victaulic Style 177 QuickVic, Anvil GRUVLOK Fig. 7001, TYCO Grinnell Figure 705, Shurjoint Models 7707/7705 or approved equal.
 - b) 8" through 12": Standard flexible coupling with Grade "E" EPDM gasket suitable for hot water up to 230°F. Victaulic Style 77, Anvil GRUVLOK Fig. 7001, TYCO Grinnell Figure 705, Shurjoint Models 7707/7705 or approved equal.
 - c) 14" to 60": Two ductile iron housing segments with flat bolt pads for metal-to-metal contact with wedge-shaped key profile. Grade "E" EPDM FlushSeal gasket suitable for hot water up to 230°F. Victaulic Style W77, TYCO Grinnell Figure 707, Shurjoint Models 7707/7707L, Anvil Gruvlok Fig. 7001-2, or approved equal.
- I. Grooved Joints - for Copper Piping: Rolled grooves, EPDM center legged gaskets, Ductile Iron housing, wrought copper or cast bronze fittings, rated for 300 psi working pressure. System shall be designed for rigid installation. Brazed flanges must be used at equipment connections, and for maintenance removal sections. Manufacturers: Victaulic, Anvil International Inc/Gruvlok, TYCO Grinnell Mechanical Products or Shurjoint Piping Products.
 1. 2" through 8": Coupling designed for direct installation onto roll grooved copper tube without prior field disassembly and no loose parts. Gasket shall be Grade "E" EPDM suitable for hot water and glycol system up to 230°F. Victaulic Style 607

QuickVic, Anvil GRUVLOK Slidelok 64 CTS, TYCO Grinnell Figure 640 or 672, Shurjoint Model C305 or approved equal.

- J. Nipples: same material and strength as adjoining pipe, except nipples having a length of less than 1" between threads shall be extra heavy Schedule 80. Manufacturer: Allied Piping Products, Babcock & Wilcox, Crane Co., Tube Turns, Smith-Cooper International and Anvil International.

2.03 FLEXIBLE CONNECTIONS

- A. Corrugated inner tube and outer shield of wire braid: Stainless steel. Maximum working pressure at room temperature: 850°F and pressure safety factor of 4:1
- B. Corrugated inner tube and outer shield of wire braid: Bronze. Maximum working pressure at room temperature up to 150°F. Manufacturer: Metraflex Co. or Flex-Hose Co., Inc.
- C. Not Used.
- D. Anvil GRUVLOK Fig. 7001, TYCO Grinnell Figure 705, 707, Victaulic Style 177, 77 or W77, Shurjoint Models 7707/ 7705 flexible couplings (or approved equal) may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three couplings, for each connector, shall be placed in close proximity to the source of vibration.
- E. Flexible Hose/Connections, stainless steel shall be manufactured by:
 - Allied Metal Hose Inc.
 - Flexaust Co.
 - Flex-Hose Co., Inc.
 - Mason Industries (Type BSS)
 - Metraflex Co.
 - Wheatley Pump & Valve Inc.
 - Anvil International

2.04 GALVANIZING

- A. Galvanizing Pipe and Fittings: hot dip process, inside and out in accordance with ASTM or other nationally recognized specifications to which pipe and fittings conform. Galvanize before threading.

2.05 JOINING AND SEALANT MATERIALS

- A. Solder: solid wire type conforming to Type 3 solder (ASTM B32 Alloy Grade E, AC or HB)
- B. Gasket Material
 - 1. For Use with Cold Water or Chilled Water: 1/16" thick rubber.
 - 2. For Use with Hot Water, Air or Steam or Oil: Waterproofed non-asbestos mineral, or ceramic fiber, or spirally wound stainless steel V-shaped strip with non-asbestos filler and an outer steel compression ring, designed for the temperatures and pressures of the piping systems. Mechanical joints utilizing an elastomeric and/or compression seal are not permitted. Fuel oil piping flanged joints requiring gaskets or packing shall be equipped with gaskets rated for a minimum of 750°F.
- C. Bolts and Nuts: heat treated carbon steel, ASTM A183 minimum tensile 110,000 psi.

- D. Joints and connections shall be approved and of a type approved for fuel-oil and diesel oil piping systems as follows:
1. Brazed in accordance with ASME Boiler and Pressure Vessel Code, Section IX Welding and Brazing Qualifications or in accordance with American Welding Society AWS B2.2 Standard for Brazing Procedure and Performance Qualification or
 2. Threaded in accordance with ASME B1.20.1 or
 3. Welded in accordance with ASME Boiler and Pressure Vessel Code, Section IX Welding and Brazing Qualifications or in accordance with AWS B2.1 Specifications for Welding Procedure and Performance Qualification or
 4. Flanged with gaskets rated for a minimum of 750°F

All threaded joints and connections shall be made tight with suitable lubricant or pipe compound. Pipe joint compounds and thread seal tape that utilize Teflon (PTFE) shall be approved for usage on fuel oil and diesel oil lines.

2.06 PIPING SPECIALTIES

- A. Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated.
- B. Pipe Escutcheons
1. Provide pipe escutcheons as specified herein 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 extension, if any. Provide pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
 - a. Pipe Escutcheons for Moist Areas: For waterproof floors and areas, where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged. If exposed to view, escutcheon shall be solid type.
 - b. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged. If exposed to view, escutcheon shall be solid type.
 2. Manufacturers
Zurn Industries, Inc.
McGuire Mfg. Co.
- C. Strainers: Low Pressure Y-Type Pipeline Strainers:
1. Provide strainers full line size of connecting piping with ends matching piping system materials. Select strainers for 125 psi working pressure with perforated stainless-steel basket with 50 percent free area. Perforation or mesh size shall depend on strainer size and/or material being strained.
 - a. Threaded Ends, 2½" and Smaller: Bronze or Cast-iron body, screwed screen retainer with centered blow down fitted with pipe plug.

- b. Flanged Ends, 3" and Larger: Cast-iron body, bolted screen retainer with off-center blow down fitted with pipe plug.
- c. Butt Welded Ends, 3" and Larger: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blow down fitted with pipe plug.
- d. Grooved Ends, 2" and Larger: Tee or Wye Type, ductile-iron or carbon steel body and access end cap, access coupling with EDPM gasket. Tee type shall be Anvil GRUVLOK Fig. 7260, TYCO Grinnell Figure S855, Victaulic Series 730 or W730, Shurjoint Model 728 or approved equal. Include wye type with off-center blow down port fitted with pipe plug, Anvil GRUVLOK Fig. 758G and 768G, TYCO Grinnell Figure S855, Victaulic Style 732 or W732 Shurjoint Model 726 or approved equal.

2. Manufacturers

Anvil International
Armstrong Machine Works.
Conbraco Industries, Inc.; Apollo Valves
Hoffman Specialty ITT; Fluid Handling Div
O.C. Keckley Company
Metraflex Co.
Victaulic Co. of America
TYCO Grinnell Mechanical Products
Shurjoint Piping Products
Spirax Sarco
Mueller Steam Specialty

D. Dielectric Unions

- 1. Provide products which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion. Joints between different metallic piping materials shall be made with approved dielectric fittings or brass converter fittings.
- 2. Manufacturers

Mueller Industries
Capitol Mfg. Co.; Div. of Harsco Corp.
Eclipse, Inc.
Epco Sales, Inc.
Perfection Corp.

E. Pipe Sleeves: Provide pipe sleeves of one of the following. Pipe sleeve must be one of the following appropriate types and thickness as specified below unless otherwise noted in the UL firestopping assembly details in which case type and thickness shall be as indicated in the UL details.

- 1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gage minimum; 4" to 6", 16 gage; over 6", 14 gage minimum.
- 2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.

3. Iron-Pipe: Fabricate from standard weight cast-iron or ductile-iron pipe; remove burrs.
4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
5. Firestop penetration materials for sealing sleeves shall be listed by Underwriters Laboratories. The materials shall be as specified in the architectural sections. For pipes passing through fire-rated floor, cast-in place firestop device with Underwriters Laboratories listing. The cast-in place device is a one-step firestopping process that does not require additional firestop penetration materials for sealing the sleeves. The device shall be installed where required for sleeving purposes. The cast-in place firestop device shall not be used for wall applications.
6. Materials for sealing space between each pipe and sleeve through non-rated interior walls shall consist of mineral wool and sealant.

F. Mechanical Sleeve Seals

1. Modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation
2. Provide mechanical sleeve seals for sleeves located in foundation walls below grade, or in exterior walls.
3. Manufacturers

Thunderline Corp.; Link Seal Type "C"
Metraflex Co; MetraSeal.

- G. Drip Pans: Fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2½". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

2.07 EXPANSION COMPENSATION

- A. Provide packless expansion joints where indicated on the Drawings and required for piping systems, with materials and pressure/temperature ratings selected to suit intended service. Select packless expansion joints to provide 200% absorption capacity of piping expansion between anchors.
- B. Expansion Compensators
1. Pressure rated for 60 psi for low pressure systems, 175 psi for high pressure systems. Multiple phosphor bronze bellows, brass shrouds and end fittings for copper piping systems, or multiple stainless steel bellows, carbon steel shrouds and end fittings for steel piping systems. Provide internal guides and anti-torque device, and removable end clip for proper positioning.
 - a. Joints for water systems shall be reinforced rubber corrugations secured by steel flanges. The number of corrugations shall be determined by the amount of movement required.

- b. Joints for steam or higher temperature fluids shall be composed of multiple layers of thin stainless steel, corrugated and mounted between flanges. The number of corrugations shall be selected for the movement involved.

2. Manufacturer

Flex-Hose Co., Inc.
Flexonics Div.; UOP, Inc.
Mason Industries
Metraflex Co.
Victaulic Co. of America
Vibration Mountings and Controls, Inc.

C. Rubber Expansion Joints

- 1. Construct of butyl rubber with full-faced integral flanges, internally reinforced with steel retaining rings. Provide steel retaining rings over entire surface of flanges, drilled to match flange bolt holes, and provide external control rods.

2. Manufacturer

Garlock; Mechanical Packing Div.
Metraflex Co.
Vibration Mountings and Controls, Inc.

- D. Expansion joints provided in grooved end steel piping water systems shall be packless, gasketed, slip-type with grooved end telescoping slip-pipe section providing up to 3" axial end movement. Install expansion joints adjacent to an anchor or between guides. Shurjoint Models 650/651, Anvil GRUVLOK Fig. 7240, Victaulic Style 150, Tyco Grinnell Figure 7550 (or approved equal) or Victaulic Style 155 expansion joints (or approved equal) consisting of a combination of flexible couplings and grooved end nipples joined in tandem to provide increased expansion. Provide in water systems to 250°F in accordance with manufacturer's recommendations for expansion compensation.

2.08 SLIP JOINTS

- A. Provide slip joints where indicated on the Drawings and required for piping systems, with materials and pressure/ temperature ratings selected to suit intended service. Select slip joints to provide 200% absorption capacity of piping expansion between anchors. Slip shall be the type designed for repacking under pressure, with drip connections for steam piping systems and ends to mate with piping system.

B. Manufacturer

Flex-Hose Co., Inc.
Flexonics Div.; UOP, Inc.
Metraflex Co.

2.09 PIPE ALIGNMENT GUIDES

- A. Provide pipe alignment guides on both sides of loops, elsewhere as required and as indicated on the Drawings. Construct with 4 fingers spider traveling inside guiding sleeve with provision for anchoring sleeve to structural steel. The pipe alignment guide spider, housing, and base must be constructed of carbon steel (painted for rust protection).

B. Manufacturer

Anvil International
Flex-Hose Co., Inc.
Hyspan Precision Products, Inc.
Metraflex Co.

2.10 HANGERS AND SUPPORTS

A. General

1. Insulated Piping: Each pipe hanger supporting insulated piping shall be provided with a pipe covering protection shield.
2. Hangers for pipes smaller than 5" shall be forged or malleable iron ring type or steel clevis type supported by a solid steel rod.
3. Hangers for pipes 5" and larger shall be formed of a section of steel angle having 3/4" diameter steel rod, threaded at both ends, run through a drilled hole near each end of the angle. Secure two nuts at the bottom end of the rod. Refer to Details Drawings.
4. Sockets used on upper ends of rods at beam clamps and on lower ends of rods for single hangers shall be malleable or forged steel with standard machine threads.
5. Supports for vertical piping shall be double bolt riser clamps, Anvil International MSS SP 69 Type 8 with each end having equal bearing on the building structure located as hereinafter specified. If piping is insulated, riser clamp shall be placed under insulation.
6. Trapeze type hangers shall be made of 2"x2"x1/4" carbon steel angle iron with drilled holes and 1/2" hanger rods. In lieu of an angle iron, a strut assembly may also be used for the trapeze style hanger supports.

B. Pipe hangers shall be manufactured by:

Anvil International
Cooper B-Line, Inc.
Carpenter & Paterson, Inc.
F. & S. Central Mfg. Co.
Grabler Mfg. Co.
Empire Industries, Inc.

2.11 INSERTS AND EXPANSION BOLTS

- A. Inserts for use in new conventional reinforced poured concrete slabs shall be as follows: Carpenter & Paterson Inc. No. 650; Anvil International Fig. 281; C. H. Leibfried Mfg. Corp. No. 100; Cooper B-Line, Inc. B2500 & N2500 Series.
- B. Inserts for new composite metal decks shall be Powers Fasteners "Bang-It" or Hilti, Inc. Cast-In Anchor HCI-WF (or approved equal). Steel deck insert shall be used to attach hanger rods.
- C. Expansion bolts for use in new and existing reinforced concrete slabs and concrete deck shall be wedge-type zinc-coated fastener with pull-out, tension, and shear capacities

appropriate for supported loads and building materials where used: ITW Ramset/Red Head "Trubolt+"; Hilti, Inc "Kwik Bolt 3", Powers Fasteners, Inc. "Power Stud+ SD2" or approved equal. Expansion Bolts installed in concrete shall be in accordance with Appendix D of ACI 318 as modified by Sections 1908.1.9 and 1908.1.10 as per Section BC 1912 of the Building Code.

2.12 SADDLES AND SHIELDS

- A. Except as otherwise indicated on the Drawings, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
 - 1. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
 - 2. Protection Shields: MSS Type 40; of length recommended by the manufacturer to prevent crushing of insulation.
 - 3. Thermal Hanger Shields: Constructed of 360° insert of high density, 100 psi, waterproofed calcium silicate, encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation.
- B. Manufacturers:
 - Elcen Metal Products Co.
 - Pipe Shields, Inc.
 - Value Engineered Products, Inc.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Perform flexibility analysis of the final piping configuration as required by ANSI B31.1. Insure that the resultant stresses are within the limits for the respective pipe materials and that the resultant forces and moments imposed on the anchors and guides do not exceed the Joist and Truss Manufacturers stated limitations.
- B. Upon completion of the flexibility analysis, notify the Authority of additional loops, anchors or guides required to adequately protect the piping system.
- C. Examine areas and conditions under which all products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the Authority.

3.02 PREPARATION

- A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.
- B. Prior to installation of hangers, supports, anchors and associated work, Contractor shall meet at project site with testing agency representatives (if any), other trades requiring coordination, the Project Architect, Project Engineer and the Authority Representative for purpose of reviewing material selections and procedures.

3.03 PIPE INSTALLATION

- A. Install pipes in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Align piping accurately at connections, within 1/16" misalignment tolerance. Comply with ANSI B31 Code for Pressure Piping.
- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations. Run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation. All piping in finished and occupied spaces shall be concealed from view by locating piping in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated on the Drawings.
- C. Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical spaces. Do not run piping in stairwells or elevator equipment rooms except for systems serving those spaces.
- D. In the outlet from each cooling coil condensate drain pan, provide a tee with a brass plug at one end to facilitate cleaning of drain. Additionally, provide a single "P" trap for proper operation of the unit.
- E. Riser Casings: Unless otherwise indicated on the Drawings, all exposed risers, including the drop risers, shall be enclosed in casings extending from floor to a height of 7'-6" above floor. Riser casings shall be installed after the pipe insulation work is completed, inspected and approved. Casings shall be made of 24-gage galvanized sheet steel, with the upper end wired with 1/8" half hard wire. Each casing shall be fastened to the wall at the upper end with a metal band and round head screws. Seams shall be located at the rear of the casing.
- E. Casing for pipe at or near floors: Where pipes at or near floors are indicated on the Drawings to be encased, pipes shall be supported, insulated, and then enclosed in a casing of No. 20-gage galvanized sheet steel.
- F. Protection of Refrigerant Piping Located Inside Buildings: All refrigerant piping and fittings installed at a height less than 7'-3" above the floor shall be concealed or otherwise protected from mechanical damage except at the point of connection to terminal equipment.
- G. Refrigerant piping that crosses an open space that affords passageway in any building shall be not less than 7'-3" above the floor unless the piping is located against the ceiling of such space. Refrigerant piping shall not be placed in any elevator, dumbwaiter or other shaft containing a moving object or in any shaft that has openings to means of egress. Refrigerant piping shall not be installed in an enclosed public stairway, stair landing or an exit.
- H. Refrigerant piping shall not be installed in public corridors.

Exception: Refrigerant piping in public corridors that complies with all of the following conditions:

1. The refrigeration system to which the piping is associated utilizes a Group A-1 refrigerant and contains not more than 10 pounds of refrigerant per system, and there is not more than one system's refrigerant piping per tenant per public corridor; and
 2. A complete discharge of any one refrigerant system's charge into the volume of the public corridor would be insufficient to achieve 50% of the allowable refrigerant densities set forth in MC Table 1103.1; and
 3. Refrigerant piping and fittings within a public corridor are installed with brazed joints or the refrigerant equipment manufacturer provided pre-charged tubing systems installed in accordance with the refrigerant equipment manufacturers instructions. Refrigerant piping and fittings shall be concealed or otherwise protected from mechanical damage.
- I. Refrigerant Piping in Concrete Floors: As per Section MC 1107.2.2, refrigerant piping installed in concrete floors shall be encased in pipe ducts. The piping shall be isolated and supported to prevent damaging vibration, stress and corrosion.
- J. Refrigerant Piping Penetrations: Refrigerant piping shall not penetrate floors, ceilings or roofs.

Exceptions:

1. Penetrations connecting the basement and the first floor
2. Penetrations connecting the top floor and a machinery penthouse or roof installation
4. Penetrations connecting adjacent floors served by the refrigeration system
5. Penetrations by piping enclosed by gas-tight, fire resistive duct or shaft as shown on the Drawings.

3.04 INSTALLATION OF PIPE SYSTEM JOINTS

- A. Provide joint of type indicated in each piping system.
- B. Thread pipe in accordance with ASME B1.20.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than three threads exposed.
- C. Weld pipe joints in accordance with recognized industry practice and as follows:
1. Weld pipe joints only when ambient temperature is above 0°F where possible.
 2. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
 3. Use pipe clamps or tack-weld joints with 1" long welds, 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".
 4. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.

5. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.
 6. Weld high-pressure piping under Special Inspection as required by the NY Construction Code.
- D. Braze Joints: Joints in refrigerant piping shall be brazed. Flared compression A1 fittings may be used only at the terminal equipment connections. Soldered joints shall not be used in such refrigerating systems. Mechanical press fittings for refrigerant lines are not permitted. Oil lines shall use brazed Type K fittings. The outside of the copper tube and the inside of the fitting where brazing rod will be applied, shall be cleaned and burnished with fine crocus cloth until all dirt and oxide is removed. A light coat of non-corrosive brazing flux shall be applied to both pipe and fittings (Acid flux shall not be used). Joint shall be uniformly heated to proper brazing temperature and the brazing material shall be fed to the joint until a uniform line of brazing material appears around the pipe at the end of the fitting. Brazing shall be done only by mechanics that are qualified for brazing refrigerant piping.
- E. Fittings for copper tubing for refrigerant use shall be wrought copper with brazed type ends as applicable. Forged brass fittings are also acceptable for this purpose. Fittings shall be suitable for working water pressure up to 250 psi. The use of cast brass fittings for this service will not be approved.
- F. Solder copper tube-and-fitting joints in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner that will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
- G. The use of mechanical formed outlets on copper tubing instead of soldered joints is acceptable. (Refer to Section MC 1203.3.8). The maximum diameter of branches shall be 2¹/₈". Use appropriate tool designed for mechanical formed outlets on copper tubes. All mechanical formed tee fittings shall be brazed in accordance with the Copper Development Association's Copper Tube Handbook Using BCuP series filler metal. All mechanical formed branch collars shall be listed by UPC, and Underwriters Laboratory. They shall comply with ASME Code for pressure piping ANSI B31.5c.
- H. Offsets in piping shall be accomplished by means of standard fittings; pipe bends shall not be used for this purpose unless shown on the Drawings or unless permission is obtained from the Authority to use pipe bends.
- I. Flanged Joints: match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.
- J. The "Y" fitting in the vacuum pump discharge piping and all fittings in the fuel oil piping within the building shall be of malleable iron.
- K. Eccentric Fittings: reductions in sizes of steam mains and hot and/or chilled water mains shall be made with eccentric fittings. To avoid trapping of condensate or air in mains at eccentric reducers, install steam piping eccentric reducers with the offset to the bottom of the run, and install water piping eccentric reducers with the offset to the top of the run.
- L. Reducing Fittings: except for welded piping, no fittings shall be taped for drip except in boss provided for that purpose. Reducing fittings shall be used where drips are required.

- M. Unions shall be used in piping only adjacent to units of equipment such as pumps, oil burners, compressors, heating coils, cooling coils and all other items and accessories, or in other locations where specified, where shown on the Drawings, or where written permission is granted prior to installation.
- N. Mechanical Couplings Type Fittings: The use of mechanical coupling type fittings on hot and cold water piping in lieu of threaded or flanged fittings is acceptable in sizes 2" to 8" inclusive. The mechanical couplings shall be self-centering and shall engage and lock the grooved pipe and/or fittings in a positive couple while allowing for some degree of angular pipe deflection, contraction and expansion. Entire coupling installation including pipe grooving shall be performed in accordance with the manufacturer's instructions. Mechanical Products couplings together with their respective grooved end pipe fittings are acceptable.
 - 1. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified.
 - 2. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing.
 - 3. A manufacturer factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
- O. Grooved Copper coupling may be used in lieu of soldering joints on 2" and up Type L copper tubing; on water services from -30°F to +250°F within the manufacturer rated working pressures. Tubing shall be roll grooved as per manufacturer.
- P. Pressed Connect Fit (Pressure Seal - Press Fit) Fittings: All the connections shall be made in accordance with the manufacturer's installation instructions. Copper tubing shall be cut at right angles using displacement type cutter or fine-toothed saw. Burrs shall be removed from inside and outside of tubing to prevent cutting sealing element. Mark insertion depth according to manufacturer's insertion depth chart. Seals and grip ring shall be checked for correct fit. Only the manufacturer's sealing elements shall be used. Press fitting shall be slid onto tubing while turning slightly to the marked depth. Oils or lubricants shall not be used. Fitting connections shall be made with the tool provided by manufacturer. Manufacturer's assembly tool shall be used to perform the pressing process.

For locations where there is insufficient access to accommodate the pressing tool, this type of joint is not allowed. Sufficient clearance must be left around each joint to allow room for the pressing tool and jaw to be attached without interference when repairing the system in the future.

3.05 INSTALLATION OF FLEXIBLE CONNECTIONS

- A. Install stainless steel type on the water line at the circulating pumps and on the chilled water lines; and bronze type on the refrigerant line. Pipe system must be properly supported so as not to impose weight on the connectors which would compress the hose and relax the braid tension. Avoid torque. Do not twist the hose assembly during installation when aligning bolt holes in a flange or in mating-up the pipe threads.

3.06 PIPING TESTS

- A. For operational and hydrostatic tests, refer to testing specifications under division 23.
- B. Where piping installed under this project is connected to any existing system, such installed piping shall be isolated from the existing system during the performance of the required tests.

3.07 INSTALLATION OF PIPING SPECIALTIES

- A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
- B. Strainers
 - 1. Provide pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
 - 2. Provide strainers in supply line ahead of the following equipment and elsewhere as indicated:
 - Pumps
 - Steam traps serving steam main drips
 - Temperature control valves
 - Pressure reducing valves
 - Temperature or pressure regulating valves
- C. Dielectric Unions: Per Sections MC 1203.1.1, joints between different ferrous and non-ferrous metallic piping materials shall be made with approved dielectric fittings or brass converter fittings.
- D. Pipe Sleeves
 - 1. Install pipe sleeves where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on the Drawings or as reviewed by the Project Architect. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain.
 - a. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings.
 - b. Install iron-pipe sleeves at exterior penetrations, both above and below grade.
 - c. Install steel-pipe or plastic-pipe sleeves where indicated on the Drawings.

2. Sleeves for floors, walls and other masonry work shall be set in place before the slabs or walls are constructed. In buildings having floor slab of composite metal deck construction, Contractor shall be responsible for cutting holes in the steel deck. Where drilled openings are in terra cotta arch, exposed hollow core of the blocks shall be completely filled with non-shrink grout and prepacked to achieve firm bearing on the entire perimeter of the structural steel sleeve. Where corrugated sheet metal is encountered, it shall be cut by the rotary drill used to cut the arch. For location of sleeve, Contractor is to coordinate with new and existing Drawings (Structural steel beams are shown on original Drawings). Openings in arch must be located to miss existing structural steel. Openings in existing arch are to be made by rotary core drill only. Hammering of any type is not permitted. The size of the opening in arch may not exceed the requirement shown on the Details Drawings. The mix for non-shrink grout shall be in accordance with the manufacturer's recommendations. The non-shrink grout shall be compacted to provide firm bearing between the structural steel sleeve or sleeves and the existing arch. Additionally, where there are two sleeves, provide compacted non-shrink grout between the sleeves.
- E. Mechanical Sleeve Seals: Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes. Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal. Use fire protective seals where required. Size annular space as required for seal installation.
- F. Fire Barrier Penetration Seals: refer to firestopping specifications under architectural specifications.
- G. Drip Pans: locate drip pans under piping passing over or within 3 feet of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to side of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated on Drawings.

3.08 INSTALLATION OF EXPANSION COMPENSATION

- A. Expansion joints: Install expansion joint as determined for adequate expansion of installed piping system. Provide pipe anchors and pipe alignment guides in accordance with manufacturer's recommendations. Align units properly to avoid end loading and torsional stress.
- B. Expansion loops: Fabricate expansion loops as determined for adequate expansion of installed piping system. Subject loop to cold spring that will absorb 50% of total expansion between hot and cold conditions. Provide pipe anchors and pipe alignment guides as determined to properly anchor piping in relationship to expansion loops.
- C. Expansion compensation for risers and terminals: If not indicated on the Drawings, install connection between piping mains and risers with at least 5 pipe fittings including tee in main, install connections between piping risers and terminal units with at least 4 pipe fittings including tee in riser.

3.09 MISCELLANEOUS CONNECTIONS

- A. For steel piping runouts not detailed on the Drawings, use three elbow connections between runouts and mains.

- B. Connections to Equipment: provide three elbow runouts to all rotating equipment such as pumps and chillers. Provide swing connections for boilers. Provide two elbow connections to fuel oil tanks.
- C. Connections to Building Structure: connect to trusses and joints at panel points. Provide supplementary steel framing at panel points to transfer loads to framing.
- D. Connection to domestic water system shall be protected by reduced pressure principal backflow preventer.

3.10 INSTALLATION OF SUPPORTS AND ANCHORS

- A. Provide all necessary pipe hanger material needed to safely and securely support or hang all piping. Pipe hanger loads shall be determined by accurate weight balance calculations to prevent transferring loads and forces to any equipment and terminal connections. Per Section MC 305.4, piping shall be supported at distances not exceeding the spacing specified in MC Table 305.4 or in accordance with MSS SP-69.
- B. Install building attachments at required locations within concrete or on structural steel for proper piping support. Hangers and anchors shall be attached to building structure per Section MC 305.3. Space attachments within maximum piping span length indicated in MSS SP-69 and MSS SP-89 and MC Table 305.4. Install additional concentrated loads at valves, flanges, guides, strainers, expansion joints, and changes in direction of piping. Install concrete inserts before concrete is poured; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts. For composite metal decks, inserts shall be of the type that is supported entirely by the concrete slab, not by the metal deck. Install expansion bolts after erection of the metal deck, after concrete is placed and completely cured in accordance with the bolts manufacturer's written installation instructions. Expansion bolts shall be installed so that the load acts on the bolts in shear and withdrawal. Expansion bolts shall be carefully located in order to eliminate the risk of damage to concrete, steel reinforcement, electrical conduits and any other embedded items.
- C. Install hangers, supports, clamps and attachments to support piping properly from building structure per Section MC 305.3. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69 and MSS SP-89 and MC Table 305.4. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
- D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and all other items and accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- E. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated or by other recognized industry methods.
- F. Provisions for Movement
 - 1. Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

G. Pipe Supports

1. Mains located near floors shall be supported on roller type pipe stands bedded in cement base. When mains are installed before concrete floor is laid, the mains shall be supported from overhead construction until the pipe stands can be put in place.
2. Horizontal piping connections (near floor) to convectors and all other items and accessories located more than 4' from risers shall be supported on adjustable iron pipe stands. Pipe stand shall consist of a split ring extension hanger mounted on a hanger flange, which shall be secured to the floor.

H. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on chilled water piping, install coated protective shields. For pipe 8" and over, install wood insulation saddles.
3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.
4. Insulation Saddle System, the equal of Anvil Fig 260 ISS can be used instead of shields and/or saddles when proper insulating techniques are employed including the use of mastic and caulk on all insulation edges and final taping. Position the pipe on the saddle, notch section of the insulation to fit around the saddle, square cut the adjoining insulation section and butt the mating end to the notched section, finish taping according to standard methods, no metal shield is required between the hanger and pipe insulation.

- I. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent transfer of loading and stresses to connected equipment.
- J. Fabricate and install anchor by welding steel shapes plates and bars to piping and to structure. Comply with AWS standards.
- K. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions and to limit movement of piping and forces to maximum recommended by manufacturer for each unit.
- L. Anchor Spacings: where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

- M. Piping passing under concrete areas shall be supported by hangers secured by means of beam clamps fastened to the beams. Where pipe support spacing is excessive between steel, beam clamps shall be fastened to structural members that are approved by the Authority. Removed fireproofing around beams shall be replaced to original condition. No hangers or supports shall be attached to hung ceilings, concrete, ductwork or work of other trades.
- N. The refrigerant piping above the roof slab shall be supported in a galvanized sheet steel enclosure constructed in accordance with the Detail shown on the Drawings. The cover of the enclosure shall be held in place with stainless steel sheet metal screws on 18" centers. The base of the enclosure shall be secured to the angle uprights with 1/4" bolts, washers and nuts.
- O. Hangers and supports for refrigerant piping shall be copper plated, malleable iron or carbon steel.

3.11 CLEANING, FLUSHING, INSPECTING

- A. Clean exterior surfaces of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items. Inspect pressure piping in accordance with procedures of ASME B31.
- B. Hanger Adjustments: adjust hangers so as to distribute loads equally on attachments.
- C. Support Adjustment: provide grout under supports so as to bring piping and equipment to proper level and elevations.

3.12 PAINTING

- A. Upon completion of the installation, remove all protecting materials, all scale and grease and leave in a clean condition for painting.

3.13 PIPE APPLICATION

- A. Boiler Piping
 - 1. Each boiler shall be connected with steam, feed water, city water (quick fill), blow-off, water equalizing, trimming, and accessories piping as shown on the Drawings and as specified. Refer to the Drawings Details. The steam header may be made with screwed fittings or fabricated by welding at the shop with welding fittings.
 - 2. Provide water supply to fill the boilers with City water as shown on the Drawings.
- B. Mains
 - 1. Steam Mains: Pitch horizontal steam piping in the direction of steam flow, excepting the runouts to risers and other piping which the Drawings indicate is to be pitched against the flow. Piping shall be hung at the elevations given on the Drawings. Where the elevations are not indicated, install piping approximately 12" below the overhead beams. In boiler, fan and equipment rooms, provide piping so as to give easy access to valves.
 - 2. Return Mains: Return mains shall be run in the locations shown on the Drawings. Return mains on floors or in trenches shall not be installed until floors have been

laid, unless otherwise directed. Such return piping shall be painted immediately after erection. Outlets of return piping in trenches, and at or near floor shall be plugged or capped until connecting piping has been installed.

3. Low Points: Low points of each seal or pocket in piping shall be provided with a 1/2" (minimum size) gate valve arranged to empty the line.
4. Water Piping: Piping shall be installed at the elevations and locations indicated on the Drawings. It shall be so supported as to avoid the trapping of air. However, where trapping of air cannot be avoided, provision shall be made for manual venting of piping in such locations. Each low point in a main shall be provided with a 1" bronze hose gate valve, having a bronze cap and chain on the outlet.
5. Condensate Drain Piping: Condensate drain piping from cooling coil drain pans shall be pitched at not less than one-eighth unit vertical in 12 units horizontal (1-percent slope) in the direction of discharge per Section MC 307.2.1.

C. Runouts

1. Runouts from steam mains for risers, convectors, and all other items and accessories shall be taken from top of steam main on a rise of 45° and shall be pitched toward the main, unless otherwise shown on the Drawings.
2. Runouts from return mains for risers, convectors, and all other items and accessories shall be taken from the side of horizontal return main and shall be pitched toward the main, unless otherwise shown on the Drawings.

- D. Risers: Steam and return risers shall be installed in the locations indicated on the Drawings. They shall be of the sizes marked on the Riser Schedule or Sheet. Where the distance between fittings is less than 18', no couplings shall be used in the riser. Risers shall be supported and anchored at the first floor of a 3-story building, and at the second floor of a 4-story building. Risers, connections to convectors, traps, and all other items and accessories shall be neatly arranged and shall allow for expansion.

E. Drips, Test Connections

1. Drips shall be provided to keep horizontal steam piping free of condensation. They shall be connected from steam mains, branches at locations indicated on the Drawings, through traps to return mains as per Drawings Details. Each trap in a steam main drip shall have a strainer and a full size valved by-pass. Drips not shown on the Drawings, but made necessary by job conditions, shall be provided as directed, as part of the Contract.
2. Provide plugged tees for steam pressure and vacuum test connections in the locations indicated on the Drawings. Test connections shall be as shown in the Drawings Details.

F. Vacuum Heating Pump Connections

1. Condensate return piping from direct radiation, heating coils, drips, and all other items and accessories shall be connected into a vacuum heating pump suction header, unless otherwise shown on the Drawings. Suction header shall be constructed of pipe, flanges, welding fittings in accordance with the Drawings Details.

2. Vacuum pump installation shall be complete in all respects. Piping, valves, connections shall be arranged so that the pumping units will perform the duties when operating simultaneously or separately.
- G. Steam Convectors Connections: Provide schedule 40 black steel pipe connection to steam convectors. Supply shall be provided with a gate valve, and a pneumatic steam control valve and return with a thermostatic trap, three elbow swing joint, and gate valve. Refer to the Standard Details.
- H. Piping for Oil Burning Equipment : Not Used.
- I. Air Piping for Temperature Control : Not Used.
- J. Steam Piping Systems: Not Used.
- K. Water and Propylene Glycol Piping Systems
1. Pitch: Pitch horizontal piping 1/8" per 10' in direction indicated on Drawings. When direction of flow is not indicated, pitch supply piping up in direction of flow and return piping downward in direction of flow.
 2. Air Vents: Install air vents at locations indicated on the Drawings, and at each high point in system. Use manual air vents, unless otherwise indicated.
 3. Drains: Provide drains at low points, consisting of a 1/2" valve with a hose bibb connection, and at the following locations and equipment:
 - a. In each section of piping separated by valves.
 - b. For each riser, where riser or runout to riser has a valve installed.
 - c. For each heating cooling unit, having valves in supply and return connections.
 - d. In low point of piping to each down feed convector or radiator.
 4. Runouts: Connect runouts to upfeed risers to top of mains, and runouts to downfeed risers to bottom of mains.
- L. Fill and Make-Up Water System to match connecting Plumbing Work.
- M. Dissimilar Pipe Joints
1. Between Cast Iron and Threaded Pipe: Use a half coupling screwed onto the threaded pipe to form a spigot end and calk into the cast iron pipe.
 2. Between Black Steel Pipe and copper pipe or tubing: Use a dielectric connector or brass converter fittings per Sections MC 1203.1 and MC 1303.1.1.
 3. Between galvanized steel pipe and copper pipe or tubing: Use a dielectric connector or brass converter fittings per Sections MC 1203.1 and MC 1303.1.1.
 4. Between Threaded Brass and Threadless Copper Pipe: Use a suitable brazing adapter.

5. Between Threaded Pipe and Types L Copper Tubing or Welded Brass: Water Tube: Use suitable cast bronze soldering adapter.
 6. Between Cast Iron and Threadless Copper Pipe: Use an approved flanged adapter.
 7. Between Cast Iron Soil Pipe and Type DWV Copper Tubing or Welded Brass: Drainage Tube: Use a suitable copper to soil pipe adapter and caulk into the cast iron pipe.
 8. Between Type DWV Copper Tubing or Welded Brass Drainage Tube and Threaded Outlets at Drains or Fixtures: Use a suitable cast bronze adapter.
 9. Between Grooved End Steel Pipe and Other Types of Pipe Joints, Pipe Fittings and Pipe Materials: Use adapter fittings and grooved end coupling fittings, as manufactured by the grooved end pipe fitting manufacturer.
 10. Between Hubless Cast Iron pipe and Other Types of Pipe Joints, Pipe Fittings and Pipe Materials: Use adapter fittings, hubless fittings and joint couplings, as furnished by manufacturer.
 11. Between Cast Iron and Ductile Iron Pipe, with Rubber Ring Gasketed Joints, and Other Types of Pipe Joints, Fittings and Materials: Use adapter fittings of material and type as required for the particular application.
 12. Dissimilar pipe joints in refrigerant piping, i.e., copper to steel, copper to bronze, all stainless steel; stainless steel to copper, brass or bronze: Use approved adapter fittings, with a cadmium free melting alloy.
- N. Piping for Water Heaters: Where Plumbing and Drainage furnishes a steam tube type water heater, provide steam and return piping, temperature regulating valve, hand valves, traps, and all other items and accessories as shown on the Drawings.
- O. Standard Weight Red Brass Pipe: Use for compressed air reducing station, piping between boiler and water column, between boiler and water feeder, between boiler and steam gauge, between boiler and secondary low water cut-off, and drip piping from water column, water feeder and secondary low water cut-off.
- P. Schedule 80 Black Steel Pipe: Use for steam heating return mains, return riser runouts, steam heating coil returns, drips, blow-offs, boiler feed pump discharge, boiler equalizer, steam vent lines, and for all fill and vent piping buried in the ground. Pipe buried in the ground shall be protected with heavy coat of black asphaltum paint.

3.14 PIPE AND FITTING SCHEDULE

- A. Compressed Air (A) 125 psig and Less:
1. 2 $\frac{1}{2}$ " and Less: Red Brass pipe with Malleable Brass threaded fittings.
 2. Standard Weight Galvanized steel pipe with Galvanized fittings is only required for direct buried pipe. Pipe above ground shall be standard weight black steel pipe with threaded or grooved joints.
- B. Compressed Air (A) 126 psig to 250 psig: Standard Weight Black Steel pipe with Screwed End 300 lb Malleable Iron fittings or grooved end with grooved end fittings.

C. Directly buried in the Ground:

1. Option 1 (All Sizes): Extra Heavy Weight Black Steel pipe (Schedule 80) with Weld End Extra Heavy Weight (Schedule 80) Steel fittings with cathodic protection. Where sacrificial anodes or impressed current systems are used, monitors to check on the adequacy of the system shall be installed and kept in proper working condition. Except where cathodic protection is provided by impressed current, underground piping systems shall have dielectric bushings, washers, sleeves or gaskets installed at the end to electrically isolate the piping system from the tank. These dielectric connectors must be chemically compatible when exposed to petroleum, petroleum additives and corrosive soils. The corrosion protection system must be designed by the Contractor's qualified engineer or corrosion specialist and must be designed to provide a minimum of thirty (30) years of protection against external corrosion. Submit the underground oil piping protection system design (cathodic protection by sacrificial anodes or impressed current) for approval.
2. Option 2 (All Sizes): Double Wall Steel pipe; inner pipe: Extra Heavy Weight Black Steel pipe (Schedule 80) with Weld End Extra Heavy Weight Steel fittings (Schedule 80); outer pipe: Standard Weight Black Steel pipe (Schedule 40) with Weld End Standard Weight Steel Fittings, primed with a factory-formulated galvanized metal primer for exterior application, then finish coated with black asphaltum.

D. Instrument Air (IA) 60 psig and Less: Type L copper tubing, with copper or brass or bronze solder fittings.

E. Hot Water Supply and Return (HWS and HWR) 125 psig and less:

1. 3" and Less: Standard weight black steel pipe with screwed ends standard weight cast-iron fittings; or grooved end pipe with grooved end fittings; or Type L hard drawn copper tubing with wrought copper or cast copper alloy solder fittings and Type 3 solder (ASTM B32 Alloy Grade E, AC or HB) or mechanically extracted joints made up with brazing alloy or press fit or roll grooved copper tube with grooved end fittings.
2. 4" size: Standard weight black steel pipe with screwed ends standard weight cast iron fittings or weld end standard weight steel fittings or grooved end fittings; or (press fit Type L hard drawn copper tubing)
3. 5" and Up: Standard weight black steel pipe with weld end standard weight steel fittings or grooved end fittings
4. Acceptable option is to provide brass pipe, brass tubing, copper or copper-alloy pipe per MC Table 1202.4. Joints between brass pipe or fittings shall be brazed, mechanical, threaded or welded joints conforming to Sections MC 1203.3 and MC 1203.5. Joints between brass tubing or fittings shall be brazed, mechanical, or soldered joints conforming to Sections MC 1203.3 and MC 1203.6. Joints between copper or copper alloy pipe or fittings shall be brazed, mechanical, soldered, threaded or welded joints conforming to Sections MC 1203.3 and MC 1203.7.

F. Refrigerants (RS, RL, RG and RD) 350 psig and Less: Refrigerant lines shall be ACR tube per ASTM B280. Joints in refrigerant piping shall be brazed. Flared compression A1 fittings may be used only at the terminal equipment connections. Soldered joints shall not be used in such refrigerating systems. Mechanical press fittings for refrigerant lines are not permitted.

G. Secondary Water (SWS and SWR) 125 psig and Less:

1. 3" and Less: Standard weight black steel pipe with screwed ends standard weight cast-iron fittings; or grooved end pipe with grooved end fittings; or Type L hard drawn copper tubing with wrought copper or cast copper alloy solder fittings and Type 3 solder (ASTM B32 Alloy Grade E, AC or HB) or mechanically extracted joints made up with brazing alloy or press fit or roll grooved copper tube with grooved end fittings.
2. 4" size: Standard weight black steel pipe with screwed ends standard weight cast iron fittings or weld end standard weight steel fittings or grooved end fittings; or (press fit Type L hard drawn copper tubing)
3. 5" and Up: Standard weight black steel pipe with weld end standard weight steel fittings or grooved end fittings
4. Acceptable option is to provide brass pipe, brass tubing, copper or copper-alloy pipe per MC Table 1202.4. Joints between brass pipe or fittings shall be brazed, mechanical, threaded or welded joints conforming to Sections MC 1203.3 and MC 1203.5. Joints between brass tubing or fittings shall be brazed, mechanical, or soldered joints conforming to Sections MC 1203.3 and MC 1203.6. Joints between copper or copper alloy pipe or fittings shall be brazed, mechanical, soldered, threaded or welded joints conforming to Sections MC 1203.3 and MC 1203.7.

H. Condensate Drain Piping: Connected to drip-lip pump bases; all drip piping from air handling units; all drains and overflow lines from heating and air conditioning systems, and all condensate piping systems connected to drain pans - All Sizes: Standard weight (Schedule 40) galvanized steel pipe; or Type L hard temper copper tubing and fittings. Minimum condensate drain line diameter shall be in accordance with MC Table 307.2.2.

I. Emergency/Standby Generator Exhaust: Standard Weight Black Steel Pipe with Welded Fittings or Double Wall Insulated Metal Chimney per Section 15575.

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SECTION 233100
METAL DUCTWORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all the metal ductwork used for the HVAC system, as specified herein, as shown on the Drawings and as needed for a complete and proper installation.

1.02 INDOOR AIR QUALITY (IAQ) REQUIREMENTS DURING CONSTRUCTION

- A. During construction, the HVAC Contractor shall comply with the Indoor Air Quality (IAQ) Requirements.

1.03 RELATED SECTIONS

- A. Division 23 Sections

1.04 SUPPLEMENTAL SUBMITTALS

A. Product Data

1. Submit Shop Standards for metal ductwork including gages, materials, type of joints, sealing requirements, method of fabrication and reinforcing. Shop standards shall be in accordance with the SMACNA HVAC Duct Construction Standards, 2005 Edition.
2. Submit manufacturer's product data for factory-fabricated single wall round ductwork, duct sealant and cement, gasket materials, duct liner and sound traps; and installation instructions.
3. Include American Conference of Governmental Industrial Hygienists (ACGIH) figure numbers for hoods if applicable.
4. Submit product data for factory manufactured commercial Fire-Resistive Duct Assemblies.

B. Shop Drawings

1. Submit scaled layout drawings (3/8"=1') of metal ductwork and fittings including but not limited to duct sizes, locations, elevations, slopes of horizontal runs, wall and floor penetrations, and connections, including location of connections. Show modifications of indicated requirements, made to conform to local shop practice and how those modifications ensure that free area, materials and rigidity are not reduced.
 - a. Layouts should include all the room plans, mechanical equipment rooms and penthouses.
2. Method of attachment of duct hangers to building construction with all the support details including methods for vibration isolation, cable hanging systems and

seismic restraints. For expansion bolts installed in concrete, submit ICC certification for use in cracked concrete.

3. Layout and fabrication details for kitchen exhaust ducts.
4. Submit shop manufactured method of fabrication for Fire-Resistive Duct Assemblies.
5. Coordinate Shop Drawings with related trades prior to submission. HVAC Contractor shall provide shop drawings for all roof openings required for installation of HVAC systems. Roof opening shop drawings shall be dimensioned from the centerline of the nearest structural column and coordinated with the approved HVAC equipment, sheet metal shop drawings, framing plan, etc.

C. Quality Control Submittals

1. Duct Leakage Tests: Refer to Cleaning and Testing Specification Sections.

1.05 SUPPLEMENTAL QUALITY ASSURANCE

A. Unless otherwise shown or specified, follow the Hood Design Data and Construction Guidelines for Local Exhaust Systems from the ACGIH Industrial Ventilation Manual.

B. Codes and Standards

1. SMACNA Standards: Comply with SMACNA's HVAC Duct Construction Standards Metal and Flexible Third Edition-2005 for fabrication and installation of metal ductwork.
2. NFPA Compliance: Comply with the NFPA 96-1984 as amended by Section MC 506 of the Mechanical Code.
3. Comply with the NY Mechanical Code, latest edition.
4. All appliances regulated by the New York Construction Codes shall be listed and labeled (reference Sections MC 301.4 and MC 301.6). Testing of material shall be in accordance with the NY Mechanical Code.
5. Smoke Control: Not used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sheet Metal

1. Aluminum: ASTM B209, Alloy 3003, Temper H-14 sheet form with standard, one-side bright finish for ducts exposed to view and with mill finish for concealed ducts.

2. Galvanized Steel: Lock-forming quality; ASTM A653 G60 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
 3. Stainless Steel: ASTM A480, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view; and Type 304, sheet form with No.1 finish for concealed ducts.
 4. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
 5. Tie Rods: Galvanized steel, 1/4" minimum diameter for 36" length or less; 3/8" minimum diameter for lengths longer than 36".
- B. Gages of Metal for galvanized rectangular duct: Gages of metal shall be in accordance with Tables 2.1 through 2.28 of SMACNA HVAC Duct Construction Standards Third Edition - 2005. Duct shall be constructed to the pressure shown on the on the Drawings. The duct pressure classification shall default to the equipment external static pressure if the pressure levels are not shown on the Drawings. However, for ductwork upstream of chilled beams, displacement induction units and VAV boxes and outdoor ductwork, the Construction Class shall be 3-inch WC (inches of water column) or higher equipment external static pressure.
- C. Hangers and Supports
1. Rod Type Hangers and Angles: Hot dip galvanized steel with 2 locking nuts in place.
 2. Strap Hangers: Same material as ducts except that galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
 3. Trapeze and Riser Supports: Steel shapes complying with ASTM A36. Same material as ducts.
 4. Strap and Rod Sizes: Comply with SMACNA for sheet width and thickness and for rod diameters.
 5. For ducts with a cross sectional area of 2 square feet or less, hangers shall be constructed of at least 1" by 1/16" steel strap. For ducts with a cross sectional area of over 2 square feet, hangers shall be constructed of at least 1" by 1/8" steel strap.
 6. Expansion bolts for use in existing and new reinforced stone concrete slabs and concrete deck shall be as follows: Fully threaded, torque-controlled, wedge-type expansion anchor consisting of a high-strength threaded stud body, stainless steel expansion elements (clip, wedge), nut and washer. Expansion Bolts installed in concrete shall be in accordance with Appendix D of ACI 318 as modified by Sections 1908.1.9 and 1908.1.10 as per Section BC 1912 of the Building Code.
 - a. "Trubolt+" as manufactured by ITW Ramset/Red Head

- b. "Kwik Bolt 3" as manufactured by Hilti, Inc.
- c. "Power Stud+ SD2" as manufactured by Powers Fasteners, Inc.

- 7. Cable Hanging Systems (Gripple): Cable Hanging Systems with adjustable mechanical devices compliant with SMACNA HVAC Duct Construction Standards Third Edition-2005 shall consist of ready-to-use factory tested kit comprising of cable and cable end options. Crimps shall be Factory installed. All cable hanger products shall be certified as SMACNA and UL listed. All cable hangers shall have a minimum of 4:1 safety margin over the listed Safe Working Load (SWL).

D. Miscellaneous Ductwork Materials

- 1. Sheet Metal Screws, Machine Bolts, Rivets and Nuts: Tinned, cadmium plated or rust resistant materials. Bolts shall be button-head stove bolts, 1/4" x 3/4" unless otherwise specified.
- 2. Concrete Inserts: Steel or malleable iron, galvanized; continuously slotted or individual inserts conforming with MSS SP-58, Types 18 and 19, Class A-B.
- 3. Beam Clamps: For ducts with a cross sectional area of 2 square feet or less, clamp shall be Caddy Catalog Number 4H-Series Fig 2. For ducts with a cross sectional area of over 2 square feet, clamp shall be Fee & Mason 255L with locking nut and 255S retaining strap.
- 4. Welding Studs: Erico Fastening Systems, capacitor discharge, low carbon steel, copper flashed.
- 5. Structural (carbon) Steel Shapes and Steel Plates: ASTM A36, shop primed.
- 6. Stainless Steel Shapes and Plates: ASTM A276 and ASTM A666.
- 7. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork in accordance with Article 2.02.A.3.
 - a. All adhesives and sealants used on the construction of ductwork shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.
- 8. Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement, type applicable for fabrication/installation detail as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork in accordance with Article 2.02.A.3.

- a. All adhesives and sealants used on the construction of ductwork shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.
9. Flexible Ducts: Either spiral-wound spring steel with flameproof vinyl sheathing, or corrugated aluminum; complying with UL 181. Where installed in unconditioned spaces other than return air plenums, provide 1" thick continuous flexible fiberglass sheath with vinyl vapor barrier jacket.
10. Underslab Ducts: For ductwork placed in concrete slabs, or under slabs on grade, fabricate ductwork of one of the following materials:

Vinyl Chloride Coated Steel
Stainless Steel

Underground ducts shall comply with Section MC 603.8.
11. If any fiberglass duct lining is used (i.e. 25 feet of supply and return ducts for DOAS systems), it shall be covered with a matte-faced neoprene covering and sealed with an acrylic polymer. Surface burning characteristics shall have a flame spread index less than 25 and smoke developed index less than 50 per ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231 per Section MC 604.3. Lining shall be secured with pins or mechanical fasteners. Lining that is secured with adhesive only is not acceptable. The fiberglass lining shall not support fungi or bacterial growth as per ASTM C1338, ASTM G21 and ASTM G22. Fiberglass lining shall conform to the erosion test method described in UL Publication No. 181. Fiberglass lining density shall be 1½ lbs. per cubic foot, minimum of 1", unless otherwise indicated on the Drawings.

The duct lining shall have the following minimum R values:

Thickness (in)	R Value (ft ² ·°F·h/BTU)
1	4.3
1.5	6.3
2	8.7

The minimum duct lining sound absorption coefficients shall be as follows:

Thickness (in.)	NRC
1	.75
1.5	.90
2	1.00

Approved manufacturers:

Owens Corning Aeroflex
Johns Manville Permacote Linacoustic
Certainteed Ultralite

Duct liner may also be a non-erosive, open cell, fiber-free, polyimide foam material. Foam maximum thermal conductivity shall be .35 BTU·in/h·°F·ft². Foam surface burning characteristics shall have a flame spread index less than 25 and smoke developed index less than 50 per ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231 per Section MC 604.3. The foam lining shall conform to the erosion test method described in UL Publication No. 181. The foam lining shall not support fungi or bacterial growth as per ASTM C1338, ASTM G21 and ASTM G22. Foam lining shall be coated with an acrylic polymer. Foam sound absorption coefficient shall be a minimum of .65 NRC for 1" lining and .80 NRC for 1½" lining. The foam lining shall be Johns Manville Polycoustic or approved equal for use as a thermal/acoustical liner for metal duct systems.

All adhesives and sealants used on the fabrication/installation of internal acoustical lining shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.

12. Welds: Weld material shall match ductwork material. Galvanized ductwork welds to be cleaned and painted with galvanizing repair paint conforming to ASTM A780.

2.02 FABRICATION – GENERAL

- A. Fabricate ductwork from galvanized sheet metal of the gages specified in SMACNA HVAC Duct Construction Standards Third Edition - 2005 except as follows:
 1. Fabricate the following ductwork from aluminum: Exhaust ductwork from shower, locker room of shower area, can washing and steam service rooms and swimming pool areas and where shown on the Drawings.
 2. Fabricate the following ductwork as follows:
 - a. Exhaust ductwork connected to fixed fume hood laboratory exhaust, Acid Storage Room exhaust and Acid Storage Cabinet exhaust:
 - 1) Ductwork from the individual hood, Acid Storage Room or Acid Storage Cabinet connection to its respective fan shall be G90 galvanized sheet steel per Section MC 510.8, with gage thicknesses as defined in MC Table 510.8. Any ductwork upstream of the exhaust fan that is outside of the building shall be AISI Type 316 stainless steel and of gages as defined in MC Table 510.8.

- 2) The stack attached to the discharge side of the exhaust fan external to the building shall be 12-gage (to tolerate wind loading) AISI Type 316 stainless steel with necked-down diameter exit cone. The stack diameter and exit cone diameter shall be as shown on the Drawings. Height of the stack shall be 10' minimum above the roof. Guy wires shall be 3/16" diameter aircraft cable, quantity as shown on the Drawings.
3. Joints, Seams and Connections: Per Section MC 603.9, all longitudinal and transverse joints, seams and connections in ducts shall be constructed as specified in SMACNA HVAC Duct Construction Standards—Metal and Flexible. All joints; and longitudinal and transverse seams and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, liquid sealants or tapes. Per Section C403.11.2.3 of the IECC, ductwork and all plenums with pressure class ratings shall be constructed to Seal Class A, duct leakage class 4. All connections shall be sealed, including, but not limited to, spin-ins, taps, other branch connections, access doors, access panels, and duct connections to equipment. Sealing that would void product listings is not required. Spiral lock seams need not be sealed. Closure systems used to seal ductwork listed and labeled in accordance with UL 181A shall be marked "181A-P" for pressure-sensitive tape, "181 A-M" for mastic or "181 A-H" for heat-sensitive tape. Closure systems used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked "181B-FX" for pressure-sensitive tape or "181B-M" for mastic. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked "181B-C." Closure systems used to seal metal ductwork shall be installed in accordance with the manufacturer's installation instructions. Unlisted duct tape is not permitted as a sealant on any metal ducts.
- B. Dissimilar Metals: Separate dissimilar metals used for ductwork with vinyl, neoprene or silicon rubber coated woven fiberglass or woven nylon/polyester blend duct connector fabric by Duro Dyne. No separation is required between screws or rivets and the materials they are inserted in.
- C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated on the Drawings, fabricate elbows with centerline radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for diverging concentric transition and 60° for converging concentric transition unless otherwise shown on the Drawings.
- D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Ductwork Accessories and Damper specification sections.
- E. The penetration of fire rated walls with fire dampers and fire/smoke dampers shall be installed as shown on drawings and as per New York Construction Codes.
- F. Fabricate ductwork with the duct liner specified above in each section of duct where required in order to meet the noise criteria standards. Provide liner where shown on the Drawings. Install liner to internal surfaces of duct in accordance with instructions

provided by the manufacturer of lining. Lining that is secured with adhesive only is not acceptable. Liner shall be neatly butted without gaps at transverse joints and shall be coated with adhesive at such joints before butting. Longitudinal joints in the duct liner shall not occur except at the corners of the ducts, unless the size of the duct and standard liner product dimensions make them necessary. Mechanical fasteners shall be located with respect to interior dimensions in accordance with the SMACNA HVAC Duct Construction Standards, Metal and Flexible, Third Edition, 2005.

2.03 FABRICATION OF ALUMINUM DUCTS

- A. Type 3003 aluminum sheets shall be used in the construction of the aluminum ducts. Hangers and braces shall be of galvanized steel. Duct shall be fabricated from gage selected according to the SMACNA HVAC Duct Construction Standards, Third Edition-2005. Where an aluminum duct is to be joined to a galvanized steel duct, the end of the galvanized duct shall be coated with black asphaltum paint before it is connected to the aluminum duct. All joints and seams in Shower Room exhaust ductwork shall be made watertight by the use of a suitable sealant. Longitudinal seams shall not be located at bottom of duct.

2.04 FABRICATION OF STAINLESS STEEL DUCTS

- A. Gages of stainless steel sheets used for ductwork shall be the same as those specified for galvanized steel sheets, unless otherwise noted.
- B. Use minimum No. 18 gage except as where noted otherwise.
- C. Use stainless steel reinforcing members for ducts in finished spaces and galvanized steel in unfinished spaces.

2.05 FACTORY-FABRICATED SINGLE WALL ROUND DUCTWORK

- A. Provide factory-fabricated duct and fittings, in lieu of shop-fabricated duct and fittings specified to be of galvanized construction in Article 2.02.
- B. Material: Galvanized sheet steel complying with ASTM A653, G60 coating designation; lockforming quality; mill-phosphatized finish for surfaces of ducts exposed to view.
- C. Gage as specified in SMACNA's HVAC Duct Construction Standards, Metal and Flexible Third Edition-2005. The construction standards are based on G60 coated galvanized steel of ASTM Standards A653.
- D. Elbows: Fabricate in accordance with details of Mitered Elbows construction standards and Round Duct Elbows of SMACNA's HVAC Duct Construction Standards, Metal and Flexible Third Edition-2005.
- E. Transverse Joints; Select joint types and fabricate according to SMACNA's HVAC Duct Construction Standards Metal and Flexible, Third Edition-2005. Round duct transverse joints shall be in accordance with SMACNA's HVAC Duct Construction Standards Metal and Flexible, Third Edition-2005 for static-pressure class, materials involved, duct-support intervals, and other provisions per SMACNA standards. For ductwork upstream of chilled beams, displacement induction units and VAV boxes and outdoor ductwork, the Construction Class shall be 3-inch WC or higher equipment external static pressure.

- F. Longitudinal Seams: Select seam types and fabricate according to SMACNA's HVAC Duct Construction Standards, Metal and Flexible, Third Edition-2005. Round duct longitudinal seams shall be in accordance with SMACNA's HVAC Duct Construction Standards Metal and Flexible, Third Edition-2005 for static-pressure class, materials involved, duct-support intervals, and other provisions per SMACNA standards. For ductwork upstream of chilled beams, displacement induction units and VAV boxes and outdoor ductwork, the Construction Class shall be 3-inch WC or higher equipment external static pressure. Fabricate round ducts larger than 90" in diameter with butt-welded longitudinal seams.
- G. Tees and Laterals: Select types and fabricate according to SMACNA's HVAC Duct Construction Standards, Metal and Flexible, Third Edition-2005. 90° tees, laterals and conical tees shall be in accordance with SMACNA's HVAC Duct Construction Standards Metal and Flexible, Third Edition-2005 for static-pressure class, materials involved, duct-support intervals, and other provisions per SMACNA standards. For ductwork upstream of chilled beams, displacement induction units, and VAV boxes and outdoor ductwork, the Construction Class shall be 3-inch WC or higher equipment external static pressure.
- H. Approved Manufacturers

SEMCO Incorporated
Sheet Metal Connectors, Inc.
McGill AirFlow LLC.

2.06 FACTORY-FABRICATED DOUBLE WALL ROUND DUCTWORK

- A. Provide factory-fabricated double wall duct and fittings, in lieu of shop-fabricated duct and fittings for exposed ductwork in the Gymnasium and where indicated on the drawings. Double-wall ducts shall be fabricated with an outer duct that complies with HVAC Duct Construction Standards, Third Edition 2005. The smooth, inner duct (perforated or solid) shall be fabricated from a thinner material that protects the insulating material sandwiched between the inner and outer duct. The insulation shall have a 1" thick layer of fiberglass insulation: thermal conductivity: 0.26 BTU·in/h·°F·ft² at 75°F mean temperature.
- B. Material: Galvanized steel of lock-forming quality conforming to ASTM A653 G60 coated; mill-phosphatized finish for surfaces of ducts exposed to view.
- C. Outer Duct: Gage as specified in SMACNA HVAC Duct Construction Manual Third Edition-2005.
 - 1. Elbows: Fabricate in accordance with SMACNA HVAC Duct Construction Standards Third Edition-2005.
 - 2. Transverse Joints: Select joint types and fabricate according to SMACNA's HVAC Duct Construction Standards Metal and Flexible, Third Edition-2005, Round Duct Transverse Joints for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA's HVAC Duct Construction Standards, Metal and Flexible, Third Edition-2005.
 - 3. Longitudinal Seams: Select seam types and fabricate according to SMACNA's HVAC Duct Construction Standards, Metal and Flexible, Third Edition-2005

Round Duct Longitudinal Seams for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA's HVAC Duct Construction Standards, Metal and Flexible, Third Edition-2005. Fabricate round ducts larger than 90" in diameter with butt-welded longitudinal seams.

4. Tees and Laterals: Select types and fabricate according to SMACNA HVAC Duct Construction Standards for static-pressure class, materials involved, duct-support intervals, and other provisions in SMACNA HVAC Duct Construction Standards
- D. Inner Duct: Perforated minimum 26 ga galvanized sheet steel having 3/32" diameter perforations, with overall open area of 23% or minimum 28 ga solid sheet steel. The perforated galvanized sheet steel insulation shall be covered with a matte-faced neoprene covering and sealed with an acrylic polymer. Surface burning characteristics shall have a flame spread index less than 25 and smoke developed index less than 50 per ASTM E84 or UL 723, using the specimen preparation and mounting procedures of ASTM E2231. The fiberglass lining shall not support fungi or bacterial growth as per ASTM C1338, ASTM G21 and ASTM G22.
- E. Fittings: Fabricate in accordance with Double-Wall Duct Fitting of SMACNA's HVAC Duct Construction Standards, Metal and Flexible Third Edition-2005.
- F. Joints: Fabricate in accordance with Double-Wall Duct Joint of SMACNA's HVAC Duct Construction Standards, Metal and Flexible Third Edition-2005.
- G. Approved Manufacturers

SEMCO Incorporated
Sheet Metal Connectors, Inc.
McGill AirFlow LLC.

2.07 KITCHEN EXHAUST DUCTS

- A. Fabricate kitchen hood exhaust ducts and supports of carbon steel sheets complying with ASTM A1008/A1008M according to the following per Section MC 506.3.1.1:
 1. Ducts with cross sectional area up to and including 155 square inches shall be constructed of 0.0598" (No. 16 gage steel)
 2. Ducts with cross sectional area over 155 square inches but not more than 200 square inches shall be constructed of 0.074" (No. 14 gage steel)
 3. Ducts with a cross sectional area equal to or more than 200 square inches shall be constructed of 0.1046" (No. 12 gage steel)

Per Section MC 506.3.1.1, if stainless steel is used for ducts of any of the cross-sectional areas listed above, the gauge steel may be increased upwards (resulting in a smaller thickness) by 1 even gauge size.

Per Section MC 506.3.1.1, listed and labeled factory-built commercial kitchen grease ducts shall be listed and labeled in accordance with UL 1978 and installed in accordance with Section MC 304.1 and as approved by the Commissioner.

Fabricate Warming Pantry hood exhaust duct and supports of 16 ga. minimum galvanized steel. For duct construction, comply with SMACNA: HVAC Duct Construction Standards, Third Edition-2005 and Section MC 506.

- B. Not Used.
- C. Per Section MC 506.2, ducts exposed to the outside atmosphere or subject to a corrosive environment shall be protected against corrosion according to the following: all exterior ducts shall be protected on the exterior by paint or other weatherproof protective coating. Stainless steel ducts shall not require paint or weatherproof protective coating.

At the base of each duct and at its termination point a clearly identifiable permanent sign shall be installed identifying the facility from which the duct originates.

2.08 SOUND TRAPS FOR DUCTWORK: Not Used.

2.09 FIRE RESISTIVE DUCT ASSEMBLIES

- A. Fire Resistive Duct Assemblies may be rigid duct assemblies comprised of welded inner steel framework that is clad with a thick fire-resistant panel or factory manufactured commercial duct assemblies that are factory fabricated sheet metal duct system with additional applied fire resistive material.
- B. Pursuant to AC 28-113, the Office of Technical Certification and Research recognizes and establishes acceptance criteria for fire resistive duct assemblies in accordance with:
 - 1. ISO 6944, "Fire-Resistance Test for Ventilation Ducts". Ducts shall be tested and evaluated for stability, integrity and insulation (thermal).
 - 2. ASTM E 814/UL 1479, "Fire Test of Through-Penetration Firestop".
 - 3. ASTM E84, "Standard Test Method for Surface Burning Characteristics of Building Materials".
- C. Fire resistive duct assemblies used as alternative protection in applications where a damper would interfere with the intended operation of the duct. Such applications include:
 - 1. Fire resistive duct assemblies used in smoke control systems including stairwell and vestibule pressurization as per Section BC 607.2.1.
 - 2. Hazardous exhaust hood ducts (lab exhausts) per Section BC 424 and NFPA 45 Section 8.10.3.1.
 - 3. Cross-over floor ducts (conventional HVAC ducts that traverse a floor from one shaft to another).

PART 3 - EXECUTION

3.01 SUPPLEMENTAL INSTALLATION

- A. Install ductwork to allow maximum headroom. Properly seam, brace, stiffen, support and render ducts mechanically airtight. Adjust ducts to suit job conditions. Dimensions may be changed as approved, if cross sectional area is maintained.
- B. Pitch horizontal ducts connected to dishwasher and shower room exhaust downward toward hood not less than 1" in 10'.
- C. Provide necessary transformation pieces, and flexible fabric connections for ductwork connected to air handling units or air inlet and outlet devices.
- D. Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated or factory-fabricated work to accommodate installation requirements.
- E. Routing: Locate ductwork runs, except as otherwise indicated on the Drawings, vertically and horizontally and avoid diagonal runs wherever possible. Drawings are essentially diagrammatic. Provide offsets, rises, drops, all other items, accessories and necessary work as required to fit structure, avoid obstruction, and retain clearances, headroom openings and passageways. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Install parallel to or at right angles to walls and partitions, parallel to ceilings, level and plumb, unless shown otherwise. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown on the Drawings. Coordinate layout with suspended ceiling and lighting fixtures and similar finished work. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. All exposed ductwork located in the Gymnasium shall be double wall duct.
- G. Hangers and Supports
 - 1. All ducts shall be as close to the ceiling as possible except where pipes or electric conduits are indicated as passing above them. They shall be installed within the enclosing work (hung ceiling or furring) and shall not interfere with its construction. Where one duct is run below another duct of greater width, the lower duct shall be hung from the support of the upper duct. The support of the upper duct shall be increased in thickness in such cases.
 - 2. When the floor and/or roof slab construction for the Project is of conventional reinforced poured concrete type, the following directions apply: Overhead ductwork shall be supported by hangers secured to MSS Type 18 inserts before the floor slabs are poured or expansion type concrete anchors and fasteners, ITW Ramset/Red Head, Hilti, Powers Fasteners or approved equal after the floor slabs are poured and the forms have been removed.

Provide concrete inserts, expansion bolts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached. When used, install powder-actuated concrete fasteners and expansion bolts after concrete is placed and completely cured and metal deck has been erected. Powder-actuated concrete fasteners may be used for standard-weight

aggregate concrete and for lightweight-aggregate concrete of not less than 3,000-psi strength. Do not use powder actuated fasteners for slabs less than 4" thick or for seismic restraints.

Metallic fasteners installed with electrically operated or powder-actuated tools used as upper hanger attachments shall be in accordance with the SMACNA Manual, with the following exceptions: Do not use powder-actuated drive pins or expansion nails. Do not attach powder-actuated or welded studs to structural steel less than 3/16" thick. Do not support a load, in excess of 250 lbs from any single welded or powder-actuated stud unless it is tested in place and confirmed by the manufacturer.

Expansion bolts shall be installed in snug fitting smoothly drilled holes after concrete is placed and completely cured and metal deck has been erected in accordance with the bolts manufacturer's installation instructions. Expansion bolts shall be installed so that the load acts on the bolts in shear and withdrawal. Expansion bolts shall be carefully located in order to eliminate the risk of damage to concrete, steel reinforcement, electrical conduits and any other embedded items. Install in concrete after concrete is placed and completely cured.

3. When the floor and/or roof slab construction for the Project is the composite metal deck type, consisting of corrugated sheet steel and reinforced concrete, the following directions apply: Overhead ductwork shall be supported by hangers secured to expansion bolts, beam clamps or to Powers Fasteners "Bang-It" (or approved equal) steel deck inserts or Hilti, Inc. Cast-In Anchor HCI-WF. Steel deck inserts shall be of a type that is supported by the concrete slab and not by the metal deck. Powers Fasteners "Bang-It" or Hilti, Inc. Cast-In Anchor HCI-WF (or approved equal) inserts shall be used for threaded rod type hangers. For hangers using flat bars, install inserts in accordance with SMACNA Duct Construction Standards, Third Edition, 2005, Chapter 5. Inserts must be installed before the concrete is poured.
 4. When using powder-actuated fasteners in precast concrete, the manufacturer of the precast concrete shall be contacted to determine if the precast concrete can accept the installation of the fasteners.
The capacity of the fasteners and their installation should be as per the manufacturer's recommendation and installation instructions.
- H. Electrical Equipment Spaces: Do not route ductwork through transformer vaults and their electrical equipment spaces and enclosures.
 - I. Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1 1/2".
 - J. Coordination: Coordinate duct installations with installation of accessories, dampers, air handling unit, controls and other associated work of the ductwork system. Coordinate work of other trades affecting the ductwork. Penetrations made by all trades are to be sealed to an air-tight condition. Testing of ductwork shall be performed after all penetrations have been made, or redone if made after original testing.

- K. Where the corner of an angle iron brace or joint member projects into a walking passage, the corner shall be mitered and shall be padded with 1/2" minimum thickness flexible foamed plastic material to minimize the possibility of injury to personnel.
- L. Per Section MC 607.1.1.1, the space around a duct penetrating a nonfire-resistance-rated floor assembly shall comply with Section BC 716.6.3.

3.02 INSTALLATION OF DUCT LINER

- A. All adhesives and sealants used on the fabrication/installation of internal acoustical lining shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.
- B. Dimensions of lined ducts indicated on the Drawings are the inside dimensions of the duct after the liner has been installed. The duct dimensions shall be increased as necessary to compensate for liner thickness.
- C. Install as per SMACNA HVAC Duct Construction Standards, Metal and Flexible, Third Edition, 2005. Include metal nosing, etc. as required.
- D. All portions of the duct designated to receive acoustical duct liner shall be completely covered with acoustical duct liner. Transverse joints shall be neatly butted and there shall be no interruptions or gaps. The black coated surface of the acoustical duct liner shall face the air stream. The acoustical duct liner shall be adhered to the sheet metal with 100% coverage of adhesive and all exposed leading edges and all transverse joints coated with adhesive. Adhesive shall conform to Adhesive and Sealant Council Standards for Adhesive for duct liner, ASC-C-7001C-1972. The acoustical duct liner shall be additionally secured with mechanical fasteners except that gripnails or the equivalent shall not be allowed. Mechanical fasteners shall conform to Mechanical Fastener Standard MF-1-1971, available from SMACNA. Acoustical duct liner shall be cut to assure overlapped and compressed longitudinal corner joints. Fasteners shall start within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and shall be spaced as recommended by SMACNA.
- E. Duct liner may not be installed:
 - 1. Where operating temperatures exceed 250°F
 - 2. In Kitchen exhaust ducts, Fume Hood exhaust ducts, Acid Storage Room exhaust ducts, Acid Storage Cabinet exhaust ducts or ducts conveying solids or corrosive gas
 - 3. In any application where the duct liner may come in direct contact with liquid water (such as cooling coils) unless protected from the water source. Do not install liner within the first six feet downstream from a fresh air intake, outside grille, cooling coil or other source of water.
 - 4. In contact with water drain pan or evaporator coils

5. Inside fire damper sleeves
6. A minimum of 6" upstream and 6" downstream of high temperature heating coils (electric coils, gas heaters) as per Section MC 604.8. Provide metal nosing over exposed liner edges.
7. In ducts operating at a velocity in excess of the liner's maximum recommended velocity

3.03 INSTALLATION OF FLEXIBLE DUCTS

- A. Maximum Length: For any duct run using flexible ductwork, do not exceed 3'-0" extended length. Per Section MC 607.7, flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any wall, floor or ceiling.
- B. Installation: Install in accordance with Chapter 3 of SMACNA: HVAC Duct Construction Standards, Metal and Flexible, Third Edition-2005.

3.04 INSTALLATION OF KITCHEN EXHAUST DUCTS

A. Fabrication

Fabricate joints with continuous welds or braze (or as specified in the UL 1978 listing for factory fabricated ducts) per Section MC 506.3.2 for watertight construction. Per Section MC 506.3.2.1, duct joints shall be butt joints, welded flange joints with a maximum flange depth of 1/2" or overlapping duct joints of either the telescoping or bell type. Overlapping joints shall be installed to prevent ledges and obstructions from collecting grease or interfering with gravity drainage to the intended collection point. The difference between the inside cross-sectional dimensions of overlapping sections of duct shall not exceed 1/4". The length of overlap for overlapping duct joints shall not exceed 2".

B. Duct to Hood Joints

As required by Section MC 506.3.2.2 duct-to-hood joints for Type I hoods shall be made with continuous internal or external liquid-tight welded or brazed joints. Such joints shall be smooth, accessible for inspection, and without grease traps.

Exception: This section shall not apply to:

1. A vertical duct-to-hood collar connection made in the top plane of the hood in accordance with all of the following:
 - a. The hood duct opening shall have a 1" deep, full perimeter, welded flange turned down into the hood interior at an angle of 90 degrees from the plane of the opening.
 - b. The duct shall have a 1" deep flange made by a 1" by 1" angle iron welded to the full perimeter of the duct not less than 1" above the bottom end of the duct.

- c. A gasket rated for use at not less than 1,500°F is installed between the duct flange and the top of the hood.
 - d. The duct-to-hood joint shall be secured by stud bolts not less than 0.25" in diameter welded to the hood with a spacing not greater than 4" on center for the full perimeter of the opening. All bolts and nuts are to be secured with lockwashers.
 - 2. Per Section MC 304.1, listed and labeled duct-to-hood collar connections shall be installed as required by the terms of their approval, in accordance with the conditions of the listing and the manufacturer's installation instructions. Manufacturer's installation instructions shall be available on the job site at the time of inspection.
- C. Ducts Exposed to the Outside Atmosphere or Subject to a Corrosive Environment
 - 1. At the base of each duct and at its termination point, a clearly identifiable permanent sign shall be installed identifying the facility from which the duct originates.
 - 2. No portion of an exterior metal duct shall be nearer than 24" to any door or window or to any exit, or located where it would be readily accessible to the public, unless it is insulated or shielded to avoid injury to any person coming in contact with the duct.
Exception: Listed and labeled factory-built commercial kitchen grease ducts may be used when installed in accordance with Section MC 304.1.
 - 1. Per Section MC 506.3.12.3, exhaust outlets serving Type I hoods (kitchen hoods for collecting and removing grease vapors and smoke) shall be located not less than 10 feet horizontally from parts of the same or contiguous buildings, adjacent buildings and adjacent property lines and shall be located not less than 10 feet above the adjoining grade level. Exhaust outlets shall be located not less than 10 feet horizontally from and not less than 3 feet above air intake openings into any building.

Exception: Exhaust outlets shall terminate not less than 5 feet from parts of the same or contiguous building, an adjacent building, adjacent property line and air intake openings into a building where air from the exhaust outlet discharges away from such locations.
 - 2. Per Section MC 506.4.2, exhaust outlets serving Type II hoods (general kitchen hoods for collecting and removing steam, moisture, vapor, heat, odors and products of combustion, e.g. above dishwashers, pot washers and light-duty appliances, and which do not produce grease or smoke) shall terminate in accordance with the hood manufacturer's installation instructions and shall comply with all of the following:
 - a. Exhaust outlets shall terminate not less than 3' feet in any direction from openings into the building.
 - b. Outlets shall terminate not less than 10 feet from property lines or buildings on the same lot.

- c. Outlets shall terminate not less than 10 feet above grade.
- d. Outlets that terminate above a roof shall terminate not less than 30" above the roof's surface.
- e. Outlets shall terminate not less than 30" from exterior vertical walls.
- f. Outlets shall be protected against local weather conditions.
- g. Outlets shall not be directed onto walkways.
- h. Outlets shall be in accordance with the provisions for exterior wall opening protectives in the Building Code.

Where the heat and moisture loads from such appliances are incorporated into a separate removal system, Type II hoods are not required.

D. Grease Duct Cleanouts and Other Openings

1. Per Section MC 506.3.8, grease duct systems shall not have openings therein other than those required for proper operation and maintenance of the system. Any portion of such system having sections not provided with access from the duct entry or discharge shall be provided with cleanout openings. Cleanout openings shall be provided at every change in direction, within 3 feet of the exhaust fan, and as required under Section MC 506.3.9. Cleanout openings shall be equipped with tight-fitting doors constructed of steel having a thickness not less than that required for the duct. Doors shall be equipped with a substantial method of latching, sufficient to hold the door tightly closed. Doors shall be designed so that they are operable without the use of a tool. Door assemblies shall have a gasket or sealant that is noncombustible and liquid tight and shall not have fasteners that penetrate the duct. Listed and labeled access door assemblies shall be installed in accordance with the terms of the listing. Signage shall be provided at all required access doors and openings in accordance with Section MC 506.3.11.
2. Per Section MC 506.3.8.1, where ductwork is large enough to allow entry of personnel, not less than one approved or listed opening having dimensions not less than 22" by 20" shall be provided in the horizontal sections, and in the top of vertical risers. Where such entry is provided, the duct and its supports shall be capable of supporting the additional load and the cleanouts specified in MC 506.3.8 are not required. Where personnel entry is not possible for cleaning the interior of vertical ducts, suitable provisions shall be made to clean the vertical duct in its entirety as well as for cleaning the base of the vertical riser.
3. Grease duct horizontal cleanouts: Per Section MC 506.3.9, cleanouts located on horizontal sections of ducts shall be spaced not more than 20 feet apart, unless the opening prescribed by Section MC 506.3.8.1 is not possible, in which case openings large enough to permit thorough cleaning shall be provided at 12-foot intervals. The cleanouts shall be located on the side of the duct with the opening not less than 1.5" above the bottom of the duct, and not less than 1" below the top of the duct. The opening minimum dimensions shall be 12" on each side.

Where the dimensions of the side of the duct prohibit the cleanout installation prescribed herein, the openings shall be on the top of the duct or the bottom of the duct. Where located on the top of the duct, the opening edges shall be a minimum of 1" from the edges of the duct. Where located in the bottom of the duct, cleanout openings shall be designed to provide internal damming around the opening, shall be provided with gasketing to preclude grease leakage, shall provide for drainage of grease down the duct around the dam, and shall be approved for the application. Where the dimensions of the sides, top or bottom of the duct preclude the installation of the prescribed minimum-size cleanout opening, the cleanout shall be located on the duct face that affords the largest opening dimension and shall be installed with the opening edges at the prescribed distances from the duct edges as previously set forth in this article.

4. Grease duct fire-resistive access opening: Per Section MC 506.3.11, where cleanout openings are located in ducts within a fire-resistance-rated enclosure, access openings shall be provided in the enclosure at each cleanout point. Access openings shall be equipped with tight-fitting sliding or hinged doors that are equal in fire-resistive protection to that of the shaft or enclosure. An approved sign shall be placed on access opening panels with wording as follows: "ACCESS PANEL. DO NOT OBSTRUCT." Cleanout openings provided in ducts that are not located within a fire-resistance-rated enclosure shall be provided with sign- age at the required opening that contains the same wording.
5. Per Section MC 506.3.8.2, a suitable cleanout shall be provided for both the inlet side and outlet side of an in-line fan except where a duct does not connect to the fan. Such cleanouts shall be located within 3' of the fan duct connections to permit a thorough cleaning of the inlet and discharge ducts connected to the in-line fan as well as the interior of the fan itself.

Exception: Where suitable cleanouts for in-line fans cannot be provided, the in-line fan shall be of "clam shell" construction, which shall permit the fan to be opened and thoroughly cleaned while remaining in place.

E. Enclosures

1. Per Section MC 506.3.10, the duct enclosure shall serve a single grease duct and shall not contain other ducts, piping or wiring systems. Duct enclosures shall be either field-applied or factory-built. Duct enclosures shall have a fire-resistance rating not less than that of the fire-resistance rated assembly penetrated, but need not exceed 2 hours. Duct enclosures shall be as prescribed by Sections MC 506.3.10.1, MC 506.3.10.2 or MC 506.3.10.3 as defined below:
2. Per Section MC 506.3.10.1, Shaft Enclosure, Commercial kitchen grease ducts constructed in accordance with Section MC 506.3.1 shall be permitted to be enclosed in accordance with the Building Code requirements for shaft construction. Such grease duct systems and exhaust equipment shall have a clearance to combustible construction of not less than 18", and shall have a clearance to noncombustible construction and gypsum wallboard attached to noncombustible structures of not less than 6". Duct enclosures shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings.

Exceptions:

- a. The shaft enclosure provisions of Section MC 506.3.10.1 shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling, wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, which material, system, method of construction or product is approved by the Commissioner and installed according to the manufacturer's instructions. Exposed duct wrap systems shall be protected where subject to physical damage.
 - b. As an alternative to the above, a minimum insulation covering of 2" of magnesium or calcium silicate block, with staggered joints, attached with galvanized steel wire or material assembly equivalent in insulating and fire-resistant qualities which cannot be penetrated by grease, and as approved by the commissioner, shall be applied to all ducts inside of the building.
 - c. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.
 - d. A listed and labeled factory-built commercial kitchen grease duct system, evaluated as an enclosure system for reduced clearances to combustibles, and approved by the Commissioner and installed according to manufacturer's instructions.
3. Field-Applied Grease Duct Enclosure: Per Section MC 506.3.10.2, commercial kitchen grease ducts constructed in accordance with Section MC 506.3.1 shall be enclosed by a field-applied grease duct enclosure that is a listed and labeled material, system, product or method of construction specifically evaluated for such purpose in accordance with ASTM E2336. The surface of the duct shall be continuously covered on all sides from the point at which the duct originates to the outlet terminal. Duct penetrations shall be protected with a through-penetration firestop system classified in accordance with ASTM E814 or UL 1479 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated. Such systems shall be installed in accordance with the listing and the manufacturer's installation instructions. Exposed duct wrap systems shall be protected where subject to physical damage.
 4. Factory-Built Grease Duct Assemblies: Per Section MC 506.3.10.3, factory-built grease duct assemblies incorporating integral enclosure materials shall be listed and labeled for use as commercial kitchen grease duct assemblies in accordance with UL 2221. Duct penetrations shall be protected with a through-penetration firestop system classified in accordance with ASTM E814 or UL 1479 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated. Such assemblies shall be installed in accordance with the listing and the manufacturer's installation instructions.

5. Per Section MC 506.3.10.4, a duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.
6. Cleanout openings provided in ducts that are not located within a fire resistance-rated enclosure shall be provided with signage at the required opening that contains the same wording.

F. Interconnection of Type I and Type II Exhaust Systems

Type I and Type II exhaust systems can be interconnected downstream of filters with a fire damper at the connection to the exhaust system per Section MC 506.3.5 Exception 2.7.

G. Grease Duct Clearances

1. Per Section MC 506.3.6, where enclosures are not required, grease duct systems and exhaust equipment serving a Type I hood shall have a clearance to combustible construction of not less than 18", and shall have a clearance to noncombustible construction and gypsum wallboard attached to noncombustible structures of not less than 3".

Exceptions:

- a. For factory-built commercial kitchen grease ducts listed and labeled in accordance with UL 1978, the required clearance shall be in accordance with the listing of such material and as approved by the commissioner.
- b. Listed and labeled exhaust equipment installed in accordance with Section MC 304.1.
- c. Where commercial kitchen grease ducts are continuously covered on all sides with a listed and labeled field-applied grease duct enclosure material, system, product or method of construction specifically evaluated for such purpose in accordance with ASTM E2336, the required clearance shall be in accordance with the listing of such material, system, product or method.
- d. Grease ducts protected with a minimum insulation covering of 2" of magnesium or calcium silicate block, with staggered joints, attached with galvanized steel wire or material assembly equivalent in insulating and fire-resistant qualities which cannot be penetrated by grease. Such protection shall be applied to all ducts inside of the building as approved by the commissioner.

H. Prevention of Grease Accumulation in Grease Ducts

Per Section MC 506.3.7, duct systems serving a Type I hoods shall be constructed and installed so that grease cannot collect in any portion thereof, and the system shall slope not less than one-fourth unit vertical in 12 units horizontal (2-percent slope) toward the hood or toward an approved grease reservoir. Where horizontal ducts exceed 75 feet in length, the slope shall not be less than one unit vertical in 12 units horizontal (8.3-percent

slope). Dampers shall not be installed in the grease duct systems, except as required by Section MC 506.3.5, Exception 2 (as noted above).

I. Residue Trap

Per Section MC 506.3.7.1, a residue trap shall be provided at the base of each vertical riser with provision for cleanout in accordance with NFPA 96.

3.05 INSTALLATION OF FIXED FUME HOOD EXHAUST DUCTS, ACID STORAGE ROOM EXHAUST DUCTS, ACID STORAGE CABINET EXHAUST DUCTS

- A. Provide and fabricate joints and seams that are watertight and provide airtight construction. Install without dips or traps that may collect residues. Install duct in accordance with NFPA 45 and ASHRAE Standards. Per Section MC 510.8.1, ducts shall be made tight with lap joints having a minimum lap of 1".
- C. The stack shall terminate a minimum of 10' above the parapet or high point of the roof structure within 10 ft. The stack shall terminate away from any openings and air intakes of the school or adjacent buildings to avoid exhausts re-entry. Open ends shall be covered with bird screens.

3.06 INSTALLATION OF FIRE RESISTIVE DUCT ASSEMBLIES

- A. Installation requirements shall be in accordance with the manufacturer's instructions, the applicable listing.
- B. Size limitation of ducts and duct enclosures shall be in accordance with the listing agency, or for site-specific installation.
- C. Where the fire rated duct assembly penetrates a fire-rated assembly, the resulting opening around the ventilation system shall be fire stopped with a firestop system tested in accordance with ASTM E814/UL 1479 as per Section BC 713.
- D. The F and T rating of the firestop system shall be equal to or greater than the hourly insulation rating of fire resistive duct assembly, and F rating of the firestop system shall be equal to or greater than the hour integrity and stability rating of the fire resistive duct assembly.
- E. The fire resistive duct assembly shall be protected from the point of penetration of a fire resistance rated ceiling, wall, floor or any concealed spaces to the outlet terminal. The stability, integrity and insulation rating for the fire resistive duct shall be equal to or greater than the highest fire resistance rating of any assembly penetrated, or a minimum of 2 hours.
- F. Fire resistive duct assemblies shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50 pursuant to ASTM E84 as per ANSI/NFPA90A.
- G. Fire resistive duct assemblies shall be labeled as per Section AC 28-113.4. All shipments and deliveries of materials shall be accompanied by a certificate or label certifying that the materials shipped or delivered are equivalent to those tested and approved.

3.07 HANGER ATTACHMENTS

Reference: SMACNA HVAC Duct Construction Standards, Third Edition-2005 Figures 4-1, 4-2, 4-3.

A. General

1. Secure upper hanger attachments to structural steel or steel bar joists wherever possible.
2. Do not attach hangers to steel decks.
3. Metallic fasteners installed with electrically operated or powder driven tools may be used as hanger attachments in accordance with the SMACNA HVAC Duct Construction Standards, Third Edition-2005.
4. The use of the Gripple cable hanging systems shall be allowed as replacement for threaded rod or strap for both upper and lower attachments when the expansion bolt fasteners used with the Gripple cable hangers are certified by ICC for use in cracked concrete. Cable Hangers (Gripple) may be used to suspend all the ductwork. Select hangers for the type of structure and suspension. All parts (including the cable) shall be supplied, warranted and proof tested by the manufacturer. Follow recommended factory installation guidelines, do not exceed working loads.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by ductwork support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of 5.

1. Secure upper hanger attachments to steel bar joists at panel point of joists.
2. Do not drill holes in main structural steel members.

C. Attachment to Cast-in-Place Concrete:

1. Secure hangers to overhead construction with expansion bolts.
2. Secure hanger attachments required to be supported from wall or floor construction with single unit expansion bolts.

3.08 HANGERS FOR DUCTS, 2 INCH WC AND UNDER

- A. Install hangers for ducts as specified in the SMACNA HVAC Duct Construction Standards, Third Edition-2005
- B. Prime coat plain steel rods threaded at the site immediately after installation as per Section 09900: Painting. Galvanized rods shall not be primed.

3.09 HANGERS FOR DUCTS OVER 2 INCH WC

- A. Install trapeze hangers for ducts as specified in the SMACNA HVAC Duct Construction Standards Third Edition-2005. Strap hangers shall not be used in this application.

3.10 DUCT RISER SUPPORTS

- A. Support vertical round ducts and vertical rectangular ducts as per SMACNA HVAC Duct Construction Standards, Third Edition-2005, with the exception that riser supports shall be provided at every floor.

3.11 OPENINGS IN WALLS AND FLOORS

- A. In Walls: Sheet metal contractor shall provide sleeves for all exposed non-rated penetrations and shall provide collars for penetrations through rated construction. All structural openings (including lintels etc.) shall be provided by the General Contractor.

- B. In Floors

- 1. When the floor and/or roof slab construction for the project is the composite metal deck type, consisting of corrugated sheet steel and reinforced concrete, the following directions apply: Any opening, which is not framed by structural steel beams on all sides (refer to the structural steel drawings), and which is required in steel decking for the installation of HVAC work shall be provided by General Contractor by installing the proper size form (prior to the pouring of concrete), and cutting the metal deck when the ducts are to be installed. Holes greater than 6" but less than 30" in any dimension will be reinforced. Holes 6" or less in dimension need not be reinforced.
- 2. When the floor slab or roof slab for the project is of conventional reinforced poured concrete type, the following directions apply: General Contractor shall form openings in the slabs for the passage of ducts. Provide the exact location and size (including clearances) of each opening required.

3.12 IDENTIFICATION

- A. Where the outside air intake for a supply fan system is isolated from the fan it serves, the connecting duct shall be identified at the intake. Identification shall consist of a 1/8" thick laminated plastic plate with 1/2" white core letters, designating the system it supplies. Plate shall be secured to the wall adjacent to the intake.

3.13 FIELD QUALITY CONTROL

- A. Leakage Tests

Perform leakage tests on ductwork in accordance with SMACNA HVAC Air Duct Leakage Test Manual, 2nd Edition-2012, Section 403.11.2.3 of the IECC and Cleaning and Testing Specification Section.

3.14 CONNECTIONS

- A. General Contractor shall arrange to have the connections of metal ductwork to equipment and shall provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Duct to exhaust fan connections for the Kitchen hood ventilating system shall be in accordance with Section MC 506.3.2.3.
- B. Coordinate as necessary to ensure that access doors have been provided in hung ceilings and any other required places for proper operation and maintenance.

3.15 ADJUSTING AND CLEANING FOR START UP AND WARRANTY

- A. Clean dust and debris out of ductwork internally, unit by unit, as units are installed. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal. Clean external surface where ductwork is to be painted that might interfere with painting or cause paint deterioration.
- B. Balancing: Balancing of Systems for air distribution balancing of metal ductwork. Seal any leaks in ductwork that become apparent during the balancing procedure.

END OF SECTION

SECTION 233101
DUCT ACCESSORIES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide duct accessories specified herein, shown on the Drawings along with all the auxiliary work needed for a complete and proper installation. The types of ductwork accessories specified in this Section include the following: turning vanes, duct hardware, duct access doors and flexible connections.

1.02 INDOOR AIR QUALITY (IAQ) REQUIREMENTS DURING CONSTRUCTION

- A. During construction, the HVAC Contractor shall comply with the Indoor Air Quality (IAQ) Requirements.

1.03 RELATED SECTIONS

- A. Division 23 Sections
- D. Division 26 Sections

1.04 SUPPLEMENTAL SUBMITTALS

- A. Shop Drawings: Submit manufacturer's assembly-type shop drawings and shop standards. Submit SMACNA Figure Numbers for each shop fabricated item.

1.05 SUPPLEMENTAL QUALITY ASSURANCE

- A. Codes and Standards
 - 1. SMACNA Compliance: Comply with applicable portions of SMACNA: HVAC Duct Construction Standards, Metal and Flexible, 2005 edition.
 - 2. Industry Standards: Comply with SMACNA recommendations pertaining to construction of ductwork accessories, except as otherwise indicated on the Drawings.
 - 3. NY Mechanical Code Compliance: Comply with applicable provisions of the NY Mechanical Code Chapters 5, 6 and 7 and the manufacturer's installation instructions pertaining to installation of ductwork accessories.

PART 2 - PRODUCTS

2.01 ADHESIVES AND SEALANTS FOR FABRICATION OF DUCTWORK ACCESSORIES

- A. All adhesives and sealants used on adhesives and sealants for fabrication of ductwork accessories shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in Table I of LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005 and Rule Amendment date of January 7, 2005.

2.02 MATERIALS AND MANUFACTURERS

A. Turning Vanes

1. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA: HVAC Duct Construction Standards, latest edition.
2. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.
3. Provide shop fabricated turning vanes or provide from one of the following manufacturers:

Anemostat Products Div.
Dynamics Corp. of America
Duro Dyne Corp.
Tuttle & Bailey, Hart & Cooley Mfg. Co.
Titus Product, Div. of Philips Inds.

B. Duct Hardware

1. Provide test hole fittings for making air readings for the proper adjusting and testing of the ventilating systems. Material and gauge of the fittings shall be compatible with the duct material. Include screw cap and gasket. Size of fitting shall allow insertion of testing instruments and of length of fitting shall allow for the duct insulation thickness. "Duro Dyne", instrument test port, "Ventlock 699" are suitable for this purpose. If required, provide test hole fitting for microprocessor type of instrument reading either local or remote.
2. Provide shop fabricated duct hardware or provide from one of the following manufacturers:

Duro Dyne Corp.
Young Regulator Co.

C. Duct Access Doors (Ref. SMACNA HVAC Duct Construction Standards, 2005 Edition)

1. Provide where indicated, duct access doors of size indicated and at location shown on the Drawings to permit inspections, operation and maintenance of all valves, coils including reheat coils, controls, fire dampers, fire/smoke dampers, air monitors where applicable, automatic or motorized dampers, filters, bearings, traps, or other apparatus concealed behind the sheet metal work.
2. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide 2 handle latch type access doors.
3. Refer to Section 08305: General Contractor shall provide access doors for access to valves, dampers and all the aforementioned equipment concealed in walls, furring and hung ceilings. The size of the access doors shall be at least 24" x 24".

4. Provide shop fabricated duct access doors or provide from one of the following manufacturers:

Air Balance Inc.
Arlan Damper Corporation
Duro Dyne Corp.
Air Louver & Damper Inc.
Ruskin Mfg.
- D. Fan Connections (Flexible Connections): (Ref. SMACNA HVAC Duct Construction Standards - 2005 Edition)
 1. Provide an airtight fabric neck at the inlet and at the outlet connections of all air handling units, supply fans and exhaust fans and where ductwork connects to vibration isolation equipment in accordance with MC.603.18.
 2. Necks shall be not less than 3" nor more than 10" in width and both sides shall be secured with crimped lock seam the entire perimeter with galvanized sheet steel bands 3" wide. This assembly shall be securely fastened to ducts and fans, and the joints shall be made air tight. Necks shall not be oiled or painted. Neck fabric shall be one of the following materials:
 - a. Cotton duck, 10-ounces per square yard minimum weight, conforming to Federal Specifications CCC-C-428D (treated for fire, water, and mildew resistance)
 - b. Flameproof elastomeric coated glass fabric, weighing not less than 14-ounces per square yard, having a tensile strength of 200 psi (minimum) and having a heat resistance of up to 500° F. ("Thermafab", manufactured by Duro Dyne Corp., is an example of this material).
 - c. Close woven glass cloth, double neoprene coated, 28-ounces per square yard minimum weight.
 3. Where ambient air temperature exceeds 100°F, use material from Article 2.02.D.2b or 2.02.D.2c. Where materials are exposed to weather or corrosive fumes (acids, alkalies, garage or fume hood exhausts), use material Article 2.02.D.2c.
 4. Provide shop fabricated fan connections or provide from one of the following manufacturers:

Duro Dyne Corp.
Flexaust (The) Co.
 5. Kitchen exhaust fan connections: Duct-to-exhaust fan connections shall be flanged and gasketed at the base of the fan for vertical discharge fans; shall be flanged, gasketed and bolted to the inlet of the fan for side-inlet utility fans; and shall be flanged, gasketed and bolted to the inlet and outlet of the fan for in-line fans. Approved flexible connectors may be provided. Refer to Section MC 506.3.2.3 of the Mechanical Code.
- E. Smoke Detecting Devices: Provide opening in the ductwork for the smoke detecting devices at various locations as indicated on the Mechanical and Electrical Contract Drawings and Approved Shop Drawings. Mechanical Contractor shall install duct smoke detectors in the

ductwork. Electrical Contractor shall furnish duct smoke detectors, and provide power wiring and control wiring for the duct smoke detectors. Per Section MC 606.2.3, where return air risers serve two or more stories and serve any portion of a return air system having a design capacity greater than 15,000 cfm, smoke detectors shall be installed on each story. Such smoke detectors shall be located upstream of the connection between the return air riser and any air ducts or plenums.

PART 3 – SUPPLEMENTAL EXECUTION

3.01 INSTALLATION OF DUCTWORK ACCESSORIES

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square throat elbows in supply and exhaust air systems, and elsewhere as indicated on the Drawings.
- C. Install test hole fittings for making air readings, on both (opposite) sides of discharge duct from all supply and exhaust fans, at set dampers on supply and return branch ducts, and at other locations where shown on the Drawings for the proper adjusting and testing of the ventilating systems.
- D. Install doors in built-up casing to open against system air pressure, with latches operable from both sides.
- E. Coordinate as necessary to interface installation of ductwork accessories with other work.
- F. Per Section MC 607.7, flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any wall, floor or ceiling.

3.02 FIELD QUALITY CONTROL

- A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to insure proper operation.

3.03 ADJUSTING AND CLEANING

- A. Adjusting: Adjust ductwork accessories for proper settings.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 233102
DAMPER ASSEMBLIES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide damper assemblies specified herein, shown on the Drawings, needed for a complete and proper installation. Damper assemblies consist of dampers and their sleeve frames. Damper assemblies provided as part of factory-fabricated equipment are specified as part of the equipment assembly in their respective sections.

1.02 INDOOR AIR QUALITY (IAQ) REQUIREMENTS DURING CONSTRUCTION

- A. During construction, the HVAC Contractor shall comply with the Indoor Air Quality (IAQ) Requirements.

1.03 RELATED SECTIONS

- A. Division 23 Sections
- B. Division 26 Sections

1.04 SUPPLEMENTAL SUBMITTALS

- A. Product Data: Submit manufacturer's product data and shop fabricated drawings as defined below. Submit charts indicating free area for flow through the damper assembly. Submit lab testing results indicating pressure drop through the damper assemblies.
- B. Shop Drawings
 - 1. Submit manufacturer's assembly-type shop drawings for each type of damper assembly showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components. Submit UL Listing with the Shop Drawings.
 - 2. Damper assembly testing per Section MC 607.3 of the Mechanical Code: Damper assemblies shall be listed and bear the label of an approved testing agency indicating compliance with the standards in this section. Fire damper assemblies shall comply with the requirements of UL 555-2006. Only fire damper assemblies labeled for use in dynamic systems shall be installed in heating, ventilation and air-conditioning systems designed to operate with fans on during a fire. Smoke damper assemblies shall comply with the requirements of UL 555S-1999. Combination fire/smoke damper assemblies shall comply with the requirements of both UL 555 and UL 555S. Ceiling radiation damper assemblies shall comply with the requirements of UL 555C-2006 Ceiling Dampers.
 - 3. Submit fire, smoke, combination fire smoke and ceiling radiation damper assembly installation details including sleeves and duct-mounted access doors and panels. Verify conformance with UL 555-2006, UL 555S-1999, UL 555C-2006 and Construction and Electrical Codes. UL Classified label shall be indicated on the installation instructions. The UL listing shall be indicated on the Shop Drawings, and permanently labeled on equipment.

4. Submit AMCA 500D prototype leakage test certification for outside air intake and exhaust air discharge damper assemblies.
 - C. Manufacturer's installation details for all fire, smoke and combination fire smoke damper assemblies shall indicate UL approval.
 - D. Maintenance Data
 1. Maintenance Manuals
 - E. Maintenance Materials
 1. Extra fusible links for fire dampers
- 1.05 SUPPLEMENTAL QUALITY ASSURANCE
 - A. Codes and Standards
 1. SMACNA Compliance: Comply with applicable portions of SMACNA: HVAC Duct Construction Standards, Metal and Flexible, 2005 Edition or later and Fire, Smoke & Radiation Damper Installation Guide for HVAC Systems - Latest Edition.
 2. UL Compliance: Construct, test, and label fire dampers, smoke dampers, combination fire/smoke damper assemblies and ceiling radiation dampers in accordance with UL 555-2006, UL 555S-1999 and UL 555C-2006.
 3. All appliances regulated by the New York Construction Codes shall be listed and labeled (reference Sections MC 301.4 and MC 301.6). Testing of material shall be in accordance with NY Mechanical Code.
 4. Per Section MC 513.10, equipment utilized in Smoke Control systems such as automatic damper assemblies and balance damper assemblies shall be suitable for their intended use, suitable for the probable exposure temperatures and shall be as approved by the Commissioner. Components shall suitable for the probable temperature rise to which the components will be exposed. Per Section MC 513.10.4, automatic damper assemblies, regardless of the purpose for which they are installed within the smoke control system, shall be listed and conform to the requirements of approved recognized standards. Per Section BC 909.5.2.1 of the Building Code, ducts and air transfer openings are required to be protected with a minimum Class II, 250°F smoke damper assembly complying with Section BC 716 when used as part of smoke control systems.
- 1.06 MAINTENANCE
 - A. Furnish extra fusible links to the Authority, one link for every 10 installed at each temperature range. Obtain receipt.
- 1.07 GUARANTEE/WARRANTY
 - A. Provide a written one-year guarantee signed by the equipment manufacturer. The starting date shall be the Date of Substantial Completion. Provide one-year component (i.e. parts and labor) guarantee.

- B. The control damper equipment shall be free from defects in workmanship and material under normal use and service. If within Twelve (12) months from the Date of Substantial Completion the installed equipment is found to be defective in operation, workmanship or materials, replace, repair or adjust the defect at no cost to the Authority. Service shall be provided within twenty-four (24) hours upon notice from Authority's designated Representative.
- C. General Requirements: The Mechanical Contractor shall provide all services, materials and equipment necessary for the successful completion of the damper control system. The Mechanical Contractor shall provide necessary material required for the work. The Mechanical Contractor shall minimize impacts on facility operations when performing scheduled repairs and non-scheduled work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide shop fabricated volume and control damper assemblies or factory fabricated volume and control damper assemblies from one of the following manufacturers:
(Ref. SMACNA HVAC Duct Construction Standards, 2005 or Latest Edition)

MESTEK Inc. Products by Air Balance, Inc. and Arrow United Industries

Penn Ventilator Co.
Ruskin Mfg.
Imperial Dampers & Louver Co., Inc.
Nailor Industries Inc.
Prefco Products, Inc.
Arlan Damper Corp.
Greenheck Fan Corp.
Pottorff, Div. of PCI Industries

- B. Subject to compliance with requirements, provide factory fabricated fire damper assemblies, smoke damper assemblies and combination fire/smoke damper assemblies from one of the following manufacturers:

MESTEK Inc. Products by Air Balance, Inc. and Arrow United Industries
Arlan Damper Corp.
Nailor Industries Inc.
Imperial Dampers & Louver Co., Inc.
Penn Ventilator Co.
Ruskin Mfg.
Greenheck Fan Corp.
Pottorff, Div. of PCI Industries

- C. Factory fabricated fire, smoke and combination fire/smoke damper assemblies shall have the damper and sleeve both provided by the same manufacturer and the assembled connection of the damper to the sleeve shall be accomplished at the factory. Shop fabricated fire damper assemblies, shop fabricated smoke damper assemblies and shop fabricated combination fire/smoke damper assemblies are not acceptable. Factory furnished dampers connected to their sleeves at shops shall not be acceptable.

2.02 ADHESIVES AND SEALANTS FOR FABRICATION OF DAMPERS

- A. All adhesives and sealants used on the fabrication of damper assemblies shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168; VOC limits shall comply with the limits indicated in LEED Version 3.0, Indoor Environmental Quality Section, Credit IEQ 4.1. Those limits correspond to an effective date of the SCAQMD Rule #1168 of July 1, 2005, and Rule Amendment date of January 7, 2005.

2.03 VOLUME DAMPERS

- A. Opposed Blade Damper assemblies: Opposed blade type frames of all welded construction utilizing channel iron members in galvanized steel ducts; extruded members in aluminum ducts and stainless steel in stainless steel ducts. Fabricate frames in accordance with SMACNA HVAC Duct Construction Standards, 2005 or Latest Edition. Fabricate blades from No. 18 gage (minimum) metal of same material as duct. Single blade damper assemblies are unacceptable for ducts over 12" in height. Blades shall be connected by a common linkage. Manual operated damper assemblies shall have a quadrant locking device. Weld motor mounting bracket to damper frame for pneumatic or electric motor operated damper assemblies.
- B. Parallel Blade Damper Assemblies (Ref. SMACNA HVAC Duct Construction Standards, 2005 or Latest Edition): Provide metal frames of all welded construction, utilizing channel iron members in steel ducts and extruded aluminum members in aluminum ducts. Fabricate blades from No. 18 gage (minimum) metal, of same material as duct. Single blade damper assemblies are unacceptable for ducts over 12" in height. Blades shall be connected by a common linkage. Weld motor mounting bracket to damper frame for pneumatic or electric motor operated dampers. Shop coat raw ferrous parts of damper assemblies with corrosion resistant paint.
- C. Splitter damper assemblies shall not be used. Volume control in duct branches shall be by volume damper assemblies.
- D. Manual Damper Regulators (Ref. SMACNA HVAC Duct Construction Standards, 2005 or Latest Edition)
 - 1. For Damper Assemblies Installed in Exposed or Accessible Concealed Ductwork: Indicating quadrant with heavy metal handle and means for locking damper in all positions.
 - 2. For Dampers Assemblies Installed in Inaccessible Concealed Ductwork: Concealed type with indicating regulator in cast metal box with cover plate. Provide assembly complete with duct and bearing, adjustment coupling, damper extension rods and minimum of 2 keys or socket wrenches for each type of damper adjustment screw or device.
- E. Damper assemblies in aluminum ducts shall be aluminum, in stainless ducts, stainless steel. Fabricate blades of same material as duct in which the dampers are installed.
- F. All outdoor intake damper assemblies and exhaust air discharge damper assemblies terminating at an exterior louver, fan or located outdoors shall be Class I motorized opposed blade low leakage type with a maximum of 4 CFM per square foot at 1.0" WC across the damper assembly in accordance with Section C403.7.7 of the 2018 IECC. Include AMCA 500D prototype leakage test certifications with the shop drawing submission for all dampers. Exception: Gravity (non-motorized) exhaust and relief damper assemblies are permitted as shown on the Drawings for buildings less than three stories in height above grade and for outside air intake or exhaust airflows of 300 cfm or less. Gravity damper assemblies shall have a maximum leakage rate of 20 cfm/SF at 1.0" WC when

tested in accordance with AMCA 500D. Gravity damper assemblies for ventilation air intakes shall be protected from direct exposure to wind. Gravity damper assemblies smaller than 24 inches in either dimension shall be permitted to have a leakage of 40 cfm/SF at 1.0" WC when tested in accordance with AMCA 500D.

- G. All modulating damper assemblies shall be the opposed-blade type; all two-position dampers shall be parallel-blade type. Damper assemblies in galvanized sheet metal shall be made of galvanized sheet steel; blades shall not be more than 6" in width.

2.04 MULTI-BLADE DAMPERS AND CONTROLS (FIELD PROVIDED DAMPERS)

A. General

1. Self-acting gravity or electric motor damper assemblies that are duct mounted and used adjacent to wall louvers shall be Class I motorized opposed blade low leakage type with a maximum of 4 CFM per square foot at 1.0" WC across the damper assembly when tested in accordance with AMCA 500D and in accordance with Section C403.7.7 of the 2018 IECC. Exception: Gravity (non-motorized) exhaust and relief damper assemblies are permitted to be used as shown on the Drawings for buildings less than three stories in height above grade and for outside air intake or exhaust airflows of 300 cfm or less. Gravity damper assemblies shall have a maximum leakage rate of 20 cfm/SF at 1.0" WC when tested in accordance with AMCA 500D. Gravity damper assemblies smaller than 24 inches in either dimension shall be permitted to have a leakage of 40 cfm/SF at 1.0" WC when tested in accordance with AMCA 500D. Gravity damper assemblies for ventilation shall be protected from direct exposure to wind.
2. Openings in walls for outside air intake louvers and exhaust or relief louvers together with the stationary louvers and screens, shall be provided by General Contractor as specified in Section 10214: Stationary Metal Wall Louvers unless otherwise indicated.

B. Construction of Multiblade Damper Assemblies (Ref. SMACNA HVAC Duct Construction Standards, 2005 or Latest Edition)

1. Frames: Frames shall be braced for rigid reinforcement. Frames shall be provided with bolt holes for mounting and with stationary stops on the four sides to prevent air leakage. Outside air intake damper frames shall be provided with drilled lugs on two sides in a lower corner, so that motor mounting bracket can be securely bolted to frame.
2. Blades: Damper blades shall be not wider than 9", shall have formed interlocking edges, and shall have a 1/2" deep "V" pressed in the center to stiffen the blades. Blade axles, axle clamps and blade connecting lugs shall be of non-ferrous metal. Blades shall be linked firmly together so that all blades work in unison. The lower blade shall be provided with a linkage connection lug for motor operation of the damper. Open position of the blades shall be limited to 90°. Damper blades for fan systems shall be not lighter than No. 18 gage galvanized sheet steel. Unless shown otherwise on the Drawings, damper blades for supply systems used in modulating type dampers, shall be of the opposed blade type. Outside Air Intake (OAI) shall have opposed blades. Damper blades for outside air intake shall be not lighter than No. 14 gage aluminum.

3. Bearings: Bearings on blade pivot points shall be fitted with stainless steel or non-ferrous metal sleeve (or ferrule type) pressed into damper frame. Bearings shall be accurately sized to fit blade axles, and shall provide smooth operation.
 4. Linkage: Linkage or tie rod to interconnect blades shall be 1/4" diameter (minimum) galvanized steel or non-ferrous metal and shall be secured to the blade lugs by means of cotter pins and washers.
- C. Painting: Black iron damper frames and blades shall be given one coat of finish black paint over a prime coat. Galvanized steel damper blades and frames shall not be primed or painted. Painting shall be done at the shop.
- D. Control for Multiblade Damper Assemblies: Refer to the Temperature Control System Sections for control of the multiblade damper assemblies. Damper assemblies shall be automatically controlled by means of damper actuators as specified below.

2.05 DAMPER ACTUATORS

- A. Provided by Temperature Control Contractor (TCC) when not provided as part of the factory assembly of the air handlers or rooftop units. TCC to coordinate with Mechanical Contractor (MC) and General Contractor (GC))

Manufacturers:

- Belimo Aircontrols (USA) Inc. (or approved equal)
 - Siemens Building Technologies, Inc. – Building Technologies, (formerly by Staefa Control Systems) (or approved equal)
 - Schneider Electric DuraDrive (or Approved Equal)
 - Honeywell Building Controls MS Series (or Approved Equal)
- B. Operation: When motor is energized, damper shall open; when non-energized, damper shall close or return to a pre-set position.

2.06 FIRE DAMPER ASSEMBLIES

- A. Provide 1½ hour or 3 hour-fire rated damper assemblies (as required in MC Table 607.3.2.1 of the Mechanical Code, listed under UL 555-2006 of types and sizes indicated on the Drawings. For galvanized duct installations, construct damper casings/blades of galvanized steel. For aluminum duct installations, construct damper casings/blades of stainless steel. Provide fusible link rated at 50°F over the maximum temperature that is normally encountered when the system is in operation or shut down, but not less than 160°F (reference Section MC 607.3.3.1). Per Section MC 607.3.3.1, the fire damper assembly operating temperature shall not be more than 350°F where located in a smoke control system complying with Section BC 909. Provide damper assemblies with positive lock in closed position. Blade Material: Steel, match casing.
- B. Each fire damper assembly shall be supplied with factory fabricated steel sleeves and retaining angles as per SMACNA: Fire, Smoke & Radiation Damper Installation Guide for HVAC Systems – 2005 or Latest Edition and in accordance with the manufacturers' UL approved installation. Gauge of sleeve shall be at least equal to gauge of duct when one or more of the following duct sleeve connections are used: plain S slip, hemmed S slip, standing S slip, reinforced standing S slip, inside slip joint, or double S slip and other

UL/SMACNA approved breakaway connections. If any other duct sleeve connections are used other than UL breakaway connections, the sleeve shall be minimum 16 gauge for dampers up to 36" wide X 24" high and 14 gauge if width exceeds 36" or height exceeds 24". Fire damper assemblies shall have UL labels affixed to them.

- C. All fire damper assemblies (used in purge and non-purge systems that utilize an electric temperature sensing device or resettable bimetallic link in lieu of a fusible element) shall be provided with two factory end switches, one set to close when the damper blades are at their open position, and the other set to close when the damper blades are at their closed position. Switches shall be physically linked to the damper blade.

2.07 COMBINATION FIRE SMOKE DAMPER ASSEMBLIES

- A. Provide at locations shown on the Drawings or as described in schedules, combination fire/smoke damper assemblies meeting or exceeding the following specifications. Each combination fire/smoke damper assembly shall be 1½ hour or 3-hour fire rated under UL 555-2006 and as required in MC Table 607.3.2.1 and shall further be classified by UL 555S-1999 as a minimum leakage Class II rated damper assembly per Section MC 607.3.2.3. Elevated smoke temperature ratings shall not be less than 250°F per Section MC 607.3.2.3 (however the post fire purge damper assemblies shall trip at the temperatures defined above in Article 2.06.A). Damper manufacturer shall have tested, and qualified with UL, a complete range of damper assembly sizes covering all dampers required by this specification; having a single damper assembly size tested and UL qualified is not acceptable. Provide access door in ducts within 6" of combination fire smoke damper assemblies. Damper assemblies that are not used as part of a smoke control or purge system may be static rated damper assemblies. Damper assemblies must operate 3 cycles at ambient temperature. Damper assemblies must close and open within 75 seconds after 15-minute exposure to minimum 250°F elevated temperature at a "testing" airflow of 2400 fpm, 4.5" WC. Damper assemblies shall "rated" at 2,000 fpm at 4.0" WC. Damper assemblies shall include and bear a UL label in accordance with established UL labeling procedures.
- B. Combination fire smoke damper assemblies shall be qualified under UL 555S-1999 to an elevated temperature of 350°F maximum temperature degradation. Appropriate electric operators shall be installed by the damper assembly manufacturer at the time of damper assembly fabrication; damper and operator shall be supplied as a single entity which meets all applicable UL 555S qualifications for both dampers and operators.
- C. Each combination fire smoke damper assembly shall be supplied with factory furnished heavy gage steel sleeves and mounting angles as per SMACNA: Fire, Smoke & Radiation Damper Installation Guide for HVAC Systems - 2005 Edition or latest (with electric motor) and in accordance with manufacturer's UL 555-2006 and 555S-1999 listing. For galvanized duct installations, construct damper assembly casings/blades of galvanized steel. For aluminum duct installations, construct damper assembly casings/blades of stainless steel. Gage of sleeve shall be at least equal to gage of duct when one or more of the following duct sleeve connections are used: plain S slip, hemmed S slip, standing S slip, reinforced standing S slip, inside slip joint, double S slip and other UL/SMACNA approved breakaway connections. If any other duct sleeve connections are used other than UL breakaway connections, the sleeve shall be min. 16 gage for dampers up to 36" w x 24"h and 14 gage if width exceeds 36" or height exceeds 24".
- D. All combination fire/smoke dampers assemblies shall be provided with two factory end switches, one set to close when the damper blades are at their open position, and the other set to close when the damper blades are at their closed position. Switches shall be physically linked to the damper blade. Factory end switches shall be utilized by the Div 16

fire alarm system to provide open/closed indication on an addressable basis. Combination fire smoke damper assemblies shall have UL labels affixed to them. Fire/smoke damper assemblies that utilize an electric temperature sensing device or resettable bimetallic link in lieu of a fusible element that are not used as part of a smoke control system or post fire smoke purge system shall be manually reset by local pushbutton switch after being subjected to elevated temperatures.

- E. Fire/Smoke damper assemblies that are used as part of a smoke control system or post fire purge system shall have the ability to be manually overridden (re-opened) from the remote command station at the smoke purge panel after being subjected to elevated temperatures unless the maximum degradation temperature has been exceeded and they reclose automatically per Section MC 607.2.1.1. All factory end switches shall be utilized by the Div 26 fire alarm system to provide open/closed indication on an addressable basis. Smoke control and purge dampers shall be dynamically rated.
- F. Per Section MC 607.3.3.3, combination fire/smoke damper actuation shall be in accordance with Sections MC 607.3.3.1 and 607.3.3.2. Combination fire/smoke dampers installed in smoke control system shaft penetrations shall not be activated by local area smoke detection unless it is secondary to the smoke management system controls.

2.08 SMOKE DAMPERS

- A. Provide smoke damper assemblies in types and sizes indicated on the Drawings, with casing/blades constructed of galvanized steel for galvanized duct installations. For aluminum duct installations, construct damper casings/blades of stainless steel. Jamb gasket shall be stainless steel to provide a minimum Class II fire retardant smoke seal (per Section MC 607.3.2.2). Provide stainless steel negator spring to assure positive closing when mounted in either vertical or horizontal position. Elevated smoke temperature ratings shall not be less than 250°F per Section MC 607.3.2.2. The damper shall close upon signal from the fire panel. Damper operators shall be electric motors equipped with instant closure clutch, linkage and motor mounting brackets. As part of the UL qualification, smoke damper assemblies shall operate (to open and close) under HVAC system operating conditions, with "testing" pressures of at least 4.5" WC in the closed position, and 2400 fpm air velocity in the open position. Damper assemblies shall be "rated" at 2,000 fpm at 4.0" WC. Damper assemblies shall have the motor mounted outside the air stream. Smoke damper assemblies shall have UL labels affixed to them.
- B. All smoke damper assemblies shall be provided with two factory end switches, one set to close when the damper blades are at their open position, and the other set to close when the damper blades are at their closed position. Switches shall be physically linked to the damper blade. Factory end switches shall be utilized by the Div 26 fire alarm system to provide open/closed indication on an addressable basis.

2.09 CEILING RADIATION DAMPERS: Not Used.

2.10 AUTOMATIC DAMPERS

- A. Install automatic damper assemblies as indicated on the Drawings. Temperature Control System-BACnet DDC.

PART 3 - EXECUTION

3.01 SUPPLEMENTAL INSTALLATION

- A. Install damper assemblies in accordance with damper manufacturer's recommendations, UL approved installation instructions and all applicable codes.
- B. Install access doors and fire rated access door as required. Per Section MC 607.4, Access and Identification, fire and smoke damper assemblies shall be provided with an approved means of access, large enough to permit inspection and maintenance of the damper assembly and its operating parts. The access shall not affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the fire-resistance rating of the assembly. Access points shall be permanently identified on the exterior by a label having letters not less than 1/2" (12.7 mm) in height reading: FIRE/SMOKE DAMPER, SMOKE DAMPER or FIRE DAMPER, followed by an identification marking that is individual and unique to the damper assembly accessed. Access doors in ducts shall be tight fitting and suitable for the required duct construction.
- C. Coordinate with other work, including ductwork, as necessary to interface installation of damper assembly properly with other work.
- D. Provide a neoprene gasket, 1/4" thick, full width of flange, wherever a galvanized duct connects to aluminum outside air intake.

3.02 SUPPLEMENTAL INSTALLATION OF FIRE DAMPER, SMOKE DAMPER AND COMBINATION FIRE/SMOKE DAMPER ASSEMBLIES

- A. All fire damper assemblies shall be installed in ducts in the fire rated partitions, walls, floors and roof as indicated on the Drawings.
- B. All fire, smoke and combination fire smoke damper assemblies shall be installed as per SMACNA: Fire, Smoke & Radiation Damper Installation Guide for HVAC Systems - Latest Edition and manufacturers' UL Listed instructions. Contractor shall obtain an affidavit from the manufacturer certifying that the UL Listed installation was adhered to Contractor shall submit this affidavit to the Authority.
- C. Connection of duct to fire damper, smoke damper and fire/smoke damper sleeve shall be made in accordance with damper assembly manufacturer's recommendations and all applicable codes.
- D. In the smoke control and post-fire smoke purge systems, fire and smoke damper combination assemblies shall have remote override capability as approved by UL. The electrical contractor shall provide the control wiring of the override system.
- E. Per Section MC 607.3.3.2, the smoke damper shall close upon actuation of a listed smoke detector or detectors installed and located in accordance with Sections MC 606 and BC 907.3 and one of the following methods, as applicable:
 - 1. Where a smoke damper assembly is installed within a duct, a smoke detector shall be installed in the duct within 5 feet of the damper assembly with no air outlets or inlets between the detector and the damper assembly. The detector shall be listed for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, dampers shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.
 - 2. Where a smoke damper assembly is installed above smoke barrier doors in a smoke barrier, a spot-type detector listed for releasing service shall be installed on either side of the smoke barrier door opening.

3. Where a smoke damper assembly is installed within an unducted opening in a wall, a spot-type detector listed for releasing service shall be installed within 5 feet horizontally of the damper assembly.
4. Where a smoke damper assembly is installed in a corridor wall, the damper shall be permitted to be controlled by a smoke detection system installed in the corridor.
5. Where a total-coverage smoke detector system is provided within all areas served by an HVAC system, dampers shall be permitted to be controlled by the smoke detection system.
6. Smoke dampers that are part of an engineered smoke control system shall be capable of being positioned manually from a command station. Such positioning devices shall be provided for supply and return/exhaust damper assemblies grouped by floor and by type. Damper switch positions shall indicate whether the related dampers are commanded to be either open or closed. Smoke damper positioning switches shall be located at the Fire Command Station, or in a Mechanical Control Center in buildings without a Fire Command Station.

3.03 SUPPLEMENTAL INSTALLATION OF VOLUME DAMPER ASSEMBLIES

- A. Provide all damper assemblies required for all systems to accomplish the intent of the Drawings. Dampers are to be installed in frames properly caulked to prevent leakage.
- B. Provide manual balancing damper assemblies as required to properly balance the air distribution system. If location of balancing damper assemblies is not defined on the drawings, the following minimum standards shall govern:
 1. All supply air main branches from trunk and all sub-branches from main shall have balancing damper assemblies.
 2. Exhaust and return main branches from trunk and all sub-branches from mains shall have balancing damper assemblies. Balancing damper assemblies shall not be installed in kitchen exhaust, fume hood exhaust, or breeching unless otherwise indicated.
 3. Locate damper assemblies as far as possible from air outlet to avoid noise transmission.
 4. Install with easy access to damper, or otherwise provide remote damper actuator.
- C. Single blade dampers shall not be used for balancing unless otherwise shown.

3.04 SUPPLEMENTAL FIELD QUALITY CONTROL

- A. Operate damper to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty components, as required to obtain proper operation.

3.05 SUPPLEMENTAL ADJUSTING AND CLEANING

- A. Adjusting: Adjust damper for proper settings, install fusible links in fire dampers and adjust for proper action.

- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

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SECTION 233400
FANS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide fans called for in the drawing schedule and as needed for a complete and proper installation. The types of fans specified herein are: Roof Type Exhaust Fan.

1.02 COMMISSIONING REQUIREMENTS

- A. HVAC Contractor shall comply with the commissioning requirements.

1.03 RELATED SECTIONS

- A. Division 01 Sections
- B. Division 23 Sections
- C. Division 26 Sections
- D. Architectural Specification Sections

1.04 SUPPLEMENTAL SUBMITTALS

- A. Product Data: Submit manufacturer's product data for fans, including specifications, installation instructions, start-up instructions, capacity ratings, fan performance curves with operating point clearly indicated, and certified fan sound-power ratings. For laboratory exhaust fans provide dimensional drawings and product data on each laboratory exhaust fan assembly. Provide fan curves for each lab exhaust fan at the specified operation point, with the flow, static pressure and horsepower clearly plotted. Provide nozzle velocity of lab exhaust fan, total exhaust flow, and discharge exhaust height at specified wind velocity.
- B. Shop Drawings: Submit mounting details indicating location of all fans.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply and control wiring to fan units. Clearly differentiate between portions of wiring that are factory installed and portions to be field-installed.
- D. Coordination Drawings:
 - 1. Show fan layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support.
 - 2. Roof type and ceiling hung fans: Show roof penetration requirements and reflected ceiling plans drawn to scale that coordinate roof penetrations and units mounted above ceiling. Show the following: roof framing and support members relative to duct penetrations; ceiling suspension assembly members; size and location of initial access modules for acoustical tile; ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers and access panels.
 - 3. Indicate and certify field measurements.
- E. Contractor's Start-Up and Demonstration Affidavit

- F. Certification of operability for smoke control systems that are to remain operable following the design earthquake ground motion per Section 13.2.2 of ASCE 7-10.
- G. Maintenance data
 - 1. Maintenance Manual
- H. Maintenance Materials

1.05 SUPPLEMENTAL QUALITY ASSURANCE

- A. All centrifugal fans required under this Section shall be the product of a single manufacturer.
- B. Codes and Standards
 - 1. AMCA Compliance: Provide centrifugal fans bearing the AMCA Certified Ratings Seal. Sound rate centrifugal fans in accordance with AMCA 300.
 - 2. ASHRAE Compliance: Test and rate centrifugal fans in accordance with ASHRAE 51 (AMCA 210):
 - 3. UL Compliance: Provide centrifugal fan electrical components that have been listed and labeled by UL. Roof type exhaust fan shall be tested in accordance with UL 705.
 - 4. NEMA Compliance: Provide motors and electrical accessories complying with NEMA standards.
 - 5. All appliances regulated by the New York Construction Codes shall be listed and labeled (reference Sections of the Mechanical Code).
 - 6. All work shall be in accordance with the NY Construction Codes and Electrical Code.
 - 7. Per Section ASHRAE 90.1 and Energy Conservation Code (NY IECC), fans shall have a fan efficiency grade (FEG) of 67 or higher as defined by AMCA 205 based on manufacturers' data certified by an approved independent testing laboratory.

The following are the exceptions to this requirement:

- a. Single fans with a motor nameplate horsepower of 5 hp or less.
- b. Fan arrays that have a combined motor nameplate horsepower of 5 hp or less and are operated as the functional equivalent of a single fan.
- c. Fans that are part of equipment subjected to the required minimum listed efficiencies in Section 6.4.1.1 of ASHRAE 90.1-2016 and Section C403.3.2 of the IECC.
- d. Fans included in an equipment package certified by an approved agency for air or energy performance of the equipment package.
- e. Powered wall/roof ventilators.

- f. Fans outside scope of AMCA 205 (diameters less than 5" and with less than 1hp).
- g. Fans that are intended to only operate during emergency conditions.

1.06 SUPPLEMENTAL DELIVERY, STORAGE, AND HANDLING

- A. Deliver centrifugal fans with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.

1.07 SITE CONDITIONS

- A. Examine the Drawings, visit the site, and take measurements to make sure that the equipment will fit in the spaces allocated, and that the equipment can be brought through the passages and the doors of the rooms. Fans too large to pass through these passages and doorways, shall be shipped "knocked down" and assembled on site.

1.08 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Sections.
- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.09 MAINTENANCE MATERIALS

- A. Maintenance materials: Furnish to the Authority one pound of the recommended lubricant or the equivalent number of cartridges for each fan and one lubrication gun and/or grease gun of the proper type for use with the cartridges for the entire project. Furnish spare set of belts for each belt driven fan. Three (3) master keys for all padlocks shall be furnished and delivered to the Authority.

PART 2 - PRODUCTS

2.01 FANS

- A. General
 - 1. Fans shall be of type, capacity, discharge location, and rotation shown on the Drawings and constructed for Class 1 operating limits, unless otherwise indicated. Fans shall be guaranteed not to overload the motor under any condition.
 - 2. Select fans for the air quantities and static pressure indicated on the Drawings, of size and speed so as to allow for a change in volume, without operating in an unstable range.
 - 3. The requirements of this Section do not apply to centrifugal fans incorporated in catalogued completely packaged units, unless otherwise indicated.
 - 4. Fans Used in Smoke Control
 - a. Per Section MC 513.10, equipment utilized in Smoke Control systems such as fans and automatic dampers shall be suitable for their intended use, suitable for the probable exposure temperatures and shall be as

approved by the Commissioner. Fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. Per Section BC 909.4.6 of the Building Code, all portions of active smoke control systems shall be capable of continued operation after detection of the fire event for not less than 20 minutes or 1.5 times the calculated egress time, whichever is more.

- b. Per Section BC 909.10.6, Seismic Requirements, smoke control systems covered by Section BC 909 are life safety systems and are required to function after an earthquake. Hence, smoke control fans shall be seismically rated. Smoke control systems shall be seismically designed in accordance with Section BC 1613 and ASCE 7-10 Section 13.2.2. The component importance factor, I_p , shall be taken as 1.5 in accordance with ASCE 7-10, Section 13.1.3. The smoke control system includes all components required for its operation, including but not limited to fans, ducts, electrical power, switchboards, motor control centers, starters, and controls. Smoke control systems in structures classified in Seismic Design Category A or B shall have a component importance factor, I_p , of 1.0.
- c. Per Section MC 513.10.5, Smoke Control Fans, in addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty with the minimum number of belts being two. Fans shall be supported and restrained by noncombustible devices in accordance with the structural design requirements of the Building Code. Motors driving fans shall not be operating beyond their nameplate horsepower (kilowatts) as determined from measurement of actual current draw. Motors driving fans shall have a minimum service factor of 1.15.

2.02 CENTRIFUGAL FANS : NOT USED.

2.03 ROOF TYPE EXHAUST FANS

- A. Roof type exhaust fans shall be of the power roof ventilator type complete with motor, frame, housing, and all other items and accessories. The fan wheel shall be aluminum. All other parts of the fan with which the air stream comes in contact shall be aluminum, stainless steel or reinforced fiberglass polyester plastic. The use of a heavy gage steel motor support plate protected with a baked enamel finish may be accepted.
- B. Fan Unit
 - 1. The fan shall be capable of exhausting the cubic feet of air per minute with the static pressure, minimum wheel diameter and speed shown on the Drawings. After assembly of motor and wheel, the rotating parts shall be statically and dynamically balanced at rated speed to provide vibration free operation.
 - 2. The fan shall be quiet operating, backward curved centrifugal non-overload type, provided with approved type belt drive. Direct-connected fans shall be furnished only when indicated on the Drawings. Fan drives shall be sized in accordance with the manufacturer's recommendations. Belts shall be selected for at least 50% excess motor horsepower. Motor shall have an adjustable pitch driving sheave and shall be separated from the air stream. The motor shall be of size and characteristics noted on the Drawings with a terminal box. Wheel and motor support assembly shall be of heavy gage aluminum, galvanized steel, or steel which has been thoroughly coated with a corrosion resisting paint. Fan and motor shall be supported on vibration isolation mounts. The fan shall be provided with an inlet ring or core.

3. The frame of the unit shall be made of aluminum or stainless steel of suitable thickness to insure structural integrity of the unit. The entire unit shall be designed to provide for easy removal of the fan, motor, and all other items and accessories without disturbing the balance of the unit.
- C. Housing: The fan unit shall be provided with a closed weatherproof housing of one of the types indicated below. Hardware, screws, and all other items and accessories used in the construction of the fan housing shall be of stainless steel or non-ferrous material. Housing shall be provided with 1 brass or cadmium plated padlock where the hood is hinged, or 2 padlocks where the hood is removable. Housing shall be of such design as to form a uniform passage for air all around the rim. The air discharge openings shall be provided with wire mesh screens of 1/2" mesh, No. 16 gage copper, bronze, aluminum or PVC encapsulated bird guard with brass or aluminum screws. Screens shall be securely fastened in place with aluminum, brass or stainless steel fasteners. Where the fan design includes an integral wiring conduit, it shall be large enough to permit passage of a 3/4" conduit through it. Where an integral wiring conduit is not included, openings for the passage of 3/4" conduit (for service wiring) from base of fan into motor compartment shall be provided by the fan manufacturer. Low silhouette type housings are not acceptable. Approved type housings are:
1. Spun Aluminum: This type housing shall be fabricated from not less than No. 16 gage aluminum in wheel sizes less than No. 30.
 - a. The top cover for size No. 30 shall be not less than No. 16 gage and the skirt, support base and curb shall be not less than No. 16 gage.
 - b. For size No. 36 fan, the cover, skirt and curb shall be not less than No. 14 gage, and the support base shall be not less than No. 12 gage.
 - c. For size No. 48 fan, the cover shall be not less than No. 14 gage, skirt and curb shall be not less than No. 12 gage and the support base shall be not less than No. 10 gage.
 2. Reinforced plastic: This type housing shall be dome-shaped, molded and bonded reinforced fiberglass polyester plastic. Sizes, less than No. 21 shall have the housing made from not less than 3/32" thick plastic. Fan size No. 21 and larger shall be of greater thickness but not less than 1/8".
- D. Thermal Overload Protection: Provide starter with thermal overload protection and pilot light for each roof exhaust fan.
- E. Disconnecting Switch: Each roof type exhauster with 2-horsepower or smaller motor shall be provided with a disconnecting switch in general purpose enclosure mounted inside of the housing near the motor. Wiring between motor and switch shall be installed by the fan manufacturer in 1/2" (minimum size) Greenfield conduit. Disconnect switch shall be positioned in a location easily accessible for field connection of service wiring. Conduit outlet from switch shall be 3/4". Disconnect switches for single phase motors shall be 2-pole, Arrow-Hart No. 6808 or approved equal; for three phase motors, they shall be 3-pole, Arrow-Hart No. 7810 or approved equal. Disconnect switches for roof type exhausters having larger than 2-horsepower motors will be provided within the fan housing by the Subcontractor for Electric Work.
- F. Dampers: Per the IECC and ASHRAE 90.1-2016, systems shall be equipped with Class 1 motorized dampers (with a maximum leakage rate of 4 cfm/SF at 1.0" w.c. when tested in accordance with AMCA 500D) that will automatically shut when the systems or spaces

served are not in use. Gravity (non-motorized) exhaust or relief dampers are acceptable in buildings less than three stories in height. Gravity (non-motorized) dampers are acceptable in systems with a design exhaust capacity of 300 cfm or less. Gravity dampers shall have a maximum leakage rate of 20 cfm/SF at 1.0" w.c. when tested in accordance with AMCA 500D. Gravity dampers smaller than 24 inches in either dimension shall be permitted to have a leakage of 40 cfm/SF at 1.0" w.c. when tested in accordance with AMCA 500D. Provide fans with the damper types as shown on the Drawings.

- G. Extension for Damper: Every roof exhauster shall have an extension base at least 12" high, except for fans serving as kitchen range hood or warming pantry exhausters. Each 12" extension base shall have an inspection opening with gasket and No. 14 gage aluminum cover plate in one side of the base. Extension bases for fans with motor operated dampers shall have a weather protected access panel, with handle, of ample size to permit removal of damper unit in one side of the extension. Extension base shall be fabricated from not less than No. 14 gage aluminum sheets and shapes and shall form a rigid structural member for the fan and housing mounted upon it. Extension shall fit the roof curb and shall be secured to it with stainless steel lag screws or anchor bolts.

- H. Bearings: Bearings shall be heavy-duty self-aligning ball bearing type either permanently lubricated or equipped with fittings for grease lubrication. In the latter case, a grease gun of the proper type shall be furnished and delivered to the Authority.

- I. Approved Manufacturers

Acme Engineering & Manufacturing Co.
Greenheck Fan Corp.
Jenco Fan
Zurn Industries Inc.
PennBarry
Penn Ventilator Co. Inc.
Carnes Company
Trane Co.
Cook (Loren) Co.
Twin City Fan & Blower

- 2.04 UTILITY FANS : NOT USED.
- 2.05 TUBULAR CENTRIFUGAL FANS : NOT USED.
- 2.06 INLINE CENTRIFUGAL FANS : NOT USED.
- 2.07 WALL EXHAUST FAN: NOT USED.
- 2.08 CEILING EXHAUST FANS: NOT USED.
- 2.09 BATHROOM EXHAUSTERS: NOT USED.
- 2.10 LABORATORY FIXED FUME HOOD DUCTED EXHAUST FAN: NOT USED.
- 2.11 KILN HOOD EXHAUST FAN : NOT USED.
- 2.11 KITCHEN EXHAUST FAN : NOT USED.
- 2.12 DUST COLLECOR SYSTEM: NOT USED.

2.13 SMOKE EVACUATION FAN (POST FIRE): NOT USED.

2.14 VENTILATOR CURBS

- A. Factory fabricated galvanized steel body, aluminum on exposed surface with rigid fiberglass insulation, properly braced, stiffened to form a rigid weatherproof unit and formed according to the roof construction. For Roof Flashing, refer to architectural specifications.
- B. Curbs shall be the products of the ventilator manufacturer.

2.15 GAS METER ROOM EXHAUST FAN: Not Used.

2.16 SHOP PAINTING

- A. Fans and steel fabrication shall be factory coated with one coat of primer and one coat of machine enamel on both the exterior and interior surfaces, except the nameplates. Apply finish paint after erection. All painting work shall be as specified on Section 09900: Painting.
- B. For roof mounted fans, all steel components shall be coated with primer for outdoor uses.

PART 3 - EXECUTION

3.01 SUPPLEMENTAL INSTALLATION

- A. Access: Provide access and service space around and over centrifugal fans as indicated, but in no case less than that recommended by manufacturer.
- B. Roof Curbs: The prefabricated roof curb will enclose the opening of the roof exhaust fan, and be furnished with flashing and with wood sill at the top. The curbs shall be mounted directly to the roof structural surface, then roofed and flashed to the top of the wood nailer for weather tightness. The exhaust fan shall fit properly over the sill and shall be secured to it with stainless steel lag screws. The joint between the fan base and the sill shall be made air tight by means of heavy roofing felt counter flashing material. Minimum height from the bottom of the fan to the finished floor shall be 12".
- C. Support: Provide 4" high concrete pad with vibration isolators under floor-mounted centrifugal fans. Concrete is specified in Section 03300: Cast-in-Place Concrete.
- D. Isolation: Set centrifugal fans on vibration isolators and fasten in accordance with manufacturer's installation instructions.
- E. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16. Ensure that rotation is in direction indicated and intended for proper performance. Do not proceed with centrifugal fan start-up until wiring installation is acceptable. Interlock wiring between fan units; and between fans and field-installed control devices. Provide control wiring between field-installed controls, indicating devices, and fan starters.
- F. Controls: Provide controls specified in the Temperature Control System Section.
- G. Duct to Kitchen Exhaust Fan Connections: Provide flexible connections on inlet and outlet duct connections (comply with Section MC 506.3.2.3 for Kitchen Exhaust Fans). Section MC 506.3.2.3 requires that duct-to-exhaust fan connections be flanged and gasketed at

the base of the fan for vertical discharge fans; be flanged, gasketed and bolted to the inlet of the fan for side-inlet utility fans; and be flanged, gasketed and bolted to the inlet and outlet of the fan for in-line fans. Approved flexible connectors may be provided.

- H. Coordinate all trades to ensure that the installation of fans is not in conflict with the work performed of other trades.
- I. For split construction fans, the installation shall be inspected by the manufacturer after field assembly who shall certify that the fans have been properly installed and are ready for proper operation.

3.02 FIELD QUALITY CONTROL

- A. Upon completion of installation of centrifugal fans, and after motor has been energized with normal power source, test equipment to demonstrate compliance. Where possible field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected. The Contractor shall perform necessary Interdisciplinary Tests and Functional Performance Tests according to the manufacturer's procedures.
- B. Instruct and train maintenance personnel in the equipment operations. Training shall be for a minimum of 2 hours. Secure written confirmation that instruction has been provided and approved maintenance manuals received.

3.03 INTERDISCIPLINARY TESTS AND FUNCTIONAL PERFORMANCE TESTS

- A. Interdisciplinary Pre-Start-Up and Start-Up Tests

The Contractor shall conduct interdisciplinary pre-start up and start up tests as per the manufacturer's start up procedures. Contractor shall submit signed start up affidavit signed by the factory authorized service representative indicating that all of the manufacturer's pre-start up and start up procedures have been successfully completed.

- B. Functional Performance Tests

Contractor shall also submit signed functional performance testing affidavit signed by the factory authorized service representative indicating that all of the manufacturer's functional performance tests have been successfully completed. Refer to the functional performance tests since a BMS/DDC system is to be provided and the equipment is to be integrated into the BMS/DDC system.

3.04 COMMISSIONING OF FANS

- A. HVAC Contractor shall comply with the Commissioning Requirements.

END OF SECTION

SECTION 233700
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide the air outlets and inlets shown on the Drawings and as needed for a complete and proper installation. The types of air outlets and inlets specified in this Section include:

1. Grilles and Registers.
2. Diffusers.

1.02 RELATED SECTIONS

- A. Division 23 Sections

1.03 SUPPLEMENTAL SUBMITTALS

- A. Product Data: Include the following:

1. Schedule of diffusers, registers and grilles indicating drawing designation, room location, quantity, model number, size, and accessories.
2. Data sheet for each type of air outlet and inlet, and accessory indicating construction, finish, and mounting details
3. Performance data for each type of air outlet and inlet including blade setting angle, cfm, pressure drop, temperature and velocity traverses, throw and drop, and noise criteria ratings.

- B. Coordination Drawings:

1. Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved: ceiling suspension assembly members; method of attaching hangers to building structure; size and location of initial access modules for acoustical tile; ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings; duct access panels.
2. Wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in walls.

- C. Maintenance materials (adjusting tools)

1.04 SUPPLEMENTAL QUALITY ASSURANCE

- A. Codes and Standards

1. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70: Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
2. AMCA Compliance: Test and rate louvers in accordance with AMCA 500L-07: Laboratory Methods of Testing Louvers for Rating.
3. Air Outlets and Inlets shall be in accordance with NY Mechanical Code.

1.05 MAINTENANCE

- A. Provide four (4) adjusting tools and deliver them to the Authority before final payment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Approved Manufacturers:

Anemostat Products Div.
Carnes Co.
Krueger, Div. of Air System Components.
Nailor Industries Inc.
Price Industries Inc.
Titus
Tuttle and Bailey

2.02 GRILLES AND REGISTERS

- A. Unless otherwise specified, fabricate grille and register faces, and frames of steel with factory applied baked-on enamel of the color selected by Authority. Include color in the schedule. Construction: Solid steel bar type. Refer to the Drawing for size, size and thickness of borders/flanges, method of fastening, and all other items and accessories.
- B. Fabricate registers and grilles of aluminum or steel with finish to match the metal panel ceilings (i.e. kitchen/food services areas). Grilles or registers for this ceiling grid must be supported independent of the ceiling system. Fabricate registers and grilles from aluminum for the following cases: shower rooms, locker rooms, can wash rooms and swimming pool areas and where shown on the Drawings.
- C. Supply Grilles/Registers: Adjustable or fixed, double deflection type. Provide grilles/registers with frames. Nominal bar spacing: 3/4" on center. Where the Drawings indicate a grille/register to be adjustable horizontally and vertically, the grille/register shall have a double core with the bars of each core adjustable. Where fixed deflecting type grilles/registers are shown on the Drawings, they shall have the bars fixed at the factory for types of deflection indicated on the Drawings.
 1. Damper Assembly for Registers: Opposed multi-blade type consisting of frame, blades, and key operated movement of the locking type.
 - a. Operators: Key operated type projecting through frame or screwdriver slot, operable from the face of the register.

- b. Construction:
 - 1) For use with Aluminum Register Faces: Aluminum with etched or acrylic finish.
 - 2) For use with Factory Painted Register Faces: Galvanized steel factory finished with baked on enamel finish.
- D. Return Air/Exhaust Grilles/Registers: Fixed, single deflection type, horizontal or vertical as indicated on the Drawings.
 - 1. Steel models: The frame shall be constructed of 20 gauge steel, fins/blades/bars of 22 gauge steel. Aluminum models: construction: extruded aluminum, frame: 0.040" thick and fins/blades/bars: 0.050" thick.
 - 2. Face Bars/Vanes/Fins/Blades
 - a. Deflection Angle: 35° to 45°.
 - b. Nominal Spacing: 1/2" or 3/4" on center.
 - 3. Damper Assembly: Opposed multi-blade type consisting of frame, blades, and key operated movement of the locking type.
 - a. Operators: Key operated type projecting through frame or screwdriver slot, operable from the face of the register.
 - b. Construction:
 - 1) For use with Aluminum Register Faces: Aluminum with etched or acrylic finish.
 - 2) For use with Factory Painted Register Faces: Galvanized steel factory finished with baked on enamel finish.
- E. Where the Drawings indicate "F. O. V.", provide framed opening with volume control.
- F. Grilles of Other Materials: When grilles of other materials are indicated on the Drawings, they shall be as specified herein, except that the material used shall be of the kind indicated on the Drawings. Thickness of metal shall be not less than the thickness of steel. Aluminum grilles shall have aluminum volume controls.
- G. Fire Damper Grille: Where the Drawings indicate a fire damper grille (F.D. Gr.), provide grille, an interlocking blade type fire damper and a volume control device, all assembled and installed as detailed on the Drawings. Fire dampers shall be as specified in Section 15915.
- H. Where the Drawings indicate "F.D.O." (Fire Damper Opening), provide fire damper grille as specified in Section 15915 but without grille core.

- I. Where the Drawings indicate "Extra Heavy Duty Type return grilles and registers, provide extra heavy duty lines of registers and grilles of the sizes, deflection angle, blades/bars/fins direction and mounting types as shown on the Drawings. The frame shall be constructed of 16-gauge steel; blades/bars/fins shall be 14-gauge steel. Nominal spacing: 1/2". Opposed blade volume damper shall be constructed of heavy gauge steel. Damper shall be operable from the face of the register.
- J. Registers and Grilles Installed in Exposed Ductwork: Frames are not required for registers and grilles installed directly in uninsulated exposed ductwork.

2.03 AIR DIFFUSERS:

- A. Air diffusers shall be of the circular, rectangular, square or linear type as indicated on the Drawings. Fabricate diffusers of steel with factory-applied bake-on enamel finish. Where diffusers are to be installed in a room with a metal panel ceiling, the diffusers shall be aluminum or steel with finish to match the ceilings. Fabricate diffusers from aluminum for the following cases: locker rooms, swimming pool areas and where shown on the Drawings.
- B. Provide proper size No. 14 gage galvanized steel frames for the air diffusers to be installed in plaster hung and gypsum board ceilings.
- C. General: Roll and reinforce all exposed edges of diffusers. Internal diffuser parts shall be readily removable to permit cleaning and access to ducts. Removable parts and assemblies shall be such that they cannot be reassembled in a manner that would produce an incorrect air distribution pattern. Secure internal assemblies with fasteners that allow removal without use of special tools. Do not use neck or duct connection sizes indicated to size diffusers.
- D. Circular, Square and Rectangular Diffusers: Complete with volume control damper and adjustable equalizing grid, fabricated of same material and with same finish as diffuser. Directional diffuser to provide the air distribution pattern indicated on the Drawings. Optional damper shall be adjustable by means of operator handle and rod device, designed to be locked in any position and operable from diffuser face.
- E. Linear Diffusers : Shall be as shown on the plans.
- F. Air Diffusers Installed in Exposed Ductwork: Frames are not required for diffusers installed directly in uninsulated exposed ductwork.
- G. Air Diffusers Installed in VAV Systems: Devices shall be specifically designed for variable-air-volume flows.

2.04 SPECIAL REGISTERS: Not Used.

PART 3 - EXECUTION

3.01 SUPPLEMENTAL INSTALLATION

- A. Install air outlets and inlets in accordance with manufacturers written instructions. Install level and plumb.

- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. Create a symmetrical pattern with other ceiling mounted components. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify the Authority for a determination of final location. Check reflected ceiling plans for exact locations.
- C. Air Outlets and Inlets shall be installed without volume dampers except at the registers if shown on the Drawings and the Drawings Schedules. The volume damper shall be typically installed on the branch duct connection where shown on the Drawings. Contractor shall follow the Contract Drawings.
- D. Air diffuser installed in a Gymnasium or Playroom shall be equipped with a shallow dome-shaped guard constructed of No. 9 gage cold rolled steel wire. Guard for circular diffusers shall be fabricated of concentric rings spaced on 3/4" centers with radial wire stiffeners spaced at 45° and electrically welded to the concentric rings. Guards for rectangular and square diffusers shall be constructed of same gage wire and in a manner similar to that specified for circular guards, except that they shall be square or rectangular in shape. Guard shall be electro-cadmium or zinc plated. Guard shall be secured to air diffuser with plated steel clamps and stainless steel machine screws and nuts. Manufacturers: J & P Wire Products; Progressive Wire Products and Mid-West Metal Products Co., Inc.
- E. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, equalizing grid, and fire dampers
- F. Linear Diffusers: With all necessary accessories required as a complete installation including dedicated volume damper.
- G. Registers and Grilles Installed in Exposed Ductwork: Cut openings in ducts, forming a double thickness of metal, to attach registers or grilles with sheet metal screws. Bend back edges of openings into duct, on all 4 sides, a minimum of 1" to provide the thickness of metal stated above. Provide felt or sponge rubber gasketing, all 4 sides of duct openings, for supply grilles and registers.
- H. Air Diffusers Installed in Exposed Ductwork: Cut and form openings in ducts, to accommodate the specified volume control damper and adjustable equalizing grid assembly. Reinforce openings as required and approved. Provide felt or sponge rubber gasketing, around duct opening, for supply diffuser assemblies.
- I. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- J. Coordinate the proper frame style with the ceiling construction as per plan or specifications/as approved.
- K. Coordinate the air outlet and inlet locations with the reflected ceiling plans, lighting plans, sections and/or details.

- L. Coordinate the color requirements for all grilles, registers and diffusers with the Authority as specified and approved.
- M. Install diffusers, registers, and grilles with airtight connection to ducts. Follow SMACNA's latest HVAC Duct Construction Standards. Install to allow service and maintenance of dampers, air extractors, and fire dampers.

3.02 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.03 CLEANING

- A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 260501
ELECTRICAL – GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General Electrical Requirements shall be provided in accordance with the requirements specified under this section, the Specifications and the Contract Drawings.
2. The Contractor shall provide all labor, materials and equipment required to perform the work as specified in the Specifications and shown on the Contract Drawings.

B. Related Sections:

1. Division 26 Sections

1.2 SUBMITTALS

A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements as specified under Division 1 of the Specifications.

B. Working Drawings:

1. Point-to-point field wiring diagrams.
2. Qualifications of proposed wiring coordinator who shall prepare the point-to-point field wiring diagrams.
3. All control schemes shall be represented on a composite control schematic showing all control, indicating and alarm devices on one drawing.

C. Reports: Demonstration of equipment report shall be submitted.

1.3 REFERENCES

A. General electrical requirements shall comply with the latest applicable provisions and recommendations of the following:

1. NFPA 70, National Electrical Code.
2. NFPA 70E, Standard for Electrical Safety in the Workplace
3. NFPA 101, Life Safety Code
4. NEMA, National Electrical Manufacturers Association.
5. UL, Underwriters Laboratories Incorporated.
6. OSHA 1910 Subpart S, Electrical

1.4 QUALITY ASSURANCE

A. General:

1. All equipment and devices, provided under this Contract, shall be properly connected and interconnected with other equipment and devices of other trades under this Contract so as to render the installations complete for successful operation, regardless of

whether all the connections and interconnections are specifically mentioned in the Specifications or shown on the Contract Drawings.

2. Similar products shall be by the same manufacturer for uniformity on the Contract.
3. Electrical material and equipment shall be new and shall bear the label of UL, or other nationally recognized, independent testing laboratory, wherever standards have been established and label service regularly applies.
4. Where execution of the work under this Contract requires certain systems and equipment to be modified, the Contractor shall perform the work with due regard to maintenance of operations and construction staging in accordance with the Specifications.
5. The modification work shall be coordinated in advance with the facility superintendent and existing conditions. Contractor shall field determine and make such investigations as required to determine the functionality of each circuit and identify circuit terminations as required for the modifications intended to ensure the proper interface of all components for a complete functional system.
6. The Contractor shall retain the services of a wiring coordinator, to prepare the point-to-point field wiring diagrams. The wiring coordinator shall have experience in the development of the diagrams of the type specified and shall have served in a similar role on a project of similar size and complexity.

B. Area Classifications:

1. Materials and equipment for all indoor areas shall conform to the area classifications shown on the Contract Drawings or stated in the Specifications.
2. Materials and equipment for all outdoor areas shall conform to corrosive requirements, unless shown otherwise on the Contract Drawings or stated in the Specifications.
3. The locations and requirements shall be in accordance with the following:
 - a. Materials, equipment and incidentals installed in corrosive areas shall meet NEC and NEMA requirements for corrosive locations. Enclosures installed in corrosive locations shall meet NEMA 4X requirements. NEMA 4X enclosures shall be Type 316 Stainless Steel. Conduit installed in corrosive locations shall be PVC coated Rigid Steel Conduit.
 - b. Materials, equipment and incidentals installed in hazardous locations shall meet NEC requirements for the Class and Division designated. Enclosures installed in hazardous locations shall be provided with stainless steel hardware and watertight gasketing.
 - c. Materials, equipment and incidentals installed in dusty locations shall meet NEC and NEMA 12 requirements.

1.5 SEQUENCE OF CONSTRUCTION AND OPERATION

- A. In order to maintain continuous facility operation during construction, a phased removal, construction and operational sequence will be required as described herein. The order in which the principal structures or work areas are presented herein is for convenience of presentation and is not intended as a sequence of work or a listing of priorities. The Contractor is advised that work in multiple areas of the facility must be performed simultaneously in order to complete the entire scope of the contract within the allotted time. All Contractors are advised that the presentation is not organized in accordance with specific trades.

1.6 INTERIM AND TEMPORARY MATERIAL AND EQUIPMENT

- A. The Contractor shall furnish, install and remove the interim material and equipment in accordance with the Contract Documents.

- B. The Contractor is responsible for the removal from the site of all interim material and equipment and disposal thereof in accordance with the Specifications.

1.7 ADDITIONAL PROVISIONS

- A. Shutdowns:

- 1. Prior to commencing work on any existing equipment which requires a shutdown or suspension of normal operations, the Contractor shall request permission from the Engineer, in writing, at least sixty (60) days in advance of the date he proposes to commence such work. Simply furnishing a date in a schedule without explicit notification to the Engineer shall not constitute proper notification. In the request, the Contractor shall explain what construction procedures shall be used during the shutdown.

- B. Protection of Underground and Covered Facilities:

- 1. The location and extent of these facilities are not guaranteed, and the Contractor is cautioned to proceed with care, in the construction of new work in order to prevent damage to any existing structures, piping, or facilities. Protection and support for all underground facilities shall be provided to insure that the service provided for all existing facilities will not be interrupted. Any rerouting of existing facilities to facilitate construction operation shall be only with written permission of the Engineer; and then in the manner and at the time approved by the Engineer. The rerouting shall be made at no additional cost.

- C. Special Protection of Machinery and Equipment:

- 1. The Contractor shall take all protective measures to the satisfaction of the Engineer necessary to insure that inclement weather or dust and debris from demolition does not enter any of the mechanical or electrical equipment enclosures. Enclosures shall be provided where necessary to prevent contamination of the air. All protective measures shall be furnished, installed, lighted, ventilated, maintained and removed at the Contractor's own cost.
 - 2. Interior dustproof covers shall be a heavy reinforced polyethylene film curtain, minimum thickness 6 mils, supported by wood framing. All seams and penetrations shall be sealed with duct tape on two sides. Junctions with existing walls, floors and ceilings shall be made with a double fold secured with a backing strip anchored to the existing wall, floor and ceiling.
 - 3. Exterior weather tight enclosures shall be provided whenever a section of a roof or exterior wall on an existing building is removed or equipment is installed in a new building.

- D. Site Visit

- 1. The Contractor, before submitting its proposal, shall visit the site and shall be responsible for having ascertained local conditions, such as location, accessibility and general character of the site, the character and extent of any existing work within or adjacent to the site, and any other work being performed on the site at the time of submitting a proposal. The Contractor shall fully examine all the drawings relating to the work and shall become completely informed as to the extent and character of the work required and prevailing existing condition. No allowances will be made for the Contractor's failure to avail itself of such information.

PART 2 - PRODUCTS

2.1 POINT-TO-POINT FIELD WIRING DIAGRAMS

- A. The Contractor shall provide point-to-point field wiring diagrams for all equipment.
- B. The diagrams shall be developed for performance of the work and to document terminations. The diagrams shall be prepared based upon approved shop drawings of related equipment, including equipment of other Specification Divisions, working drawings and inspections as necessary to complete the diagrams. The diagrams shall include:
 - 1. External wiring for each piece of equipment, panel, instrument and other devices to control stations, lighting panels and motor controllers. The diagrams shall include control, status, signal and power wiring. Power diagrams shall include connections to switchgear, motor control centers, panelboards, control panels, control stations and field devices.
 - 2. Numbered terminal block identification for each wire termination.
 - 3. Unique identification of the assigned wire numbers and color coding for all interconnections.
 - 4. Identification of all wiring by the conduit tag in which the wire is installed. Wiring and conduit tags shall be developed by the Contractor as described on the Contract Drawings.
 - 5. Terminal, junction, and pull boxes through which wiring is routed.
 - 6. Identification of equipment with functional name and number to which wiring is to be connected.

2.2 SHOP FINISHES

- A. Exposed ferrous metal surfaces except aluminum, bronze, brass and stainless steel components shall be cleaned with a commercial blast and primed with one coat of rust inhibitive primer.
- B. Manufactured assemblies such as switchgear, substations, motor control centers, panelboards and motor controllers shall be shop painted in accordance with the requirements.
- C. Other equipment shall be painted with the manufacturer's best grade finish paint system compatible with the finish coatings.

PART 3 - EXECUTION

3.1 MAINTENANCE OF OPERATIONS

- A. Where execution of the work under this Contract requires certain equipment to be taken out of service, the Contractor shall perform the work with due regard to maintenance of operations and construction staging in accordance with the Contract Specifications.
- B. The Contractor shall schedule the work in advance with the Engineer so as not to affect proper facility operations. When the work is scheduled, the Engineer shall be notified 48 hours prior to proceeding with the work to allow time for the facility superintendent to perform load switching and alternation of equipment.
- C. To the maximum extent possible at the end of the workday, all equipment shall be back in place and ready for its normal service use should a facility emergency arise. In addition, should an emergency condition occur during execution of the work, at the request of the facility engineer, the equipment shall be placed back in service immediately and turned over to facility personnel.

- D. In the event of accidental shutdown of facility equipment the Contractor shall notify facility personnel immediately to allow for an orderly restart of affected equipment.

3.2 DEMONSTRATION OF EQUIPMENT

- A. The Contractor shall demonstrate that, in the presence of the Engineer, all electrical systems and electrically operated equipment operates as specified, designed and as required.
- B. The demonstration of equipment shall include the following:
 - 1. All power circuits shall be operated to verify proper connection to equipment. Mechanical key-interlocks for circuit breakers shall be operated to verify their proper operation. Power shall be removed and reapplied to automatic transfer switches to verify their operation.
 - 2. Emergency power systems shall be activated to verify their automatic start-up, proper operation while running and proper de-energization and cool down upon availability of normal power.
 - 3. All pushbuttons, indicating lights and similar devices shall be operated to verify proper connection and function. All devices, such as pressure and flow switches and similar devices shall be operated to verify that shut-downs and control sequences operate as required.
 - 4. The Contractor shall operate the systems to verify wiring and adjust the controls, as required, to achieve proper operation. This shall include wiring, timing and switching functions.
- C. The Contractor shall provide a demonstration of equipment report. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, and all other pertinent information.

3.3 RESTORATION

- A. The Contractor shall field paint after installation marred or scratched surfaces. All scratches, abrasions and other damage to equipment shall be touch-up painted.

END OF SECTION

SECTION 260505
ELECTRICAL - DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing demolition work. This section also includes equipment relocation. The demolition and relocation work shall be performed in accordance with the requirements specified under this Section, the Contract Specifications, and the Contract Drawings.
2. The Contractor shall remove and dispose of all electrical equipment and items as a result of the demolition Work. Where demolished equipment is so identified, it shall become the property of the City and disposal shall not occur.
3. The Contractor shall also relocate electrical equipment. The extent of the demolition and relocation work is shown on the Contract Drawings.

1.2 PERFORMANCE REQUIREMENTS

A. Scheduling

1. The Contractor shall proceed with the demolition and removal of equipment in a sequence designed to maintain the existing facility in operation. The Contractor shall notify the Engineer 48 hours before proceeding and meet with plant personnel to review removals and demolition work. Work shall begin only after approval of the City and Engineer.
2. Any equipment and appurtenances removed without proper authorization, which are necessary for the operation of the existing facility, shall be replaced to the satisfaction of the Engineer at no additional cost.
3. The Contractor shall familiarize himself with the work of all disciplines and coordinate and schedule demolition activities with the other disciplines for proper sequencing of the work and the removal of equipment.

1.3 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited, to:

1. Techniques and details proposed to accomplish the demolition work.

1.4 REFERENCES

A. Demolition work shall comply with the latest applicable provisions and recommendations of the following:

1.	NFPA 70	National Electrical Code.
2.	NFPA 70E	Standard for Electrical Safety in the Workplace
3.	NFPA 101	Life Safety Code.
4.	OSHA 1910	Subpart S - Electrical.

1.5 QUALITY ASSURANCE

- A. All demolition and removal work shall be in accordance with the Building Code and Electrical Code.
- B. In performance of the demolition work, the Contractor shall provide protection of adjacent plant areas, existing equipment and on-going construction. No electrical equipment shall be disposed off-site without the written approval of the Owner and Engineer.
- C. The Contractor shall execute the work in a careful and safe manner with the least possible disturbance to the public and to the operation of the facility. All work shall be performed with due regard to maintenance of plant operations and construction staging in accordance with the Contract Specifications.
- D. Demolition and removal work shall be executed with care and performed by competent experienced workers for the various types of demolition and removal work. All patching, replacing and refinishing of work shall be done by skilled workers. The work shall be carried out through to completion with due regard to the safety of employees, workers on site and the public.
- E. The Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. The Contractor shall give particular attention to shoring, bracing and shielding requirements so as to prevent any damage to new or existing construction. The Contractor shall be responsible for any damage which may be caused by demolition and removal work to any part or parts of existing structures or equipment designated for reuse or to remain.
- F. All demolished equipment becomes the property of the Contractor, except where identified by the Owner.
- G. The Contractor shall coordinate with other disciplines to disconnect or remove sources of power to equipment being removed or relocated under other disciplines.

1.6 SITE CONDITIONS

- A. The Owner assumes no responsibility for the actual condition of structures to be demolished and removed. Conditions existing at the time of inspection for bidding purposes shall be noted by the Contractor and shall be used by him in preparing his bid.
- B. The Contractor shall perform the work with due regard that certain equipment, tanks, and piping contain gases which are potentially hazardous and may be toxic, contain insufficient oxygen for human survival and are combustible in the presence of oxygen. All work regarding hazardous materials shall be performed.
- C. The Contractor shall perform the work with due regard that in some areas only certain systems and equipment shall be demolished while other systems and equipment shall remain operational. Contractor shall field determine and make such investigations as required to determine the source and function of each circuit, to allow for the disconnection and removal each circuit not required as result of the demolition and to retain all active circuits for areas unaffected by the demolition work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. The Contractor shall provide protection and restoration of structures in accordance with the Contract Specifications. Catch platforms, lights, barriers, weather protection, warning signs and other items shall be provided as required for proper protection of the public, occupants of the building, workers engaged in demolition operations, and adjacent construction.
- B. The Contractor shall provide 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.
- C. The Contractor shall provide temporary protection of the existing structure designated to remain where demolition, removal and new work is being done, connections made, materials handled or equipment moved.
- D. The Contractor shall provide dustproof partitions to prevent dust from rising by wetting demolished masonry, concrete, plaster and similar debris. Unaltered portions of the existing equipment affected by the demolition shall be protected. Such enclosures will be required in areas of major demolition work and for protection of existing equipment and personnel. Insulating barriers shall also be provided where necessary for protection.
 - 1. Dust proof partitions shall be constructed of wood studs with plywood on both sides. Partitions shall extend from floor to ceiling with a closure plate at the floor and ceiling and a dust- tight door in each enclosure complete with hardware, attached and keyed.
 - 2. Insulation barriers shall be provided to cover exposed, energized terminals, wires and busses.
 - 3. Adequate ventilation shall be provided for a safe working environment.
- E. The Contractor shall provide adequate fire protection during demolition in accordance with the local Fire Department requirements.
- F. The Contractor shall not close or obstruct roadways, walkways, passageways, or stairways and shall not store or place materials in passageways, stairs or other means of egress. The Contractor shall conduct operations with minimum traffic interference.
- G. The Contractor shall repair any damage to the existing structure or contents by reason of the insufficiency of protection provided.

3.2 REMOVALS

- A. The Contractor shall demolish any abandoned existing electrical equipment. All motors shall be disconnected by the Contractor and removed with the driven equipment.
- B. All wiring shall be removed, salvaged and stored. Direct burial cable shall be abandoned, but disconnected at both ends, insulated and identified. Where cable enters a structure, the cable shall be cut back to the point of entrance.
- C. All exposed conduits shall be removed and disposed. Conduits underground or concealed shall be abandoned. Abandoned conduits shall be cut flush with the slab or wall at the point of entrance and plugged.
- D. Recessed equipment to be demolished shall be abandoned, unless otherwise noted on the Contract Drawings. Demolished recessed panelboards and boxes enclosure fronts and

- internals shall be completely removed. The enclosure fronts shall be covered with new blank cover plates.
- E. Wherever cable and conduit are to be removed for disposition, the circuit shall be de-energized by the Contractor and adjacent circuits that are to remain in service shall be blanked off and then isolated.
 - F. All supports, pedestals and anchors for conduits, lighting fixtures and other equipment shall be removed with the equipment unless otherwise noted on the Contract Drawings. Concrete bases, anchor bolts and other supports shall be removed to approximately one inch below the surrounding finished area and the recesses shall be patched to match the adjacent areas.
 - G. The Contractor shall dispose of all demolition equipment, debris and other items, not marked by the City to remain, off the site and in conformance with all applicable codes and regulations.
 - H. The Contractor shall perform patching, restoration, finishing and new work in accordance with the Contract Specifications. All openings in structures as a result of the work, shall be patched and exterior openings made watertight. Where alterations occur, or new and old work join, the Contractor shall cut, remove, redrill or refinish the adjacent surfaces to the extent required by the conditions, so to leave the altered work in a condition as existed prior to the start of the work.
 - I. Superstructure wall and roof openings shall be closed, and damaged surfaces shall be restored to match the adjacent areas. Wall sleeves and castings shall be plugged or blanked off, all conduit openings in equipment shall be closed.
 - J. Where equipment is indicated to be removed, relocated and reused, the equipment shall be operated in the presence of representatives of the Contractor, City and Engineer. Such items shall be removed or relocated with care to prevent unnecessary damage, under the supervision of the trade responsible for reinstallation and protected and stored until required. Material or items damaged during removal shall be replaced with similar new material or items.
 - K. Ballasts in each existing lighting fixture shall be assumed to contain PCB's unless specifically marked with a label indicating "No PCBs". Remove ballasts from each lighting fixture and pack them in accordance with EPA PCB regulations. Ship ballast in approved containers to an EPA approved recycling facility and pay all shipping, packaging and recycle costs.
 - L. PCBs, mercury and PCB/mercury contaminated equipment shall be removed, packaged, shipped and disposed of in accordance with all State and Federal regulations. Obtain the services of a firm licensed and regularly engaged in the removal of PCBs and PCB contaminated equipment. The firm shall be licensed in the State or States in which the contaminated material is handled, shipped and disposed. Pay all fees associated with the removal of the contaminated material and equipment and provide documentation showing acceptable disposal.
 - M. Should the Contractor discover PCB or mercury contaminated equipment that was not identified; they shall cease work on or about the equipment and notify the Engineer immediately. The Contractor shall then proceed with the work as directed by the Engineer.

3.3 CLEANING AND MAINTENANCE

- A. The Contractor shall maintain the existing electrical power system to operate without interruption. Any interruption of electrical power to the existing facility and equipment shall be with the approval and permission of the Owner and the Engineer.
- B. The Contractor shall maintain all protection facilities installed in preparation of the demolition work.
- C. The Contractor shall provide on-site dump containers for collection of waste materials, debris and rubbish.

- D. All existing surfaces shall be cleaned of dirt, grease, loose paint before refinishing.
- E. The Contractor shall clean the site and properties of dust, dirt and debris caused by the demolition and removal work in accordance with the Contract Specifications. Waste materials, debris and rubbish shall be disposed of and the areas shall be returned to conditions prior to start of the work.

END OF SECTION

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SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Metal-clad cable.
- D. Variable-frequency drive cable.
- E. Photovoltaic wire.
- F. Wiring connectors.
- G. Electrical tape.
- H. Heat shrink tubing.
- I. Oxide inhibiting compound.
- J. Wire pulling lubricant.
- K. Cable ties.
- L. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- C. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
- I. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.
- J. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.
- K. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. NFPA 79 - Electrical Standard for Industrial Machinery; 2018.
- N. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- O. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- R. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- S. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
- T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- U. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.
- V. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
 - 1. Exceptions:
 - a. Use variable-frequency drive cable for connection between variable-frequency motor controllers and associated motors.
- C. Underground feeder and branch-circuit cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. For damp, wet, or corrosive locations as a substitute for NFPA 70, Type NMC nonmetallic-sheathed cable, when nonmetallic-sheathed cable is permitted.

2. In addition to other applicable restrictions, may not be used:
 - a. Where exposed to view.
 - b. Where exposed to damage.
- D. Armored cable is not permitted.
- E. Metal-clad cable is permitted only as follows:
 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
 2. In addition to other applicable restrictions, may not be used:
 - a. Where not approved for use by the authority having jurisdiction.
 - b. Where exposed to view.
 - c. Where exposed to damage.
 - d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
 - e. For patient care areas of health care facilities requiring redundant grounding.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
- I. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- J. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- K. Conductor Material:
 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 3. Tinned Copper Conductors: Comply with ASTM B33.
- L. Minimum Conductor Size:
 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 2. Control Circuits: 14 AWG.

- M. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- N. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
 - d. For control circuits, comply with manufacturer's recommended color code.
 - e. Unless otherwise noted, all wiring shall be hospital grade.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Size 4 AWG and Larger: Type XHHW-2.
 - b. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

- A. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.
- B. Provide equipment grounding conductor unless otherwise indicated.
- C. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.

2.05 METAL-CLAD CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc: www.afcweb.com/#sle.
 - 2. Southwire Company: www.southwire.com/#sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- G. Grounding: Full-size integral equipment grounding conductor.
1. Provide additional isolated/insulated grounding conductor where indicated or required.
- H. Armor: Steel, interlocked tape.
- I. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.06 VARIABLE-FREQUENCY DRIVE CABLE

- A. Description: Flexible motor supply cable listed and labeled as complying with UL 2277 in accordance with NFPA 79; specifically designed for use with variable frequency drives and associated nonlinear power distortions.
- B. Conductor Stranding: Stranded.
- C. Insulation Voltage Rating: 1000 V.
- D. Insulation: Use only thermoset insulation types; thermoplastic insulation types are not permitted.
- E. Grounding: Full-size integral equipment grounding conductor or symmetrical arrangement of multiple conductors of equivalent size.
- F. Provide metallic shielding.
- G. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.07 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.08 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
 - 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
 - 5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
 - 6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 - 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
- E. Install metal-clad cable (Type MC) in accordance with NECA 120.
- F. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- G. Exposed Cable Installation (only where specifically permitted):
 - 1. Route cables parallel or perpendicular to building structural members and surfaces.
 - 2. Protect cables from physical damage.
- H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- J. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- K. Variable-Frequency Drive Cable: Terminate shielding at both variable-frequency motor controller and associated motor using glands or termination kits recommended by manufacturer.

- L. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- M. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- N. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- O. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- P. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 - 3. Wet Locations: Use heat shrink tubing.
- Q. Insulate ends of spare conductors using vinyl insulating electrical tape.
- R. Identify conductors and cables in accordance with Section 26 0553.
- S. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- T. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- F. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 - 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
 - c. Metal process piping.
 - 8. Provide bonding for interior metal air ducts.
- G. Communications Systems Grounding and Bonding:
 - 1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 - 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
 - d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.
 3. Holes for Connections: As indicated or as required for connections to be made.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- B. Section 26 0533 - CONDUIT: Additional support and attachment requirements for conduits.
- C. Section 26 0534 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2.5. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Comply with MFMA-4.
2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
3. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
 - d. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
 - e. Outlet Boxes: 1/4 inch (6 mm) diameter.
 - f. Luminaires: 1/4 inch (6 mm) diameter.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
3. Hollow Masonry: Use toggle bolts.
4. Hollow Stud Walls: Use toggle bolts.
5. Wood: Use wood screws.
6. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.
 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Conduit Support and Attachment: Also comply with Section 26 0533.13.
- J. Box Support and Attachment: Also comply with Section 26 0533.16.
- K. Interior Luminaire Support and Attachment: Also comply with Section 26 5100.
- L. Secure fasteners according to manufacturer's recommended torque settings.
- M. Remove temporary supports.
- N. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 260533

CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. PVC-coated galvanized steel rigid metal conduit (RMC).
- D. Flexible metal conduit (FMC).
- E. Liquidtight flexible metal conduit (LFMC).
- F. Electrical metallic tubing (EMT).
- G. Rigid polyvinyl chloride (PVC) conduit.
- H. Liquidtight flexible nonmetallic conduit (LFNC).
- I. Conduit fittings.
- J. Accessories.

1.02 RELATED REQUIREMENTS

- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- D. Section 26 0529 - Hangers and Supports for Electrical Systems.
- E. Section 26 0534 - Boxes for Electrical Systems.
- G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2018.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2018.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- N. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

- P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- R. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- S. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.

6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
 7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Embedded Within Concrete:
1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Not Subject to Physical Damage: Use rigid PVC conduit.
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
1. Maximum Length: 6 feet (1.8 m).
- N. Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit.
 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
- O. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Electrical Service Conduits: Also comply with Section 26 2100.
- C. Communications Systems Conduits: Also comply with Section 27 1000.
- D. Fittings for Grounding and Bonding: Also comply with Section 26 0526.
- E. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- F. Provide products listed, classified, and labeled as suitable for the purpose intended.
- G. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 1/2 inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
 - 5. Underground, Interior: 3/4 inch (21 mm) trade size.
 - 6. Underground, Exterior: 1 inch (27 mm) trade size.
- H. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
- C. PVC-Coated Fittings:
 - 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 - 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.06 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.07 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

2.08 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 - 4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
 - 5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.10 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

- A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

2.11 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.
- G. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- H. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- I. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
- J. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- G. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
- H. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.
 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 10. Route conduits above water and drain piping where possible.
 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 14. Group parallel conduits in the same area together on a common rack.
- I. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 8. Use of spring steel conduit clips for support of conduits is not permitted.
 9. Use of wire for support of conduits is not permitted.
 - a. For securing conduits to studs in hollow stud walls.
 - b. For suspending conduits supported by spring steel conduit clips (only where specifically indicated or permitted).
 10. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.

8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- L. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 2316 and Section 31 2323.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches (610 mm).
 - b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
 3. Provide underground warning tape in accordance with Section 26 0553 along entire conduit length.
- M. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
 2. Secure conduits to prevent floating or movement during pouring of concrete.
- N. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 3000 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.
- O. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- P. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- Q. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 3. Where conduits penetrate coolers or freezers.
- R. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- S. Provide grounding and bonding in accordance with Section 26 0526.

- T. Identify conduits in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260534

BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Floor boxes.
- E. Underground boxes/enclosures.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26 0529 - Hangers and Supports for Electrical Systems.
- E. Section 26 0533 - CONDUIT:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 2726 - Wiring Devices:
 - 1. Wall plates.
 - 2. Floor box service fittings.
 - 3. Poke-through assemblies.
 - 4. Access floor boxes.
 - 5. Additional requirements for locating boxes for wiring devices.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 508A - UL Standard for Safety Industrial Control Panels; 2018.
- L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

- M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 6. Coordinate the work with other trades to preserve insulation integrity.
 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
 8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for floor boxes and poke-throughs.
1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
 4. Use nonmetallic boxes where exposed rigid PVC conduit is used.
 5. Use suitable concrete type boxes where flush-mounted in concrete.
 6. Use suitable masonry type boxes where flush-mounted in masonry walls.
 7. Use raised covers suitable for the type of wall construction and device configuration where required.
 8. Use shallow boxes where required by the type of wall construction.
 9. Do not use "through-wall" boxes designed for access from both sides of wall.
 10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 12. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
 13. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 14. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 15. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 - b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
 - c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
 16. Wall Plates: Comply with Section 26 2726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
1. Manufacturers:
 - a. Hubbell Incorporated; _____: www.hubbell.com/#sle.
 - b. Legrand.
- E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 2726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
 2. Use cast iron floor boxes within slab on grade.
 3. Use sheet-steel or cast iron floor boxes within slab above grade.
 4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).

5. Manufacturer: Same as manufacturer of floor box service fittings.
- F. Underground Boxes/Enclosures:
 1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
 2. Size: Sized as required.
 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
 4. Applications:
 - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 8 load rating.
 - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.
 - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
 5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
 - a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

2.02 ACCESSORIES

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
 2. Unless dimensioned, box locations indicated are approximate.
 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
 4. Locate boxes so that wall plates do not span different building finishes.
 5. Locate boxes so that wall plates do not cross masonry joints.
 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.

8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- I. Box Supports:
 1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- L. Floor-Mounted Cabinets: Mount on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.
- M. Install boxes as required to preserve insulation integrity.
- N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- O. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.
- P. Underground Boxes/Enclosures:
 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
 2. Mount enclosures located in landscaped areas with top at 1 inch (25 mm) above finished grade.
 3. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- Q. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- S. Close unused box openings.
- T. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- U. Provide grounding and bonding in accordance with Section 26 0526.
- V. Identify boxes in accordance with Section 26 0553.

3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Warning signs and labels.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2018.
- E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain whose designations are changed as part of the new work.
- B. Identification for Equipment:
 - 1. Use identification nameplate or identification label to identify each piece of NEW equipment being added for the Tenant Improvement phase of project..
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

- b. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - c. Transfer Switches:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
 - 3) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
- 2. Use voltage marker or identification label to identify highest voltage present for each piece of electrical equipment.
- 3. Use identification nameplate or identification label to identify disconnect location for equipment with remote disconnecting means.
- 4. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
- 5. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
- 6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
- 7. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment indicated.
 - a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
- 8. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 - 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 - 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
 - 5. Use underground warning tape to identify direct buried cables.
- D. Identification for Raceways:
 - 1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
 - 2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet (6.1 m).
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.

- 1) Color Code:
 - (a) Emergency Power System: Red.
 - (b) Fire Alarm System: Red.
- 2) Field-Painting: Comply with Section 09 9123 and 09 9113.
- 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
5. Use underground warning tape to identify underground raceways.
- E. Identification for Boxes:
 1. Use voltage markers to identify highest voltage present.
 2. Use voltage markers or color coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.
 - b. For exposed boxes in public areas, do not color code.
- F. Identification for Devices:
 1. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
 2. Use identification label to identify fire alarm system devices.
 - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
 3. Use identification label to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 4. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
 5. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.
- G. Identification for Luminaires:
 1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 2. Legend:
 - a. System designation where applicable:

- 1) Emergency Power System: Identify with text "EMERGENCY".
 - 2) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
 - a. System Designation: 1 inch (25 mm).
 - b. Equipment Designation: 1/2 inch (13 mm).
 - c. Exception: Provide minimum text height of 1 inch (25 mm) for equipment located more than 10 feet (3.0 m) above floor or working platform.
5. Color:
 - a. Normal Power System: White text on black background.
 - b. Emergency Power System: White text on red background.
 - c. Fire Alarm System: White text on red background.
- D. Format for Caution and Warning Messages:
 1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/2 inch (13 mm).
 5. Color: Black text on yellow background unless otherwise indicated.
- E. Format for Receptacle Identification:
 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 2. Legend: Power source and circuit number or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch (5 mm).
 5. Color: Black text on clear background.
- F. Format for Control Device Identification:
 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 2. Legend: Load controlled or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch (5 mm).
 5. Color: Black text on clear background.
- G. Format for Fire Alarm Device Identification:
 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 2. Legend: Designation indicated and device zone or address.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch (5 mm).
 5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- D. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
- E. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:

2.06 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.

- 5. Interior Components: Legible from the point of access.
 - 6. Conduits: Legible from the floor.
 - 7. Boxes: Outside face of cover.
 - 8. Conductors and Cables: Legible from the point of access.
 - 9. Devices: Outside face of cover.
 - C. Install identification products centered, level, and parallel with lines of item being identified.
 - D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
 - E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
 - F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
 - G. Secure rigid signs using stainless steel screws.
 - H. Mark all handwritten text, where permitted, to be neat and legible.
- 3.03 FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
 - B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 260583

WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0533 - CONDUIT
- C. Section 26 0534 - Boxes for Electrical Systems.
- D. Section 26 2726 - Wiring Devices.
- E. Section 26 2816 - Enclosed Switches.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Comply with NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 26 2816 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 2726.
- D. Flexible Conduit: As specified in Section 26 0533.
- E. Wire and Cable: As specified in Section 26 0519.
- F. Boxes: As specified in Section 26 0533.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION

SECTION 260923

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Time switches.
- C. Daylighting controls (if applicable).
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0534 - Boxes for Electrical Systems.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 5100 - Interior Lighting.

1.03 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- E. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- H. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.
- I. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
 - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
 - 4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
 - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
 - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
 - 2. Daylighting Controls (if applicable): Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- D. Field Quality Control Reports.
- E. Operation and Maintenance Data: Include detailed information on device programming and setup.
- F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.
- C. Provide five year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
- C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.02 OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 - 3. Sensor Switch Inc;: www.sensorswitch.com/#sle.
 - 4. WattStopper; : www.wattstopper.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
 - 6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
 - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
 - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
 - d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 20 minutes.
8. Sensitivity: Field adjustable.
9. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
12. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
13. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
14. Wireless Sensors:
 - a. RF Range: 30 feet (9 m) through typical construction materials.
 - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
 - c. Power: Battery-operated with minimum ten-year battery life.

C. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - c. Finish: Color to be selected by Architect.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
 3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet (37.2 sq m).
 4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
- D. Wall Dimmer Occupancy Sensors:
1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
 - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
 - e. Provide field adjustable dimming preset for occupied state.
 - f. Finish: Color to be selected by Architect.
- E. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 square meters) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 3. Ultrasonic Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet (46.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
- F. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
- G. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 3. Input Supply Voltage: Dual rated for 120/277 V ac.
 4. Load Rating: As required to control the load indicated on drawings.
- H. Power Packs for Wireless Occupancy Sensors:

1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
2. Input Supply Voltage: Dual rated for 120/277 V ac.
3. Load Rating: As required to control the load indicated on drawings.

2.03 TIME SWITCHES

- A. Digital Electronic Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
 2. Program Capability:
 - a. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
 3. Schedule Capacity: Not less than 16 programmable on/off operations.
 4. Provide automatic daylight savings time and leap year compensation.
 5. Provide power outage backup to retain programming and maintain clock.
 6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
 7. Input Supply Voltage: As indicated on the drawings.
 8. Output Switch Configuration: As required to control the load indicated on drawings.
 9. Output Switch Contact Ratings: As required to control the load indicated on drawings.
 10. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
 - a. Indoor clean, dry locations: Type 1.

2.04 DAYLIGHTING CONTROLS

- A. Manufacturers:
1. Hubbell Control Solutions; _____: www.hubbell.com/hubbellcontrolsolutions/en/#sle.
 2. Sensor Switch Inc; _____: www.sensorswitch.com/#sle.
 3. WattStopper; _____: www.wattstopper.com/#sle.
- B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
- C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
1. Sensor Type: Filtered silicon photo diode.
 2. Sensor Range:
 - a. Indoor Photo Sensors: 5 to 100 footcandles (53.8 to 1,080 lx).
 - b. Outdoor Photo Sensors: 5 to 250 footcandles (53.8 to 2690 lx).
 - c. Atrium Photo Sensors: 200 to 2,500 footcandles (2150 to 2,6910 lx).
 - d. Skylight Photo Sensors: 1,000 to 6,000 footcandles (10,760 to 64,580 lx).
- D. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.
- E. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
- F. Daylighting Control Switching Modules for Wireless Sensors:

1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
 2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
 4. Control Capability: Capable of controlling one programmable channel.
 5. Input Supply Voltage: Dual rated for 120/277 V ac.
 6. Load Rating: As required to control the load indicated on drawings.
- G. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
 2. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
 3. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
 4. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
 5. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
 6. Output Voltage: Compatible with specified dimming ballasts.
- H. Daylighting Control Dimming Modules for Wireless Sensors:
1. Description: Plenum rated control unit compatible with specified wireless photo sensors and with specified dimming ballasts, for continuous dimming of compatible dimming ballasts in response to changes in measured light levels according to selected settings.
 2. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
 3. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
 4. Control Capability: Capable of controlling up to 32 ballasts with up to two separately programmable daylighting zones.
- I. Power Packs for Low Voltage Daylighting Control Modules:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 2. Input Supply Voltage: Dual rated for 120/277 V ac.
 3. Load Ratings: As required to control the load indicated on drawings.
- J. Accessories:
1. Where indicated, provide compatible accessory wall switches for manual override control.
 2. Where indicated, provide compatible accessory wireless controls for manual override control.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
 - 1. Mounting Heights: to be verified with Architect
 - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 - 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.
- G. Provide required supports in accordance with Section 26 0529.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Identify lighting control devices in accordance with Section 26 0553.
- J. Occupancy Sensor Locations:
 - 1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
 - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- K. Daylighting Control Photo Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.

2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
- L. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- N. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.
- O. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test time switches to verify proper operation.
- E. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- F. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

- B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
 - 4. Location: At project site.

END OF SECTION

SECTION 262416

PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- F. NEMA PB 1 - Panelboards; 2011.
- G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- L. UL 67 - Panelboards; Current Edition, Including All Revisions.
- M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
- P. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation: www.eaton.com/#sle.
- B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- C. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- D. Substitutions: See Section 01 6000 - Product Requirements.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
 3. Label equipment utilizing series ratings as required by NFPA 70.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 - c. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 4300, list and label panelboards as a complete assembly including surge protective device.
- K. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
 1. Ampere Rating: Not less than ampere rating of panelboard bus.
 2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
 3. Coil Voltage: As required for connection to control system indicated.
- L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

- M. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- N. Load centers are not acceptable.
- O. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Sub-feed lugs.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Copper.
 - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 - 2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 3. Provide clear plastic circuit directory holder mounted on inside of door.
- F. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- G. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- H. Minimum Integrated Short Circuit Rating:
 - 1. 240 Volt Panelboards: 10,000 amperes rms symmetrical.
 - 2. 480 Volt Panelboards: 14,000 amperes rms symmetrical.
- I. Series Rated panelboards are not acceptable.
- J. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
 - 1. Type SWD for lighting circuits.
 - 2. Type HACR for air conditioning equipment circuits.
 - 3. Class A ground fault interrupter circuit breakers where scheduled.
 - 4. Do not use tandem circuit breakers.
- K. Enclosure: NEMA PB 1, Type 1.
- L. Cabinet Box: 6 inches (153 mm) deep, 20 inches (508 mm) wide for 240 volt and less panelboards, 20 inches (508 mm) wide for 480 volt panelboards.
- M. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.04 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:

- a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
 - a. Provide the following field-adjustable trip response settings:
 - 1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
 - 2) Long time delay.
 - 3) Short time pickup and delay.
 - 4) Instantaneous pickup.
 - 5) Ground fault pickup and delay where ground fault protection is indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
11. Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.05 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 26 0526.
 - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
- K. Install all field-installed branch devices, components, and accessories.
- L. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- N. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 0573.
- O. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- P. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- Q. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- R. Height: 6 feet (1800 mm) to top of panelboard; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.
- S. Provide filler plates to cover unused spaces in panelboards.
- T. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
 - 1. Emergency and night lighting circuits.
 - 2. Fire detection and alarm circuits.
 - 3. Communications equipment circuits.
 - 4. Intrusion detection and access control system circuits.
 - 5. Video surveillance system circuits.
- U. Identify panelboards in accordance with Section 26 0553.
- V. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.
- W. Provide identification nameplate for each panelboard in accordance with Section 26 0553.
- X. Provide arc flash warning labels in accordance with NFPA 70.

- Y. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
- Z. Ground and bond panelboard enclosure according to Section 26 0526.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Perform field inspection and testing in accordance with Section 01 4000.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- E. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 30 amperes. Tests listed as optional are not required.
- F. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- G. Test GFCI circuit breakers to verify proper operation.
- H. Test AFCI circuit breakers to verify proper operation.
- I. Test shunt trips to verify proper operation.
- J. Correct deficiencies and replace damaged or defective panelboards or associated components.
- K. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.
- E. Floor box service fittings.
- F. Poke-through assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0534 - Boxes for Electrical Systems.
- D. Section 26 0923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
- M. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Operation and Maintenance Data:
 1. Wall Dimmers: Include information on operation and setting of presets.
 2. GFCI Receptacles: Include information on status indicators.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hubbell Incorporated: www.hubbell-wiring.com.
- B. Leviton Manufacturing Company, Inc: www.leviton.com.
- C. Lutron Electronics Company, Inc: www.lutron.com.
- D. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

2.02 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI protection for receptacles installed in kitchens.
- F. Provide GFCI protection for receptacles serving electric drinking fountains.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.
- H. For flush floor service fittings, use tile rings for installations in tile floors.
- I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.03 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Above-Floor Service Fittings: Gray wiring devices with satin aluminum housing.
- C. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

- D. Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.
- E. All finishes for all devices as selected by the Architect and Owners representatives.

2.04 WALL SWITCHES

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.05 WALL DIMMERS

- A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- B. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:
 - 1. Incandescent: 600 W.
 - 2. Magnetic Low-Voltage: 600 VA.
 - 3. Electronic Low-Voltage: 400 VA.
- C. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.06 RECEPTACLES

- A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
 - 3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.
- B. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
 - 3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
- C. GFCI Receptacles:
 - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
- D. USB Charging Devices:
 1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
 - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
 2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

2.07 WALL PLATES

- A. Wall Plates: Comply with UL 514D.
 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard; Color as selected by Architect.
 3. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.08 FLOOR BOX SERVICE FITTINGS

- A. Description: Service fittings compatible with floor boxes provided under Section 26 0533.16 with components, adapters, and trims required for complete installation.
- B. Above-Floor Service Fittings:
 1. Single Service Pedestal Convenience Receptacles:
 - a. Configuration: One standard convenience duplex receptacle.
 2. Single Service Pedestal Communications Outlets:
 - a. Configuration: One 1 inch bushed opening.
 - b. Voice and Data Jacks: Provided by others.
 3. Single Service Pedestal Furniture Feed:
 - a. Configuration: One 3/4 inch knockout.
 4. Dual Service Pedestal Combination Outlets:
 - a. Configuration:
 - 1) Power: One standard convenience duplex receptacle.
 - 2) Communications: One 1 inch bushed opening.
 - 3) Voice and Data Jacks: Provided by others.
 - b. Provide barrier to separate line and low voltage compartments.
- C. Flush Floor Service Fittings:
 1. Single Service Flush Convenience Receptacles:
 - a. Cover: Rectangular.
 - b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 2. Single Service Flush Furniture Feed:
 - a. Cover: Rectangular.
 - b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
 3. Dual Service Flush Combination Outlets:
 - a. Cover: Rectangular.
 - b. Configuration:

- 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 - 2) Voice and Data Jacks: Provided by others.
4. Dual Service Flush Furniture Feed:
 - a. Cover: Rectangular.
 - b. Configuration:
 - 1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
 - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
5. Accessories:
 - a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
 - b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

2.09 POKE-THROUGH ASSEMBLIES

- A. Manufacturers:
 1. Legrand.
- B. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.
- C. Above-Floor Service Fittings:
 1. Single Service Pedestal Convenience Receptacles:
 - a. Configuration: One standard convenience duplex receptacle.
 2. Single Service Pedestal Communications Outlets:
 - a. Configuration: One 1 inch bushed opening.
 3. Single Service Pedestal Furniture Feed:
 - a. Configuration: One 3/4 inch knockout.
 4. Dual Service Pedestal Combination Outlets:
 - a. Configuration:
 - 1) Power: One standard convenience duplex receptacle.
 - 2) Communications: One 1 inch bushed opening.
 - 3) Voice and Data Jacks: Provided by others.
 - b. Provide barrier to separate line and low voltage compartments.
- D. Flush Floor Service Fittings:
 1. Single Service Flush Convenience Receptacles:
 - a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 2. Single Service Flush Communications Outlets:
 - a. Configuration: _____.
 3. Single Service Flush Furniture Feed:
 - a. Configuration: One 2 inch by 1-1/4 inch combination threaded opening(s).
 4. Dual Service Flush Combination Outlets:
 - a. Cover: Hinged door(s).
 - b. Configuration:
 - 1) Power: One standard convenience duplex receptacle(s).
 - 2) Communications: _____.
 - 3) Voice and Data Jacks: As specified in Section 27 1000.
 5. Dual Service Flush Furniture Feed:
 - a. Configuration:
 - 1) Power: One 3/4 inch threaded opening(s).
 - 2) Communications: One 1-1/4" threaded opening(s).
 6. Accessories:

- a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that openings in access floor are in proper locations.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
 1. Mounting Heights: as listed below unless directed by Architect otherwise.
 - a. Wall Switches: 48 inches (1200 mm) above finished floor.
 - b. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

- J. Install wall switches with OFF position down.
- K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- L. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- P. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include wiring diagrams showing all factory and field connections.
- D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation: www.eaton.com/#sle.
- B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- C. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- N. Heavy Duty Switches:

1. Comply with NEMA KS 1.
 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
- O. Provide the following features and accessories where indicated or where required to complete installation:
1. Hubs: As required for environment type; sized to accept conduits to be installed.
 2. Integral fuse pullers.
 3. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Identify enclosed switches in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Lamps.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0534 - Boxes for Electrical Systems.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.
- H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- L. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- M. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. All fixture quantities, types and mounting locations shall be coordinated with Architectural plans prior to submission of a bid. Any discrepancies from this coordination shall be brought to the attention of the Architect and Engineers prior to bid. Electrical Contractor to be responsible for the ownership and installation of all light fixtures as detailed on architectural and Engineering plans.
- B. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for

mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
 3. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
- D. Field quality control reports.
- E. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 MANUFACTURERS - LUMINAIRES

- A. As specified on drawings.

2.02 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.03 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
 - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- I. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
 - 1. LED Tape - General Requirements:
 - a. Listed.
 - b. Designed for field cutting in accordance with listing.
- J. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.
- K. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.04 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
 - 1. Sealed maintenance-free lead calcium unless otherwise indicated.
 - 2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- G. Accessories:
 - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
 - 2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
 - 3. Provide compatible accessory wire guards where indicated.
 - 4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.05 EXIT SIGNS

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
 - 2. Directional Arrows: As indicated or as required for installed location.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
 - 1. Self-Powered Exit Signs:
 - a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
 - b. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.
 - c. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
 - d. Provide low-voltage disconnect to prevent battery damage from deep discharge.
 - e. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101; provide indicator light(s) to report test and diagnostic status.

2.06 DRIVERS

- A. Drivers - General Requirements:
 - 1. Minimum Efficiency/Efficacy: Provide drivers complying with all current applicable federal and state ballast efficiency/efficacy standards.
 - 3. Electronic Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
- B. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.07 LAMPS

- A. Lamps - General Requirements:
 - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
 - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
 - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.

4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.08 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Provide required support and attachment in accordance with Section 26 0529.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Suspended Ceiling Mounted Luminaires:
 1. Do not use ceiling tiles to bear weight of luminaires.
 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
 4. Secure pendant-mounted luminaires to building structure.
 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
 7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- H. Recessed Luminaires:
 1. Install trims tight to mounting surface with no visible light leakage.
 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- I. Suspended Luminaires:
 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
 4. Install canopies tight to mounting surface.
 5. Unless otherwise indicated, support pendants from swivel hangers.
- J. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- K. Install accessories furnished with each luminaire.
- L. Bond products and metal accessories to branch circuit equipment grounding conductor.
- M. Emergency Lighting Units:
 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- N. Exit Signs:
 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- O. Install lamps in each luminaire.
- P. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

- A. Clean surfaces according to manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

END OF SECTION

SECTION 284600

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of the Contract Documents, including the General and Supplementary General Condition and Division 1 - General Requirements shall apply to the work of this section.
- B. At the time of bid, all exceptions taken to these Specifications, all variances from these Specification and all substitutions of operating capabilities or equipment called for in these Specification shall be listed in writing and forwarded to the Engineer. Any such exception, variances or substitutions that were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.
- C. The entire system shall be installed with aesthetics in mind. All control panels and remote annunciators installed in public spaces shall be semi-flush mounted with no exposed conduit or cable trays.

1.2 WORK INCLUDED

- A. The work covered by this Section of the Specification shall include all labor, equipment, materials and services to furnish and install a complete fire alarm system of the addressable, non-coded type. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using a plug-in programmer. The system shall consist of, but not be limited to, the following:
 - 1. Fire Alarm Control Panel and related remote data gathering panels.
 - 2. Remote Annunciators with semi flush backbox.
 - 3. Addressable manual fire alarm stations.
 - 4. Addressable analog area smoke detectors.
 - 5. Addressable analog heat detectors.
 - 6. Magnetic door\card access release override control.
 - 7. Audible notification appliances - Horns.
 - 8. Visual notification appliances - strobes.
 - 9. Central station alarm connection control.
 - 10. Sprinkler supervisory switches and tamper switch supervision.
 - 11. Battery standby.

1.3 APPLICABLE CODES AND STANDARDS

- A. All equipment shall be UL listed for its intended use and conform to the latest UL Standards.
- B. Underwriters Laboratories Inc.: The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:

UL 864/UOJZ, APOU Control Units for Fire Protective Signaling Systems.

UL 268 Smoke Detectors for Fire Protective Signaling Systems.

UL 268A Smoke Detectors for Duct Applications.

UL 217 Smoke Detectors Single Station.

- UL 521 Heat Detectors for Fire Protective Signaling Systems.
- UL 228 Door Holders for Fire Protective Signaling Systems.
- UL 464 Audible Signaling Appliances.
- UL 1638 Visual Signaling Appliances.
- UL 38 Manually Activated Signaling Boxes.
- UL 346 Waterflow Indicators for Fire Protective Signaling Systems.
- UL 1971 Standard for Signaling Devices for the Hearing Impaired
- UL 1481 Power Supplies for Fire Protective Signaling Systems.
- UL 1711 Amplifiers for Fire Protective Signaling Systems.
- UUKL The Fire Alarm system shall be UUKL for Smoke Control.

C. This installation shall comply with:

1. Americans with Disabilities Act (ADA)
2. National Electric Code, Article 760
3. National Fire Protection Association Standards: NFPA72
4. Local and State Building Codes and the Local Authorities Having Jurisdiction.
5. International Standards Organization (ISO): ISO-9001
6. All power and wire requirements shall follow the Electrical Code
7. 2020 Building Code of NYS
8. Utilize MEA/BSA/OTCR Approved Fire Alarm Equipment.

1.4 RELATED DOCUMENTS

- A. Secure permits and approvals prior to installation.
- B. Prior to commencement and after completion of work notify Authorities Having Jurisdiction.
- C. Submit letter of approval for installation before requesting acceptance of system.

1.5 RELATED WORK

- A. 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:
 1. Sprinkler waterflow and supervisory switches shall be furnished and installed by the fire protection contractor but wired and connected by the electrical contractor. Modification of existing sprinkler devices to accommodate monitoring by the new fire alarm system shall be the responsibility of the fire alarm system-installing contractor.
 2. Elevator recall control circuits to be provided by the elevator control equipment. The operation of the elevators shall be in accordance with Chapter 30 and Appendix K.
 3. Conduit: Section 263000.
 4. Wire and Cables: Section 263000.

1.6 SUBMITTALS

- A. Provide list of all types of equipment and components provided. This shall be incorporated as part of a Table of Contents, which will also indicate the manufacturer's part number, the description of the part, and the part number of the manufacturer's product datasheet on which the information can be found.
- B. Provide description of operation of the system (Sequence of Operation), similar to that provided on the contract drawings, to include any and all exceptions, variances or substitutions listed at the time of bid. Any such exceptions, variances or substitutions that were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. The sequence of operation shall be project specific and shall provide individual sequences for every type of alarm, supervisory, or trouble condition that may occur as part of normal or off-normal system use.
- C. Provide manufacturer's ORIGINAL printed product data, catalog cuts and description of any special installation procedures. Photocopied and/or illegible product data sheets shall not be acceptable. All product datasheets shall be highlighted or stamped with arrows to indicate the specific components being submitted for approval.
- D. Provide manufacturer's installation instruction manual for specified system.
- E. Provide samples of various items when requested.
- F. Provide copy of NY License to perform such work.
- G. Provide copies of NICET Level II Fire Alarm certifications for the two (2) technicians assigned to this project.
- H. Provide shop drawings as follows:
 - 1. Coversheet with project name, address and drawing index.
 - 2. General notes drawing with peripheral device backbox size information, part numbers, device mounting height information, and the names, addresses, point of contact, and telephone numbers of all contract project team members.
 - 3. Device riser diagram that individually depicts all control panels, annunciators, addressable devices, and notification appliances. Shall include a specific, proposed point descriptor above each addressable device. Shall include a specific, discrete point address that shall correspond to addresses depicted on the device layout floor plans. Drawing shall provide wire specifications, and wire tags shown on all conductors depicted on the riser diagram. All circuits shall have designations that shall correspond with those require on the control panel and floor plan drawings. End-of-line resistors (and values) shall be depicted.
 - 4. Control panel termination drawing(s). Shall depict internal component placement and all internal and field termination points. Drawing shall provide a detail indicating where conduit penetrations shall be made, so as to avoid conflicts with internally mounted batteries. For each additional data-gathering panel, a separate control panel drawing shall be provided, which clearly indicated the designation, service and location of the control enclosure. End-of-line resistors (and values) shall be depicted.
 - 5. See section 3.4 DOCUMENTATION AND TRAINING for other documents relating to this section.
 - 6. Device typical wiring diagram drawing(s) shall be provided which depict all system components, and their respective field wiring termination points. Wire type, gauge, and jacket shall also be indicated. When an addressable module is used in multiple configurations for monitoring or controlling various types of equipment, different device typical diagrams shall be provided. End-of-line resistors (and values) shall be depicted.

7. Device layout floor plans shall be created for every area served by the fire alarm system. CAD Files (AutoCAD – latest edition) shall be provided by the consulting engineer for the use of the fire alarm system equipment vendor in the preparation of the floor plans. Floor plans shall indicate accurate locations for all control and peripheral devices. Drawings shall be NO LESS THAN 1/8-INCH SCALE. All addressable devices shall be depicted with a discrete address that corresponds with that indicated on the Riser Diagram. All notification appliances shall also be provided with a circuit address that corresponds to that depicted on the Riser Diagram. If individual floors need to be segmented to accommodate the 1/8" scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner. End-of-line resistors (and values) shall be depicted.
8. Contained in the title block of each drawing shall be symbol legends with device counts, wire tag legends, circuit schedules for all addressable and notification appliance circuits, the project name/address, and a drawing description which corresponds to that indicated in the drawing index on the coversheet drawing. A section of each drawing title block shall be reserved for revision numbers and notes. The initial submission shall be Revision 0, with Revision A, B, or C as project modifications require.
- I. Battery calculations shall be provided on a per power supply/charger basis based on 24 hours of supervision and 15 minutes of alarm. These calculations shall clearly indicate the quantity of devices, the device part numbers, the supervisory current draw, the alarm current draw, totals for all categories, and the calculated battery requirements. Battery calculations shall also reflect all control panel component, remote annunciator, and auxiliary relay current draws. Failure to provide these calculations shall be grounds for the complete rejection of the submittal package.
- J. Table of contents, product data sheets, sequences of operation, battery calculations, installation instructions, licenses, NICET certifications and B-Size (blackline) reduced shop drawings shall be provided by the fire alarm vendor as part of a single, spiral bound submittal book. The submittal book shall have laminated covers indicating the project address, system type, and contractor. The book shall consist of labeled dividers, and shall not exceed 9 ½" in width, and 11 ½" in height. No less than three (3) sets of submittal booklets shall be provided to the consulting engineer for review and comment. Additional copies may be required at no additional cost to the project.
- K. Scale drawing sets shall be submitted along with the submittal booklets. These drawings may be either D-Size or E-Size Blue-line drawings and of a sufficient resolution to be completely read. Sets shall be bound and folded so as to not take up more than 100 square inches of space. No less than three (3) sets of scale drawing sets shall be provided to the consulting engineer for review and comment. Additional copies may be required at no additional cost to the project.

1.7 WARRANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance or approval by AHJ. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

PART II - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The catalog numbers used are those of Edwards - EST (formerly GE Security)"or equal", and constitute the type and quality of equipment to be furnished. Notifier, Simplex and other manufacturers may be submitted as equal.

- B. If equipment of another manufacturer is to be submitted for approval as equal, the contractor shall, at the time of bid, list all exceptions taken to these Specifications, all variances from these Specifications and all substitutions of operating capabilities or equipment called for in these Specifications and forward said list to the Engineer. Any such exceptions, variances or substitutions that were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. Final determination of compliance with these Specifications shall rest with the Engineer, who, at his discretion, may require proof of performance.
- C. Alternate product submissions based upon use of a product line considered proprietary in its distribution, design, application software, or ongoing maintenance and repair shall not be acceptable. Proof of a product's non-proprietary nature shall be the burden of the contractor at the time of Bid, and shall be in the form of written documentation. The determination of a product's compliance to this requirement shall be exclusively that of the Consulting Engineer.
- D. All products used shall be of a single manufacturer. Submission of notification appliances, auxiliary relays, or documentation from other than a single manufacturer shall not be acceptable and will be grounds for immediate disapproval without comment.
- E. The Fire Alarm / Life Safety System supplied under this specification shall be a microprocessor-based. All Control Panel Assemblies and connected Field Appliances shall be both designed and manufactured by the same company, and shall be tested and cross-listed as compatible to ensure that a fully functioning Life Safety System is designed and installed.

2.2 CIRCUITING GUIDELINES

- A. Each Signaling Line Circuit (SLC) shall be circuited so device loading is not to exceed 80% of loop capacity in order to leave for space for future devices. The loop shall have Class B operation. Each DGP shall include an SLC loop on a per floor basis. T-Tapping a selected loop to cover an alternate floor shall not be accepted.
- B. NAC Circuits shall have Class B operation. Each of the following types of alarm notification appliances shall be circuited as shown on the drawings but shall be typically as follows:
 - a. Audible Signals: Provide sufficient spare capacity to assure that the addition of five (5) audible devices can be supported without the need for addition control components (power supplies, signal circuit modules, amplifiers, batteries, etc.)
 - b. Visual Signals Provide sufficient spare capacity to assure that the addition of three (3) visual devices can be supported without the need for addition control components (power supplies, signal circuit modules, batteries, etc.)
- C. The network riser shall be wired NFPA Style 7 (Class A with isolation).
- D. Where it is necessary to interface conventional initiating devices provide intelligent input modules to supervise Class B zone wiring.
- E. Each of the following types of devices or equipment shall be provided with supervised circuits as shown on the drawings but shall be typically as follows:
 - a. Sprinkler Valve Supervisory Switches: Provide one (1) supervisory module circuit for each sprinkler valve supervisory switch.
 - b. When waterflow and tamper switches exist at the same location, provide one (1) dual input addressable module. When odd numbers of devices exist at a single location, provide additional single input addressable modules.
- F. Provide a dedicated 24VDC circuit to feed all auxiliary relays required for inductive loads. Circuits shall be supervised via an end-of-line relay and addressable input module. Auxiliary relays shall not derive their power from the starter or load being controlled.
- G. In no case shall any fire alarm circuit be sized beyond 80% of circuit capacity.

2.3 SUPPORT FOR INSTALLER AND OWNER MAINTENANCE

- A. Provide a coded one-man walk test feature. Allow audible or silent testing. Signal alarms and troubles during test. Allow receipt of alarms and programmed operations for alarms from areas not under test.
- B. Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.
- C. Provide loop controller diagnostics to identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the circuit wiring of remote module shall be identified by device address.
- D. Allow the user to display/report the condition of addressable analog detectors. Include device address, device type, percent obscuration, and maintenance indicator. The maintenance indicator shall provide the user with a measure of contamination of a device upon which cleaning decisions can confidently be made.
- E. Allow the user to report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity. Include Facility Name, Licensee, Project Program Compilation date, Compiler Version, Project Revision Number, and the time and date of the History Report.
- F. Allow the user to disable/enable devices, zones, actions, timers and sequences. Protect the disable function with a password.
- G. Allow the user to activate/restore outputs, actions, sequences, and simulate detector smoke levels.
- H. Allow the service user to enter time and date, reconfigure an external port for download programming, initiate auto programming and change passwords. Protect these functions with a password.
- I. THE END-USER SHALL RETAIN COMPLETE RIGHTS AND OWNERSHIP TO ALL SOFTWARE RUNNING IN THE SYSTEM. The fire alarm equipment vendor shall provide useable hard and soft copies of the software database to the End-User at the end of the warranty period. The database provided shall be useable by any authorized and certified distributor of the product line, and shall include all applicable passwords necessary for total and unrestricted use and modification of the database. The Consulting Engineer shall define the extent of hardcopy database documentation to be provided.

2.4 UL LISTED AND APPROVED EQUIPMENT

- A. Fire Alarm Control Panel Requirements:

The fire alarm control panel or panels and all system devices (horn-strobes, strobes, pull stations, smoke and heat detectors, etc. shall be Edwards (EST) type EST3X series (or equal). All under one label "UL listed and approved" for the use of fire alarm systems in this area of the United States of America.

The operating controls shall be located behind locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified.

Note: The Fire Alarm vendor may substitute the Edwards EST iO series panel for systems under 200 fire alarm devices.

- B. System Controllers: The main controller SFS-1CPU shall be supervised, site programmable, and of modular design supporting up to 125 detectors and 125 remote modules per addressable Signaling line Circuit (SLC). The CPU shall support up to 6 SLC's per panel for a total panel capacity of 1500

Intelligent Addressable points. The system shall be designed with peer-to-peer networking capability for enhanced survivability, with support for up to 8 Nodes, each with up to 1500 points and an overall capacity of 4,000 points. The cabinets shall be steel, with a red finish.

- C. The system shall store all basic system functionality and job specific data in non-volatile memory. All site specific and operating data shall survive a complete power failure intact. Passwords shall protect any changes to system operations.
- D. The Main Controller Module shall control and monitor all local or remote peripherals. It shall support a large 960 character LCD, power supply, remote LCD and zone display annunciators, printers, and support communication interface standard protocol (CSI) devices such as color computer annunciators and color graphic displays.
- E. The panel shall have an interface module for remote site monitoring. The control panel shall include built-in (part of the fire alarm control panel) Digital Alarm Communicator Transmitter (DACT)) module to transmit smoke, supervisory, waterflow, trouble, CO Alarm (if included), pump running, and pump trouble events to a Central monitoring Station (CMS) company. The DACT shall support dual telephones lines, Contact I.D. communications, and configured for dual tone multi-frequency (DTMF) or pulse modes. It shall be possible to delay AC power failure reports, auto test call, and be site programmable. The DACT shall be capable of transmitting every individual condition to the central station via Contact I.D. format. Selection of Contact I.D. format SHALL be of the discretion of the engineer and building owner but shall be an available option. Contractors who choose a separate dialer must meet all of the above options and are responsible for all necessary added connections such as power (with FCO/FDS), conduit, wire, addressable interface modules etc.
- F. The system shall have built-in automatic system programming to automatically address and map all system devices attached to the main controller. A minimum default single stage alarm system operation shall be supported with alarm silence, event silence, drill, lamp test, and reset common controls.
- G. Advanced Windows-based System Definition Utility with Program Version Reporting to document any and all changes made during system start-up or system commissioning shall be used to maintain site specific programming. Time and Date Stamps of all modifications made to the program must be included to allow full retention of all previous program version data. It shall support programming of any input point to any output point. The system shall support the use of Bar Code readers to assist custom programming functions. It shall allow authorized customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms. The system program shall meet the requirements of this project, current codes and standards, and satisfy the local Authority Having Jurisdiction.
- H. The system shall support distributed processor intelligent detectors with the following operational attributes; integral multiple differential sensors, automatic device mapping, electronic addressing, environmental compensation, pre-alarm, dirty detector identification, automatic day/night sensitivity adjustment, normal/alarm LEDs, relay bases, sounder bases and isolator bases.
- I. The system shall use full digital communications to supervise all addressable loop devices for placement, correct location, and operation. It shall allow swapping of "same type" devices without the need of addressing and impose the "location" parameters on replacement device. It shall initiate and maintain a trouble if a device is added to a loop and clear the trouble when the new device is mapped and defined into the system.
- J. Each controller shall contain a RS232 printer/programming port for programming locally via a PC. When operational, each controller shall support a printer through the RS232 port and be capable of message routing.
- K. Single stage operation shall be provided.
- L. The system shall have a UL Listed Detector Sensitivity test feature, which will be a function of the smoke detectors and performed automatically every 4 hours.

- M. The system shall support 100% of all remote devices in alarm and provide support for a 100% compliment of detector isolator bases.
- N. All panel modules shall be supervised for placement and return trouble if damaged or removed.
- O. The system shall have a CPU watchdog circuit to initiate trouble should the CPU fail.
- P. The Fire Alarm / Life Safety System shall code the Notification Appliance Circuits with the industry standard Temporal 3 pattern.
- Q. Audible notification appliances shall be affected by signal silence features. Visual signal appliance shall not be affected by signal silence features.
- R. User Interface: The 4X-LCD Display Module shall be of membrane style construction with a 24 line by 40-character (960 total characters) Liquid Crystal Display (LCD). The LCD shall use super-twist technology and backlighting for high contrast visual clarity and a colored gray/black and white display. In the normal mode the LCD shall display the time, a customer facility name, and the number of history events. In the alarm mode the LCD display the total number of events and the type of event on display. The LCD shall reserve 42 characters of display space for each user custom message by addressable device. The module shall have visual indicators for the following common control functions; Power, Alarm, Supervisory, Monitor, Trouble, Disable, Ground Fault, CPU fail, and Test. There shall be common control keys and visual indicators for reset, alarm silence, panel silence, and drill. Provide four pairs of display control keys for selection of event display by type (alarm, supervisory, monitor and trouble) and forward / backward scrolling through event listings. The operation of these keys shall be integrated with the related common control indicators to flash the indicators when undisplayed events are available for display and turn on steady when all events have been displayed. The LCD shall display the first event of the highest priority as well as the previous seven (7) alarm events "hands free" in chronological order so that the arriving firefighter may track the fires progression. Provide system function keys; status, reports, enable, disable, activate, restore, program, and test. The module shall have a numeric keypad, zero through nine with delete and enter keys.
- S. Power Supplies: The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 10.0A continuous for notification appliance circuits. Four synchronized NAC circuits at 3 amp 24vdc shall be included in base assembly. All outputs shall be power limited. The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current plus general alarm for 15 minutes.

2.5 COMPONENTS

- A. Intelligent Devices — General: Each remote device shall have a microprocessor with non-volatile memory to support its functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number, device address, device type, personality code, date of manufacture, hours in use, time and date of last alarm, amount of environmental compensation left/used, last maintenance date, job/project number, current detector sensitivity values, diagnostic information (trouble codes) and algorithms required to process sensor data and perform communications with the loop controller. Each device shall be capable of electronic addressing, either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device's address by physical means shall not be necessary.
- B. Intelligent Detectors — General: The System Intelligent Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and

distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters shall not be acceptable. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and analog loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total analog loop response time for detectors changing state shall be 0.5 seconds. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the analog loop controller. A red LED shall flash to display alarm status. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient "Environmental Thresholds" approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminants as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24-hour long term and 4-hour short-term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 80% and 100% of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour. The intelligent analog detectors shall be suitable for mounting on any Signature Series detector mounting base.

- C. Fixed Temperature/Rate of Rise Heat Detector, SIGA2-HRS: Provide intelligent combination fixed temperature/rate-of-rise heat detectors SIGA-HRS. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135⁰F (57⁰C) and a rate-of-rise alarm point of 15⁰F (9⁰C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.
- D. Photoelectric Smoke Detector, SIGA2-PS: Provide intelligent photoelectric smoke detectors SIGA2-PS. The analog photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. Systems using central intelligence for alarm decisions shall not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging and humidity. The information shall be stored in the integral processor and transferred to the analog loop controller for retrieval using a laptop PC or the SIGA-PRO Signature Program/Service Tool. The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The photo detector shall be suitable for operation in the following environment: Temperature: 32⁰F to 120⁰F (0⁰C to 49⁰C), Humidity: 0-93% RH, non-condensing, Elevation: no limit.

- E. Addressable Carbon Monoxide (CO) Detector, EST model SIGA2-COS with sounder base. Provide intelligent addressable Carbon Monoxide Alarms as required by Chapter 9 with Audible Base. The CO detection element shall indicate a trouble condition at the FACP signaling end of life and be field replaceable. The CO detector shall be UL 2075 listed.
- F. Standard Detector Mounting Bases, SIGA-SB / SIGA-SB4: Provide standard detector mounting bases SIGA-SB suitable for mounting on North American 1-gang, 3½" or 4" octagon box and 4" square box. The base shall, contain no electronics, support all Signature Series detector types and have the following minimum requirements: Removal of the respective detector shall not affect communications with other detectors, Terminal connections shall be made on the room side of the base, bases that must be removed to gain access to the terminals shall not be acceptable. The base shall be capable of supporting one (1) Signature Series SIGA-LED Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.
- G. Intelligent Modules — General: It shall be possible to address each Intelligent Signature Series module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Modules requiring EPROM, PROM, ROM changes or DIP switch and/or jumper changes shall not be acceptable. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment: Temperature: 32°F to 120°F (0°C to 49°C), Humidity: 0-93% RH, non-condensing.
- H. Single Input Module, SIGA-CT1 (Waterflow Detectors, Tamper Switches etc.): Provide intelligent single input modules SIGA-CT1. The Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).
- I. Dual Input Module, SIGA-CT2: Provide intelligent dual input modules SIGA-CT2. The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The dual input module shall support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).
- J. Single Input Signal Module, SIGA-CC1: Provide intelligent single input signal modules SIGA-CC1. The Single Input (Single Riser Select) Signal Module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. When selected as a telephone power selector, the module shall be capable of generating its own "ring tone". The module shall be suitable for mounting on North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The single input signal module shall support the following operations: Audible/Visible Signal Power Selector (Polarized 24 Vdc @ 2A).
- K. Control Relay Module, SIGA-CR: Provide intelligent control relay modules SIGA-CR. The Control Relay Module shall provide one form "R" dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and

releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" deep 4" square boxes with 1-gang covers.

- L. Manual Pull Station, SIGA-270: Provide intelligent single action fire alarm pull stations as indicated on the project plans. The fire alarm station shall be of metal construction with an internal toggle switch. Finish the station in red with silver "PULL IN CASE OF FIRE" English lettering. The manual station shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. It shall be possible to address each Signature Series fire alarm pull station without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable. The manual stations shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing up to 24 diagnostic codes that can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground faults. Fire alarm pull stations shall be suitable for temperatures 32°F to 120°F (0°C to 49°C), Humidity: 0-93% RH, non-condensing.
- M. Notification Appliances – General: All appliances shall be UL Listed for Fire Protective Service. All strobe appliances or combination appliances with strobes shall be capable of providing the "Equivalent Facilitation" which is allowed under the Americans with Disabilities Act accessibility guidelines (ADA(AG)), and shall be UL 1971, and ULC S526 Listed. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel (NO EXCEPTIONS) specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from THE CONTROL PANEL MANUFACTURER clearly stating that the control equipment (as submitted) is 100% compatible with the submitted Notification Appliances.
- N. Strobes, G1RF-VM Series: Provide EST Series G1RF-VM series low profile wall mounted strobes at the locations shown on the drawings. Strobes shall provide synchronized flash outputs. Strobe output shall be field selectable as indicated on the drawings in one of the following intensity levels; 15/75, 15cd, 30cd, 75cd or 110cd*. Low profile strobes shall mount in a North American 1-gang box or surface mounted on a matching back box provided by the manufacturer, as directed in the field. - The fire alarm vendor may select below 75 candela where allowed by the appropriate release of ADA. 15/75 strobes may be used in corridors and in locations where 15 candela is required per NFPA wall and ceiling tables (see NFPA 72).
- O. Temporal Horn Strobes, G1RF-HDVM Series: Provide EST Series G1RF-HDVM low profile wall mount horn/strobes at the locations shown on the drawings. The horn/strobe shall provide an audible output of 84.4 dBA at 10 ft at the high setting and for smaller room size locations (as indicated on the plans) a low dB setting (field selectable) of 79.4 dB at 10 ft. when measured in reverberation room per UL-464. Strobes shall provide synchronized flash outputs. The strobe output shall be as indicated on the drawings in one of the following field selectable intensity levels*; 15/75, 15cd, 30cd, 75cd & 110cd devices. The horn shall have a selectable steady or synchronized temporal output. Low profile horn/strobes shall mount in a North American 1-gang box or surface mounted on a matching back box provided by the manufacturer, as directed in the field. - The fire alarm vendor may select below 75 candela where allowed by the appropriate release of ADA. 15/75 strobes may be used in corridors and in locations where 15 candela is required per NFPA wall and ceiling tables (see NFPA 72).
- P. Temporal Horn, G1RF-HD: Provide EST Series G1RF-HD low profile wall mount horn at the locations shown on the drawings. The horn shall provide an audible output of 84.4 dBA at 10 ft at the high setting and for smaller room size locations (as indicated on the plans) a low dB setting (field selectable) of 79.4 dB at 10 ft. when measured in reverberation room per UL-464. The horn shall have a selectable steady or synchronized temporal output. Low profile horn shall mount in a North

American 1-gang box or surface mounted on a matching back box provided by the manufacturer, as directed in the field.

- Q. Weather Rated Strobes, Horns and Horn Strobes: Provide EST model 757 weather rated Notification Appliance Circuit (NAC) devices as indicated on the project plans. Weatherproof NAC devices shall be suitable for temperatures -31 °F to 150 °F and 0 to 98% RH, non-condensing. Weather rated NAC devices shall include a weather resistant color matched mounting box, model 757A-WB.
- R. Multi-Voltage Control Relays, MR-200 Series: Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.
- S. Electromagnetic Door Holders: Provide Wall Mounted, EST Edwards 1504/1505/1508/1509 Series. Provide flush, semi-flush or surface wall mounted electromagnetic door holder/releases rated at 24 Vac/Vdc as directed by the Consulting Engineer. Finish shall be brushed zinc. Electromagnetic door holders submitted for use must have written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.
- T. STI Stopper II Lexan Guards: Manual pull stations that are provided with STI Stopper II lexan guards shall include non-audible alarms as required on the plans. They shall be surface or flush mounting, as required for each individual device. Stopper Covers shall only be included on devices shown on the plans to include them.
- X. Operating Instruction/Riser Diagram Holders: Shall be red painted steel, frame holder with clear, Acrylic window with nine inch by twelve inch (9" x 12") dimensions. One (1) holder shall be provided for the fire alarm control panel (FACP)/system operating instructions and one (1) holder shall be provided for a reduced copy (8-1/2" X 11") of the fire alarm system riser diagram. The operating instruction and riser diagram holders shall be mounted adjacent to the fire alarm control panel (FACP).

PART III - EXECUTION

3.1 INSTALLATION

- A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the manufacturer, approved by the Fire Department, Fire Code, Electrical Code, and specified with in.
- B. All penetration of floor slabs and firewalls shall be sleeved (1" conduit minimum) fire stopped in accordance with all local fire codes.
- C. End of Line Resistors shall be furnished as required for mounting as directed by the manufacturer. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled so removal of the device is not required to identify the EOL device.
- D. All manual pull stations shall be mounted 42 - 48 inches above the finished floor, as measured to the handle.
- E. All audio/visual devices shall be mounted 80 inches above the finished floor, as measured to the lens. Devices shall be mounted no less than 6 inches from the ceiling. Audio visual devices shall be mounted per NFPA 72.

- F. No area smoke detectors shall be mounted within 36 inches of any HVAC supply, return air register or lighting fixture.
- G. No area smoke or heat detector shall be mounted within 12 inches of any wall. All detectors shall be installed in strict accordance with NFPA 72 as amended in Appendix Q guidelines for such devices.
- H. All mechanical rooms, boiler rooms, gymnasiums, wiring closets, custodian rooms, attic spaces, etc. or areas with no hung ceilings shall be piped with 3/4" conduit and installed as necessary by the Electrical Code. All areas in public view shall be in metal conduit. All boxes must be painted red and labeled "FIRE ALARM".
- I. All addressable modules shall be mounted within 36 inches of the monitored or controlled point of termination. This shall include, but is not necessarily limited to, fan shutdown, elevator recall, shunt trip, sprinkler status points, or door release. Label all addressable modules as to their function.
- J. New door holders shall derive their 24VAC/VDC power from a separate power supply housed in a dedicated, metal enclosure. The power supply shall have a 120VAC feed, and is to be centrally located to serve door holders on a per floor or area basis. All existing door holders shall be connected to new FACP. E.C. shall extend all existing wiring in order to make this work. Locations and quantities of door holder power supplies shall be referenced and submitted in the submission package for approval by the Consulting Engineer.
- K. All low voltage wiring terminated to the fire alarm system shall be PLENUM RATED with no exceptions and no less than No. 12 AWG in size for NAC circuits and 16 AWG for Initiating Circuits, and solid copper per the Electrical code. Exposed wire above 8ft AFF shall be 150 degrees C and as specified in the electrical code.
- L. All line voltage (120VAC) wiring shall be no less than No. 12 AWG in size, and solid copper. This shall include all system grounding. FACP must have a DEDICATED fused disconnect arranged per the Electrical code.
- M. All wiring shall be color-coded throughout, to National Electrical Code standards.
- N. Power-limited/Non-power-limited NEC wiring standards SHALL BE OBSERVED.
- O. All junction box covers shall be painted red and labeled FIRE ALARM SYSTEM.
- P. Fire alarm system wiring shall not co-mingle with any other system wiring in the facility. Conduits shall not be shared under any circumstance. Only when fire alarm wiring enters the enclosure of a monitored or controlled system will co-habitation be permitted (i.e. at fan starters or elevator controllers). THIS WILL BE FIELD INSPECTED BY THE PROJECT ENGINEER.
- Q. Fire alarm control panel enclosures shall have engraved labels indicating, "FIRE ALARM SYSTEM", and the areas of the building served by that panel.
- R. Auxiliary relays shall be appropriately labeled to indicate "FIRE ALARM SYSTEM" and their specific function (i.e. FAN S-1 SHUTDOWN).
- S. All fire alarm wiring shall be continuous and unspliced. Terminations shall only occur at fire alarm devices or control panel enclosures under terminal screws. All other splicing methods are specifically disallowed (i.e. plastic wirenuts).
- T. All fire alarm wiring shall be installed using a dedicated system of supports (i.e. bridle rings). Fire alarm wiring shall not be bundled or strapped to existing conduit, pipe or wire in the facility. THIS WILL BE FIELD INSPECTED BY THE PROJECT ENGINEER.
- U. All fire alarm wiring shall be sleeved when passing through any wall, using conduit sleeves (1" min.) with bushings, and fire stopped in accordance with Code.
- V. All low voltage operation shall be provided from the fire alarm control panel.
- W. All fire alarm devices shall be accessible for periodic maintenance. Should a device location indicated on the Contract Drawings not meet this requirement, it shall be the responsibility of the

installing contractor to bring it, in writing, to the attention of the Project Engineer. Failure to bring such issues to the attention of the Project Engineer shall be the exclusive liability of the installing Electrical Contractor.

- X. The installing Electrical Contractor shall be responsible for the removal of ENTIRE existing fire alarm system components and controls on the demolition drawing shown or not, upon approval of the AHJ and the Consulting Engineer. The End-User reserves the right to retain any existing fire alarm system components, upon their request. All existing fire alarm system components requiring special handling for disposal (due to radioactivity) shall be the responsibility of the installing contractor. Written proof of proper disposal by the installing contractor shall be required prior to release of outstanding retainage.

3.2 FIELD QUALITY CONTROL

- A. The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the function as specified.
- B. The installing contractor or fire alarm equipment vendor shall have no less than two (2) NICET Level II fire alarm technicians dedicated to this project.
- C. The Installing Contractor and the Fire Alarm System Vendor shall, upon the request of the Consulting Engineer or End-User, attend any and all project meetings for the purpose of accurately determining progress.
- D. It shall be the responsibility of the installing contractor to assure that construction debris does not adversely affect any sensing devices installed as part of this project. Should it be deemed necessary by the Consulting Engineer, End-User or AHJ, the installing contractor shall be responsible for the cleaning of all smoke detectors prior to final acceptance.

3.3 TESTS

- A. The fire alarm system vendor shall test the system in accordance with the manufacturer's requirements and NFPA 72 as amended by the NYS Building Code. The vendor shall provide completed reports to the Consulting Engineer for review and approval prior to final acceptance.
- B. Each individual system operation on a circuit-by-circuit basis shall be tested for its complete operation. The procedure for testing the entire fire alarm system shall be set forth with the consent of the code enforcement official, the Engineer and the manufacturer.

3.4 DOCUMENTATION AND TRAINING

- A. The contractor shall compile and provide to the owners three (3) complete manual on the completed system to include SITE SPECIFIC operating and maintenance instruction, catalog cuts of all equipment and components, as-built wiring diagrams and a manufacturer's suggested spare parts list, and an end user training video on DVD disk.
- B. In addition to the above manuals, the Electrical Contractor shall provide the services of the manufacturer's trained representative for two (2) separate calendar days for a period of four (4) hours per day to instruct the owners' designated personnel on the operation and maintenance of the entire system.
- C. As-built drawings shall consist of the following:
 - 1. Complete revision of all previously submitted drawings.
 - 2. Point-to-point depiction of all device wiring on the device layout floor plans.
 - 3. One (1) set of B-size, laminated as-built drawings.

4. Two (2) sets of 30"x42"inch 1\16"=1' scale drawings showing all points of fire alarm. One set shall be submitted with the close-out documents. Second set shall be mounted in frame with a lexan cover. These drawing must be submitted to project Engineer or approval.
 5. Fire Alarm Matrix designed per NFPA 72: FIGURE A.10.6.2.3(9).
- D. Turnover of all software database hard/soft copies shall be required. This shall include all possible programming software logs, diskettes or CDs containing exported project files, hard copies of all device maps, the revision number of the version of programming utility used, and all required passwords. The turnover of all database information shall occur prior to the end of the One (1) warranty period (or period as amended earlier in this specification).

END OF SECTION

SECTION 311000

SITE CLEARING

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. Provide all equipment and do all work necessary to clear the site, complete, including clearing and grubbing, as indicated on the Drawings and as specified.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 024113 - Selective Site Demolition and Removals.
 - 2. Section 312300 - Earthwork.

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American National Standards Institute (ANSI):
 - Z133.1 Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush
 - 2. New York State Department of Transportation (NYSDOT):
 - Specifications Standard Specifications - Construction and Materials

1.5 PERMITS

- A. In accordance with the Village of Ossining Contract Legal Documents, contractor shall obtain all permits necessary prior to the start of any construction.

1.6 SUBMITTALS

- A. The following shall be submitted:
 - 1. Certificates of severance of utility services.

2. Location plan of staging areas and schedule for moving staging equipment into those areas shall be submitted for Engineer's approval prior to mobilization and related site preparation operations.
 3. After review of the site, Contractor shall submit proposed location for temporary access road around stormwater outfalls and existing utilities.
 - B. Submit schedule of existing trees to be pruned including extent of pruning.
- 1.7 PROTECTION
 - A. Prevent movement, settlement or collapse of adjacent services and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the Owner.
- 1.8 EXISTING SERVICES
 - A. Existing structures and utilities shall be suitably protected from damage.
- 1.9 MAINTAINING TRAFFIC
 - A. Do not close or obstruct roadways without permits.
 - B. Conduct operations with minimum interference to public or private roadways.
- 1.10 QUALITY ASSURANCE
 - A. Selective pruning methods shall conform to the applicable requirements of ANSI Z133.1.
 - B. Work of this section shall be completed by a professional ISA Certified Arborist with a minimum five years experience, who has successfully completed an exam and education program equal to the International Society of Arboriculture (ISA) Certification Program, sponsored by the International Society of Arboriculture 2009, P.O. Box 3129, Champaign, IL 61826 (217) 355-9411; Email: isa@isa-arbor.com.

PART 2 - PRODUCTS

- 2.1 TEMPORARY SEED MIX
 - A. Seed shall conform to NYSDOT Specifications Section 713.04, "Seeds".

PART 3 - EXECUTION

- 3.1 CLEARING AND GRUBBING
 - A. Trees, shrubs, and other vegetation not indicated on the Drawings or designated in the field by the Engineer to remain and required for execution of the Work shall be cleared and grubbed.
 - B. Stumps shall be removed to their full depth. Roots 3 in. and larger shall be removed to a depth of 2 ft. below finished grade. Stumps shall be legally disposed of off-site.

3.2 TREE REMOVAL

- A. Unless otherwise indicated, trees and shrubs not indicated on the Drawings or designated in the field by the Engineer to remain, and required for execution of the Work shall be removed.
- B. Trees shall be cut and stumps shall be removed to their full depth.
 - 1. Roots 3 in. and larger shall be removed to a depth of 2 ft. below finished grade.
 - 2. Stumps shall be legally disposed of off-site.
- C. Do not apply herbicide to remaining stumps or plant life to inhibit growth.
- D. Fill depressions caused by stump removal and clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated. Seed with temporary erosion control mixture as specified.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.
- E. At the Contractor's option:
 - 1. Felled trees, including stumps, may be legally disposed of off-site at a location selected by the Contractor; or
 - 2. Felled trees, not including stumps, may be chipped on-site and completely removed to a location selected by the Contractor.
 - 3. Felled trees, not including stumps, may be chipped off-site and removed to a location selected by the Contractor.
- F. Stumps: Contractor shall be required to haul stumps to and legally dispose of at an off-site location selected by the Contractor.
- G. Burning shall not be permitted on-site.

3.3 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. Existing structures and utilities shall be suitably protected from damage, including but not limited to existing stone walls, concrete vault, manholes, and utility lines.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.

3.3 DISPOSAL OF MATERIALS

- A. Material resulting from the site clearing work and not scheduled to be salvaged and which is unsuitable for reuse on the project, shall become the property of the Contractor and shall be legally disposed of off-site.

- B. Debris, rubbish, and other material shall be removed and disposed of on a daily basis.

END OF SECTION

SECTION 312300

EARTHWORK

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. Provide all equipment and materials, and do all work necessary for site excavating, backfilling, and compacting, as indicated on the Drawings and as specified.
- B. The work of this section shall include, but is not necessarily limited to the following:
 - 1. Site excavation, filling, and grading.
 - 2. Excavation and backfill for site structures and utilities.
 - 3. Preparation of subgrade for slabs, pavements, and landscaping.
 - 4. Sheeting, bracing, and support of excavations as necessary.
 - 5. Drainage and dewatering as necessary to perform work in the dry.
 - 6. Placement and compaction of fills.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 - 1. Section 033001 - Cast-in-Place Concrete – Sitework.
 - 2. Section 329000 - Landscape.
 - 3. Aggregate base courses beneath paving is included under the applicable paving specification section.

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

- 1. American Society for Testing and Materials (ASTM):

D 422	Particle - Size Analysis of Soils
D 1556	Density of Soil in Place by the Sand-Cone Method
D 1557	Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700kNm/m ³))

D 2487	Classification of Soils for Engineering Purposes
D 3017	Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils

2. Associated General Contractors of America, Inc.(AGC):

Manual	Manual of Accident Prevention in Construction

3. New York State Department of Transportation (NYSDOT):

Specifications	Standard Specifications-Construction and Materials

1.5 EXISTING CONDITIONS

- A. The Contractor shall become thoroughly familiar with the site, consult records and drawings of adjacent structures and of existing utilities and their connections, and note all conditions which may influence the work of this Section.
- B. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section including work which has been let for construction under previous bid packages. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.
- C. The Contractor may, at his own expense, conduct additional subsurface testing as required for his own information.

1.6 PERMITS

- A. In accordance with the Village of Ossining Contract Legal Documents, contractor shall obtain all permits necessary prior to the start of any construction.

1.7 INFORMATION NOT GUARANTEED

- A. Information on the Drawings and in the Specifications relating to subsurface conditions, natural phenomena, and existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy or completeness of this information is not guaranteed.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period, as no additional compensation will be made for errors and inaccuracies that may be found therein.

1.8 QUALITY CONTROL

- A. Inspection and testing shall be conducted and paid for in accordance with the contract document.

- B. Contractor shall select and pay for an independent testing agency to perform on-site observation and testing during the following phases of the construction operations. The services of the Testing Laboratory and/or Soils Engineer shall include, but not be limited to the following:
1. Observation during placement and compaction of fills.
 2. Laboratory testing and analysis of fill and bedding materials specified, as required.
 3. Observe construction and perform water content, gradation, and compaction tests at a frequency and at locations determined by the Testing Laboratory. The results of these tests will be submitted to the Engineer, copy to the Contractor, on a timely basis so that the Contractor can take such action as is required to remedy indicated deficiencies. During the course of construction, the Testing Laboratory will advise the Engineer in writing with copy to Contractor if, at any time, in his opinion, the work is not in substantial conformity with the Contract Documents.
 4. Observation of fills following interruptions by rain or other inclement weather.
- C. Contractor shall perform field density tests in accordance with ASTM D 1556 or D 3017.
1. Make at least one field density test of the subgrade for every 2000 sq. ft. of paved area, but in no case less than three tests.
 2. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved areas, but in no case less than three tests.
- D. The Testing Laboratory's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Testing Laboratory, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.
- E. The Owner reserves the right to modify or waive Testing Laboratory services.
- F. Testing of soils shall be in accordance with the following:

<u>Property</u>	<u>ASTM Test Method</u>
Particle-Size Analysis	D 422
Liquid Limit	D 4318
Plasticity Index	D 4318

1. Off-site materials: One soil test shall be performed for every 2000 cy of material imported, or more frequent if the material varies from previous samples.

1.9 SUBMITTALS

- A. Source of any off-site material shall be identified, and the results of material tests shall be submitted for Engineer review and approval prior to delivering any material on-site.
- B. A 10 lb. sample of each off-site material proposed for use, and of any on-site material when so requested by the Engineer or Testing Laboratory, shall be submitted for approval.
1. Samples shall be delivered to office of the Engineer or Testing Laboratory, as directed.

- 2. Samples required in connection with compaction tests will be taken and transported by the Testing Laboratory.
- C. Proposed methods and materials to be employed for dewatering shall be submitted for approval.

1.10 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The work shall be executed in such manner as to prevent any damage to adjacent property and any other property and existing improvements such as, but not limited to: streets, curbs, paving, utility lines and structures, monuments, bench marks and other public and private property. Protect existing structures and foundations from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of, and without cost to the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to their original condition at the completion of operations. The Contractor shall replace, at his own cost, existing bench marks, monuments, and other reference points which are disturbed or destroyed.
- C. Buried structures, utility lines, etc., including those which project less than 18 in. above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment and shall be maintained at all times until completion of Project.

1.11 DRAINAGE AND DEWATERING

- A. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to keep excavated areas sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction procedures or cause excessive disturbance of underlying natural ground or excavation bottom.
- B. The Contractor shall grade and ditch the site as necessary to direct surface runoff away from open excavations and subgrade surfaces. Positive drainage (minimum 1.0% slope) shall be maintained at all times.
- C. Water from trenches and excavations shall be disposed of in such a manner as will not cause injury to public health nor to public or private property, nor to existing work, nor to the work completed or in progress, nor to the surface of roads, walks, and streets, nor cause any interference with the use of the same by the public. Methods of disposal of pumped effluent shall not cause erosion or siltation, and shall be approved by the Engineer.
- D. Under no circumstances place fills, pour concrete, or install piping and appurtenances in excavations containing free water.
- E. There shall be sufficient pumping equipment, in good working order, available at all times to remove water.

- F. Where, in the opinion of the Testing Laboratory, pumping of excavations is not effective in maintaining a dry firm subgrade, other dewatering methods acceptable to the Testing Laboratory, shall be employed. This may include the use of well points or deep well dewatering.

1.12 FROST PROTECTION

- A. Do not excavate to full indicated depth when freezing temperatures may be expected, unless footings or slabs can be poured immediately after the excavation has been completed. Protect the excavation from frost if placing of concrete is delayed.
- B. Completed foundations which have not been backfilled shall be protected from freezing by temporary additional earth cover, insulating blankets, heaters, or other methods acceptable to the Engineer.
- C. Frozen material shall not be placed as fill or backfill.

1.13 SHORING AND SHEETING

- A. Provide shoring, sheeting and/or bracing at excavations, as required, to prevent collapse of earth at side of excavations.
- B. Comply with federal, state, and local regulations, or in the absence of such regulations, comply with the requirements contained in the AGC Manual.
- C. Remove sheeting and shoring and the like, as backfilling operations progress, taking all necessary precautions to prevent collapse of excavation sides.

1.14 DEFINITIONS

- A. Subgrade - shall be that portion of the soil or rock which remains after stripping of topsoil, excavation, and prior to filling or placement of roadway base course.
- B. Embankment - shall be defined as any area on the site to raise grades to proposed subgrade elevations. Embankments are placed in layers to a predetermined elevation and cross section.
- C. Structural Backfill - shall be the designated material as indicated on the Drawings to attain the proposed grades abutting or adjacent to site structures.
- D. Utility Trench Backfill - is the area bounded by the proposed finished subgrade and the cover material over the respective pipe or conduit. This material shall conform with applicable requirements for embankment or structural backfill depending on the area or zone into which the utility is installed.
- E. Satisfactory On-site Borrow is defined as inorganic soil material, with maximum particle size less than 4 inches, which exhibits a well-defined Moisture Density Relationship Curve and which conforms to Unified Soil Classification System (USCS) Classes GW, GM, GC, GP, SW, SM, SP SC and SC-SM.

- F. Unsatisfactory Materials include Ex-situ Rock Muck and USCS Classes ML, CL, CH, MH, OH, OL, PT and Miscellaneous Fill, Organic Matter, Cobbles and Boulders, and any on-site borrow which cannot be (practically) moisture adjusted to within 2% to 3% of Optimum Moisture Content.
- G. Topsoil - The upper layer of the soil profile which is supporting the growth of vegetation as evidenced by the existence therein of numerous roots and other organic matter.
- H. Soil - all earth materials, organic or inorganic, which have resulted from natural processes such as weathering, decay, and chemical action of in situ rock or the deposition of unconsolidated material.
- I. Rock (Ledge) - shall be defined as sound and solid mass, layer, or ledge of mineral matter in place of such hardness and texture that it:

- 1. Mechanical Definition of Rock:

Cannot be effectively loosened or broken down by ripping in a single pass with a late model tractor-mounted hydraulic ripper equipped with one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler type tractor rated between 210-and 240-net flywheel horsepower, operating in low gear, or

- 2. Manual Definition of Rock:

In areas where the use of the ripper described above is impracticable, rock defined as sound material of such hardness and texture that it cannot be loosened or broken by a 6 lb. drifting pick. The drifting pick shall have a handle not less than 34 in. in length.

1.15 COORDINATION

- A. Prior to start of earthwork the Contractor shall arrange an on-site meeting with the Engineer for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.
- B. As construction proceeds, the Contractor shall be responsible for notifying the Engineer prior to start of earthwork operations requiring inspection and/or testing.
- C. The Contractor shall be responsible for obtaining test samples of soil materials proposed to be used and transporting them to the site sufficiently in advance of time planned for use of these materials for testing of materials to be completed. Use of these proposed materials by the Contractor prior to testing and approval or rejection, shall be at the Contractor's risk.

PART 2 PRODUCTS

2.1 SOURCE OF MATERIALS

- A. Material shall be obtained from required on-site excavations, to the extent that suitable material is available, and from offsite sources, to the extent that suitable material is not available from on-site excavations.

1. No recycled material derived from asphalt or concrete pavements, brick or concrete building materials, glass or other similar building materials shall be permitted as fill or backfill on the site unless specifically approved in writing by the City of White Plains.

2.2 FILL AND BACKFILL MATERIALS

- A. On-site material for use in compacted backfill shall be natural, inorganic, granular soil, taken from areas of excavation after stripping of topsoil and removal of unsuitable material.
- B. Material containing organic matter, topsoil, organic silt, peat, or soft or frost-susceptible soil is unsuitable for any of the following uses:

Backfill beneath site structures

Backfill beneath pavement and within 5 ft. of subgrade

Bearing strata material

Bedding

- C. Select Granular Fill or Satisfactory On-site Borrow may be used as Fill and Backfill below pavement subgrade elevation. Subbase Course below pavements, slabs and sidewalks shall consist of NYSDOT Type 4 or Type 2 Subbase Course Material.
- D. Pipe Bedding Material shall be specified by the Project Civil Engineer.
- E. Select Granular Fill shall be a high quality natural or manufactured mineral aggregate product, which has been approved for use after review of all required prequalification test submittals.
- F. The minimum requirements for a prequalification submittal shall include the following test results which are not more than 60 days old:
 1. Sieve Analysis – ASTM D422
 2. Moisture Density Relationship Modified Effort – ASTM D1557
 3. Plasticity Index – ASTM D4318
 4. Soundness Test – ASTM C88
- G. Select Granular Fill material shall be well-graded sand and gravel, approved recycled product or crushed rock product which is capable of being compacted to the required density at the proper moisture content and which is 98% free of deleterious materials, trash, roots, debris, frozen material and organic or other foreign matter.
- H. Select Granular Fill material shall be accepted on the basis of gradation and a well-defined Moisture-Density Relationship Curve. Select Granular Fill to be placed within 2'-0" of final exterior grade shall be subject to Soundness requirements. Soundness shall be less than 30% loss based on a four-cycle magnesium sulfate soundness test. Plasticity Index of that portion of fill material passing the No. 40 mesh sieve shall not exceed 5.0. Gradation shall be as given below:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
2 in.	100
1/4 in.	25-60

No. 40
No. 200

5-40
0-10

2.3 SLEEVES

- A. Sleeves for installing future pipe or wiring shall be Schedule 40 PVC pipe, minimum 4 in. diameter unless otherwise noted.

1. Sleeve locations for future conduit shall be coordinated with the Owner and Engineer.

PART 3 EXECUTION

3.1 SUBGRADE INSPECTION

- A. Notify Engineer when excavations have reached required subgrade.
- B. When excavations have reached required subgrade, Contractor shall have subgrades surveyed to determine if subgrade elevations will allow for the indicated depth of proposed materials to be placed on them.
1. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material to achieve required subgrade elevation, as directed.
 2. If survey indicates that subgrade elevations are too high, continue excavation and reconstruct subgrades to required elevation as directed, without additional compensation.
 3. If survey indicates that subgrade elevations are too low, add compacted backfill or fill material to achieve required subgrade elevation as directed, without additional compensation.
- C. All subgrade to receive site features such as asphalt pavement, concrete sidewalk, slabs etc. shall be examined and approved by Testing Laboratory, prior to placement of any Fill.
1. The subgrade under pavements and sidewalks shall be proof rolled using a 5-ton smooth drum roller making at least 3 passes on vibratory mode. This requirement may be modified or relaxed depending on presence of surrounding adjacent structures, utilities and buildings. Proof rolling shall not damage any of these elements. Testing Laboratory will delineate any unstable or non-uniform response areas that will require remediation. Remediation will likely include undercutting to firm ground and backfilling with Select Granular Fill.
 2. Sand and Gravel subgrade prepared as outlined above and approved by a Testing Laboratory is expected to exhibit a Modulus of Subgrade Reaction of 200 pci.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.2 EXCAVATION

- A. Sheeting, shoring, bracing, pumping, bailing, and other incidental work necessary to make and maintain excavations and keep them free from water at all times during placing of concrete, utility lines, and fill and backfill materials, shall be performed or supplied as required. Fill and backfill shall be placed in dry or dewatered areas only.
- B. Sheeting shall be installed where required to maintain safe and workable conditions in excavations. Sheeting, including necessary wales and struts, shall be selected and designed by the Contractor. Use of sheeting shall equal or exceed minimum required for safety and/or conformance to law.
- C. Structures, pipes, pavement, earth, and other property liable to damage from excavation operations shall be braced, underpinned, and supported as required to prevent damage and movement.
- D. As excavation approaches underground utilities and structures, excavation shall be done by hand tools. Such manual excavation is incidental to normal excavation and no special payment will be made.
- E. Excavation shall include satisfactory disposal of excavated material not employed as backfill or fill materials.
 - 1. Excavation material, other than topsoil, which is not required for or is unsuitable for backfill or fill materials, shall be legally disposed of off-site.
- F. Excavation for pipe and other items shall be carried far enough below underside of item to accommodate bedding material.
- G. Excavations which extend below indicated or specified levels ("over-excavation"), shall be filled to those levels with compacted Structural Backfill Material if within the areas of structures and Granular Fill for areas beyond the structures limits.
- H. If bearing surface of subgrade which is to receive fill, structure, concrete, or other construction becomes softened, disturbed, or unstable, unsuitable material shall be removed down to a firm bearing surface and replaced with suitable material. Subgrade shall then be protected from further disturbance until construction item is placed.
- I. Excavations shall not be wider than required to set, brace, and remove forms for concrete, install structures, piping, or perform other necessary work. Width of trench at 12 in. above top of pipe or conduit shall not be greater than the sum of outside diameter of the pipe or the conduit plus 2 ft. (pipe O.D. + 2 ft.). Sides of trench above this level shall be sloping, at an angle 30 degrees or less from vertical, from this level to grade. In materials where sloping walls are not stable, trench walls shall be sheeted.
- J. Rock, if encountered, shall be removed by mechanical means only.
 - 1. Surfaces of rock foundation shall be sufficiently rough to bond well with the masonry and embankments to be built and, if required, shall be cut to rough benches or steps.
 - 2. Before masonry is built upon rock, the rock shall be freed from all vegetation, dirt, clay, shale, excessively cracked rock, water, ice, and other objectionable substances. Picking, wedging, streams of water under high pressure, stream jets, and other effective means shall be used to clean exposed rock.

3. Except as otherwise indicated on the Drawings, rock shall be excavated to a depth 6 in. or more below bottom of structures.

K. Below-ground Demolition

1. Underground items, not indicated on the Drawings, which impede construction of new work indicated, shall be abandoned, demolished, and/or removed only with the approval of the Engineer.

- L. Proof roll areas to support pavements with a 35 ton rubber tired roller in four passes in two perpendicular directions. Undercut to level of stable soils in unstable areas. Perform work in presence of Testing Laboratory.

3.3 FILLING AND BACKFILLING

- A. Filling shall be done in any area only after the Testing Laboratory has reviewed subgrade.

- B. All filling and backfilling for this project shall be accomplished in a workmanlike manner according to good industry practice. All filling and backfilling should be installed in a quality controlled manner with prequalified materials, with quality assurance structural tests and inspections conducted at regular intervals according to City of White Plains requirements, and consistent with the following methodology.

1. The area to receive fill should be properly prepared, proof rolled, inspected and approved prior to placement of fill.
2. Fill material shall be placed on the approved subgrade in a manner to minimize segregation. The fill should be placed in nearly horizontal lifts commencing at the lowest fill area elevation and proceeding with each lift upward and outward from the lower lift.
3. The moisture content of the material shall be adjusted prior to application of compaction such that it is within 2% of the Optimum Moisture Content.
4. The compacted lift thickness and minimum in-place field density shall conform to the requirements of Table 1.

Table 1: Structural Fill Compaction and Lift Thickness Recommendations

Minimum In-Place Density*	Range of Compacted Lift Thickness (inches)	Fill Area Description
95%	8 to 12	Subbase Course under pavement, slabs and sidewalks, mass fill within open trenches resulting from removal of existing
95%	8 to 12	Confined areas, and utility trench backfill

*As determined using ASTM D1557, Modified Proctor.

5. When the test results indicate that insufficient compaction has been obtained in any layer, the Contractor shall take action to modify or alter the moisture content of the soil, to provide additional compaction or otherwise to increase the in-place soil density. If the Contractor cannot obtain satisfactory compaction due to material properties, the Contractor shall remove the unsatisfactory material and replace with new material.

6. Materials which are frozen or which are contaminated with mud, debris, organics or other deleterious materials shall be removed and replaced with uncontaminated specified material.
 7. No fill shall be placed over an area or lift of fill that has not been tested and achieved satisfactory results.
- C. Compaction of backfill in excavation shall be to a density not less than that required of the surrounding area fill.
- D. Equipment and methods employed to achieve specified compaction shall be subject to the approval of the Engineer and Testing Laboratory, and equipment shall be replaced and methods revised as directed until specified compaction is obtained.
- E. Compaction of each lift shall be completed before compaction of the next lift is started.
- F. Backfill adjacent to wall, conduit, pipe, and similar item, and in other areas where wheeled equipment cannot safely be employed, shall be placed in 4 in. thick layers, to the specified compaction, using mechanical tampers.

3.4 MOISTURE CONTROL

- A. Variation of moisture content in fill and backfill materials shall be limited to Optimum Moisture (-1% to +3%). Moisture content shall be as uniformly distributed as practicable within each lift, and shall be adjusted as necessary to obtain the specified compaction.
- B. Material which does not contain sufficient moisture to be compacted to the specified densities shall be moisture conditioned by sprinkling, disking, windrowing, or other method approved by the Testing Laboratory.
1. Material conditioned by sprinkling shall have water added before compaction. Uniformly apply water to surface of subgrade or layer of soil material to obtain sufficient moisture content. The Contractor shall maintain sufficient hoses and/or water distributing equipment at the site for this purpose.
- C. Material containing excess moisture shall be dried to required Optimum Moisture Content before it is placed and compacted. Excessively moist soils shall be removed and replaced or shall be scarified by use of plows, discs, or other approved methods, and air-dried to meet the above requirements.
- D. Materials which are within the moisture requirements specified above, but which display pronounced elasticity or deformation under the action of earthmoving and compaction equipment, shall be reduced to Optimum Moisture Content, or below, to secure stability.
- E. In the event of sudden downpours or other inclement weather, exposed subgrades and fills which, in the opinion of the Testing Laboratory, become inundated or excessively moistened shall have excess water removed and soil dried as specified above.

3.5 DUST CONTROL

- A. Contractor shall be responsible for dust control during all construction operations. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities including sweeping and sprinkling of streets as necessary, so as to minimize the

creation and dispersion of dust. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread calcium chloride as directed. Methods and materials for dust control shall be as approved by the Engineer.

1. Throughout the construction period the Contractor shall carry on an active program for the control of fugitive dust within all site construction zones, or areas disturbed as a result of construction. Control methods shall include the following: Apply calcium chloride at a uniform rate of one and one-half (1 ½) pounds per square yard in areas subject to blowing. For emergency control of dust apply water to affected areas. The source of supply and the method of application for water are the responsibility of the Contractor.
2. The frequency and methods of application for fugitive dust control shall be as directed by the Engineer with concurrence by the Owner.

3.6 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Surplus construction and demolition material shall be handled in accordance with the City of White Plains Department of Public Works Contract Legal Documents.
- B. Material resulting from earthwork operations and not scheduled for salvaging shall become the property of the Contractor and shall be suitably disposed of off-site.
- C. Debris, rubbish, and other material shall be removed and disposed of on a daily basis.

END OF SECTION

SECTION 321413

CONCRETE UNIT PAVING

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. Provide all equipment and materials and do all work necessary to construct the concrete unit pavers, as indicated on the Drawings and as specified herein. Concrete pavers include rectangular concrete pavers, set as follows:

- 1. On sand setting bed over compacted aggregate base with sand swept joints.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

- 1. Section 312300 - Earthwork, establishment of subgrade elevation

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

- 1. American Association of State Highway and Transportation Officials (AASHTO):

M 43	Standard Size of Coarse Aggregate for Highway Construction

- 2. American Society for Testing and Materials (ASTM):

C 33	Concrete Aggregates

C 67	Brick and Structural Clay Tile

C 91	Masonry Cement

C 136	Sieve Analysis of Fine and Coarse Aggregates

C 144	Aggregate for Masonry Mortar

C 902	Pedestrian and Light Traffic Paving Brick
C 936	Solid Concrete Interlocking Paving Units
D 1557	Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (457-mm) Drop

3. Americans with Disabilities Act (ADA):

Appendix to Part 1191	Accessibility Guidelines for Buildings and Facilities

4. National Concrete Masonry Association (NCMA):

A-10	Solid Concrete Masonry Paving Units

1.5 SUBMITTALS

A. Concrete Pavers:

1. Samples for verification: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
2. Accepted samples become the standard of acceptance for the product produced.
3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
4. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

B. Joint and Setting Bed Sand:

1. Provide three representative one pound samples in containers of Joint Sand materials.
2. Provide three representative one pound samples in containers of Setting Bed Sand materials.
3. Test results from an independent testing laboratory for sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.

C. Base and Subbase Aggregate:

1. Test results from an independent testing laboratory for sieve analysis per ASTM C 136.

D. Paving Installation Contractor:

1. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

1.6 FIELD MOCK-UP

- A. Prior to start of precast concrete paving the Contractor shall construct a sample panel for use as a prototype for concrete pavers for each application. Each sample panel shall be 5 ft. x 5 ft. minimum. Panel shall exhibit the specified base, thickness, colors, jointing, pattern, finish, surface sealant and workmanship. The Contractor shall not proceed with the precast concrete paving work until the Architect has approved each sample panel. If panel is not acceptable, the Contractor shall construct additional panels as required until an acceptable panel is obtained. The accepted panel shall become the standard for the entire job and shall remain undisturbed until completion of the precast concrete paving.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 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 unit paver installation.
 - 5. Demolish and remove mockups when directed.

1.7 QUALITY ASSURANCE

- A. Utilize a Manufacturer having at least ten years of experience manufacturing concrete pavers on projects of similar nature or project size.
- B. Installer Qualifications: An experienced installer who has completed unit paver installation similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

1.8 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Polymeric Jointing Sand:
 - 1. Install Polymeric Joint Sand only when ambient temperature is above 40°F (5°C), under dry conditions with no rain forecast for 24 hours and when surface of pavement is completely dry.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Pavers shall be carefully packed and loaded for shipment and all necessary precautions taken against damage in transit and handling.
- B. Aggregate materials shall be kept dry and free from soiling.

- C. Pavers damaged in any manner will be rejected and replaced with new materials at no additional cost to the Owner.

1.10 CONCRETE PAVER OVERAGE AND ATTIC STOCK

- A. Provide a minimum of 5% additional material for overage to be used during construction.
- B. Contractor to provide 100 square feet of each product and size used to owner for maintenance and repair. Furnish Pavers from the same production run as installed materials.
- C. Manufacture to supply maintenance and reinstatement manuals for Concrete Paver units.

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

- A. Basis-of-Design Product: The Concrete Paver shapes are based on:
 - 1. As manufactured by:
Unilock 510 Smith St., Buffalo, NY
14210 Office 716 822 6074
Mobile 585 369 8662
 - 2. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
- B. Product requirements:
 - 1. Concrete Paver
 - a. Color: 20% French Gray and 80% Winter Marvel
 - b. Finish: Umbriano
 - c. Edge: Micro Bevel
 - d. Size: 4 in. x 24 in. x 2-3/4 in. Manufacture the sizes indicated on the Drawings with a maximum tolerance of plus or minus 1/16 in all directions.
- C. Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
 - 1. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi (50 MPa).
 - 2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
 - 3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C 1645, with no breakage greater than 1.0% loss in dry weight of any individual unit. Conduct this test method not more than 12 months prior to delivery of units.
- D. Accept only pigments in concrete pavers conforming to ASTM C 979.
- E. Maximum allowable breakage of product is 5%.

2.2 SAND FOR JOINT FILLERS

- A. Provide EV Polysand, manufactured by Unilock 510 Smith St. Buffalo, NY 14210; Office 716 822 6074; mobile 585 369 8662, or approved equal. Color as selected by Engineers.

2.3 SAND FOR SETTING BED

- A. Provide Setting Bed Sand as follows:
1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
 2. Do not use limestone screenings, stone dust, or sand material that does not conform to the grading requirements of ASTM C 33.
 3. Do not use mason sand or sand conforming to ASTM C 144.
 4. Utilize sand that are as hard as practically available where concrete pavers are subject to vehicular traffic.
 5. Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 2 below:

TABLE 2 – SETTING BED SAND GRADATION
REQUIREMENTS FOR SETTING BED SAND

ASTM C 33	
Sieve Size	Percent Passing
3/8 in (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075)	0 to 1

2.4 SAND-CEMENT SETTING BED

- A. Dry-Pack Setting bed shall be a Sand: Portland cement mixture.
- B. Mixture shall be six parts sand: one part Portland cement.
1. Portland cement shall conform to ASTM C 150, Type I or II.
 2. Sand shall be as specified in Paragraph 2.3 above. Source of supply shall not be changed during course of job without written permission of the Engineer.

2.5 GEOGRID

- A. Geogrid reinforcement shall be DriveGrid System with triangular geometry, manufactured

by Unilock 510 Smith St., Buffalo, NY 14210 Office 716 822 6074; Mobile 585 369 8662,, or approved equal.

2.6 RESTRAINING EDGE

- A. Surface sealant shall be The Natural Look EV Protector, manufactured by TechniSeal, 300 Avenue Liberté, Candiac, Québec, Canada, J5R 6X1; Toll free: 1-800-465-7325; (514) 523-2110, or approved equal.

2.7 WATER

- A. Water shall be potable and shall be free of injurious contaminants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SUBGRADE

- A. Areas to be paved will be compacted and brought to subgrade elevation under Section 312300, EARTHWORK before work of this section is performed. Final fine grading, filling, and compaction of areas to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.
 - 1. After trimming to the grades specified, the pavement subgrade shall be proof rolled to 100 percent Standard Proctor Density in the presence of the Consultant, with soft spots or localized pockets of objectionable material excavated and properly replaced with approved granular materials.
 - 2. The subgrade shall be trimmed to within 0 to ½ in. (0 to 10mm) of the specified grades. The Surface of the prepared subgrade shall not deviate by more than 3/8 in. (10mm) from the bottom edge of a 39 in. (1m) straight edge laid in any direction.
- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 312300, EARTHWORK.
- C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below gravel base course to a compaction at optimum moisture of at least 95% of maximum density, as determined by ASTM D 1557. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.
 - 1. Field testing shall be conducted to determine in-place density, accompanied by visual inspection of the compaction methods being used.
- D. Excavation required in pavement subgrade shall be completed before fine grading and final

compaction of subgrade are performed. Where excavation must be performed in completed subgrade, subbase, base, or pavement, subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312300, EARTHWORK. Completed subgrade after filling such areas shall be uniformly and properly graded.

- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompact before placing pavement.
- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.
- H. Prepared subgrade will be inspected by the Architect. Subgrade shall be approved by the Architect before installation of gravel base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this section of the specification.

3.3 GEOGRID

- A. Geogrid reinforcement shall be installed on prepared subgrade incorporated as part of a reinforced aggregate base. Geogrid shall be placed in strict accordance with manufacturer's printed instructions.

3.4 AGGREGATE BASE COURSE

- A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:
 - 1. NYSDOT Specifications Section 304.
- B. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- C. Aggregate material shall be applied in lifts less than or equal to 6 in. thick, compacted measure. Each lift shall be separately compacted to specified density, using a 6 ton smooth drum vibratory roller equivalent to a 6 ton static roller, or an approved equivalent. Smaller areas or areas impossible to reach with large drum rollers shall be compacted to specified density using a vibrating plate compactor.
 - 1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
 - 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 - 3. Surface irregularities which exceed 1/2 in. as measured by means of a 10 ft. long straightedge, shall be replaced and properly recompact.
- D. Base course shall be compacted at optimum moisture content to not less than 95% of

maximum density as determined by ASTM D 1557.

- E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise injured, shall be cleaned, replaced, or otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.5 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Joint Pattern: As indicated in the Drawings.
- E. Tolerances: Do not exceed 1/16-inch (1.6-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and 1/4 inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- F. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.6 SAND- CEMENT SETTING BED

- A. Sand-cement shall be mixed dry until the mass is of uniform color. Once thoroughly mixed, the mass shall be lightly moistened with water.
- B. Sand-cement mixture shall be spread over protection course as a setting bed for pavers. Mixture shall be spread, and leveled to required slope and grade. Minimum thickness of setting bed shall be 3/4 in. after leveling.
- C. Surface tolerance shall be within 1/4 in. of required grade as measured with a 10 ft. straightedge in both transverse and longitudinal directions.
- D. The area of bedding placed in any one work day shall be scheduled so that no bedding course remains at the end of the day without a paver course.

3.7 SAND SETTING BED

- A. Sand shall be spread over compacted aggregate base as a setting bed for pavers. Minimum thickness of sand bed shall be 3/4 in. thick, leveled to required slope and grade. Bed shall not be compacted until pavers are installed.

- B. Surface tolerance shall be within 1/4 in. of required grade as measured with a 10 ft. straightedge in both the transverse and longitudinal directions.
1. The spread sand shall be carefully maintained in a loose condition, and protected against incidental compaction, both prior to and following screeding. Any incidentally Compacted sand or screeded sand left overnight, shall be loosened before further paving units are placed. Sand shall be lightly screeded in a loose condition to the predetermined depth, only slightly ahead of the paving units. Under no circumstances shall the sand be screeded in advance of the lying face to an extent to which paving will not be complete on that day.
 2. Screed sand shall be fully protected against incidental compaction, including compaction by rain. Any screeded sand which is incidentally compacted prior to laying of the paving unit, shall be removed and brought back to profile in a loose condition. Neither pedestrian nor vehicular traffic shall be permitted on the screeded sand.
 3. The Contractor shall screed the bedding sand using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards.

3.8 SETTING CONCRETE PAVERS

- A. Setting bed shall be protected from damage prior to setting pavers.
- B. Setting shall be done by competent workmen under adequate supervision, and in accordance with manufacturer's recommendations. Pavers shall be placed on the setting bed, to true line and plane and in required position.
- C. Pavers with chips, cracks, or other structural or aesthetic defects shall not be used.
- D. Set pavers with a minimum joint width of 1/16 inch (1.6 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- E. Low amplitude, high frequency plate compactors shall be used to compact the pavers into the sand. The compactor shall transmit an effective force not less than 75 kN per square meter (1600 Lb./ ft²) of plate area. The frequency of vibration shall be within the range of 75 to 100 Hz. Use Table below to select size of compaction equipment:

PAVER THICKNESS AND REQUIRED MINIMUM COMPACTION FORCE

Paver Thickness	Compaction Force
2 3/8 in. (60 mm)	3000 lbs. [13 kN]
2 3/4 in. (70 mm) &	
3 1/8 in. (80 mm)	5000 lbs. [22 kN]

- F. Use of a urethane plate compactor pad is recommended to minimize any scuffing of the paving stone surface.
- G. The pavers shall be compacted to achieve consolidation of the sand bedding and brought to level and profile by not less than three passes. Initial compaction should proceed as closely

as possible following the installation of the paving units and prior to the acceptance of any traffic or application of sweeping sand.

3.9 SURFACE SEALER

- A. Apply to dry clean paver surface before filling joints. Apply two coats minimum at recommended coverage rates in strict compliance with manufacturer's published application and safety instructions.

3.10. JOINT TREATMENT

- A. Spread dry polymeric sand and fill joints immediately after setting. Minimum depth: 1.25".
 - 1. Installation: Surface must be completely dry. Cover surface with product; using a push broom, sweep product so as to fill joints completely down to their full depth; sweep surface clean of polymeric sand to avoid staining during compaction. Joints must be filled up to the bottom of the paver chamfer or at minimum 1/8" below the top of the pavers.
 - 2. Compaction: Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. A rubber roller attachment or carpet can be used under the plate to protect pavers from damage. Check with the paver supplier as to the suitability of compacting pavers or slabs 2 inches or less in thickness. Repeat steps 1 and 2.
 - 3. Wetting:
Important: Surface must be free of polymeric sand; clean it with a fine bristle brush or a leaf blower. Wetting must be performed gradually in at least three sprayings; each time, especially during the first spraying, be sure not to flood pavement or generate run-off, as this could wash out the binder, especially on sloped sites.
Spraying principles: Use a very fine mist so that the water falls lightly on pavement without displacing polymeric sand; take care not to aim the jet directly on the surface.
First spraying: Dampen surface very lightly with a fine mist; this first spraying will stabilize polymeric sand on the surface and make it more absorbent for subsequent sprayings. Wait for 5 to 10 minutes. Subsequent sprayings: Lightly spray surface in 5 to 10 minute intervals, so as to gradually moisten joints; repeat sprayings until joints are moistened down to the bottom, and this, using a minimum amount of water; using a small screwdriver, check wetting progress in several spots by emptying a little section of polymeric sand down to the bottom of the joint.
 - 4. Drying time:
Drying time is directly influenced by ambient humidity and temperature - at least 24 hours for pedestrian areas; - at least 48 hours is recommended for vehicular areas.
NOTE: Drying time can be considerably less in dry climates
After application, if there is a risk of rain during drying time, protect the pavement with a tarp.

3.11 FIELD QUALITY CONTROL

- A. Final elevations shall be checked for conformance to the drawings after removal of excess joint sand.
- B. All surface and pavement structures shall be true to the lines and levels, grades, thickness and cross sections shown on the drawings. All pavements shall be finished to lines and levels to ensure positive drainage at all drainage outlets and channels. In no case shall the cross-

fall of any portion of pavement be less than 2 percent. The final surface elevations shall not deviate more than 3/8 in. (10 mm) under a 10 ft. (3 m) long straight edge.

- C. The surface elevation of pavers shall be 1/8 to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.

3.12 CLEANING OF PAVED SURFACE

- A. After completion of the concrete pavers, paved areas shall be thoroughly swept clean and surface shall be left unsoiled. Where required, surface shall be cleaned with water or an approved cleaner.

3.13 DISPOSAL OF MATERIALS

- A. Debris, rubbish, and other material shall be removed and disposed of on a daily basis as noted in the Contract Documents.

END OF SECTION 321413

SECTION 321540

STABILIZED PATHWAY AGGREGATE: DECOMPOSED GRANITE

PART 1: GENERAL

1.1 SUMMARY

- A. This section includes materials and execution information for construction with aggregate with stabilized binder for foot traffic applications

- B. Related Sections:

- Section 312300 - Earthwork
 - Section 329000 - Landscaping
 - Section 129300 - Site Furnishings

1.2 REFERENCES

- A. ASTM C136 / C136M – 14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates, ASTM International, West Conshohocken, PA, 2014, www.astm.org
- B. ASTM D2419 – 14, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregates, ASTM International, West Conshohocken, PA, 2014, www.astm.org
- C. ASTM F1951 – 14, Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment, ASTM International, West Conshohocken, PA, 2014, www.astm.org

1.3 SUBMITTALS

- A. Submit the following:
 - 1. Manufacturer's product data sheet.
 - 2. [1 quart] of aggregate sample of stabilized crushed aggregate paving.
 - 3. Stabilized crushed aggregate gradation indicating that the product meets specifications.
 - 4. Manufacturer's Material Safety Data Sheet.

1.4 SITE CONDITIONS

- A. Ensure that the subgrade and base are properly graded and compacted to required specifications.
- B. Do not install the aggregate pathway during rain. Rain within 3-5 days after installation will increase curing time.
- C. Protect all nearby surfaces, plants, and structures from possible contamination from materials or damage by equipment.
- D. It is not recommended to install when temperatures are below 40 degrees Fahrenheit (5 degrees Celsius).

1.5 Quality Control

- A. Install 4 ft. wide x 10 ft. long mock-up of decomposed granite or 3/8" or 1/4" minus crushed aggregate surfacing with Stabilizer® additive at location specified by Landscape Architect.
- B. Allow Landscape Architect to view test plot before proceeding with rest of stabilized crushed aggregate paving.
- C. Approved mock-up may remain as part of completed Work.
- D. Contractor shall provide certification that they are qualified installer as required by the manufacturer.

1.6 HANDLING, AND STORAGE

A. Handling:

When dealing with un-blended aggregate, wear appropriate respirator when ventilation is inadequate. Avoid contact with skin and eyes.

B. Storage:

Protect stabilized crushed aggregate mix from contamination. Store undercover. If the blended and hydrated aggregate is sitting for long periods of time (longer than 48 hours), or when subject to rainfall, it needs to be turned with a skid steerer or loader to ensure consistent moisture content throughout prior to installation. Verify hydration level with snowball test before installation. For any questions regarding storage, contact the manufacturer or local dealer.

PART 2: PRODUCTS

2.1 MANUFACTURERS

A. Stabilized pathway aggregate provided by:

Stabilizer Solutions

33 South 28th Street
Phoenix, Arizona 85034
800-336-2468
info@stabilizersolutions.com

Organic-Lock

Envirobond Products Corporation
2100 Bloor St. W, Suite 6191
Toronto, ON Canada M6S 5A5
416-628-3704
info@organic-lock.com

2.2 MATERIALS

A. Crushed Aggregate Material shall consist of sound, angular, durable particles.

1. Gradation, in accordance with ASTM C136: *

Optimal Gradation		
Sieve	Sieve Size (mm)	Percent Passing
4	4.75	80% - 100%
8	2.36	65% - 90%
16	1.18	40% - 65%
30	0.6	25% - 55%
50	0.3	15% - 35%
100	0.15	10% - 20%
200	0.075	5% - 15%

* May vary depending on manufacturer's specifications.
Submit manufacturer's requirements for approval.

PART 3: EXECUTION

3.1 PREPARATION

1. Prepare the Subgrade

Excavate the area to the depth required so that finish grade can be established as noted on plans.

A Foot-Traffic Pathway will require a full depth of 9 inches: 6 inches of compacted base depth together with 3 inches of compacted Pathway Aggregate.

Compact the subgrade to 95% Modified Proctor Density.

2. Prepare the Base

Install the base material as per your NYDOT road base guidelines. Clear stone or ungraded base is NOT acceptable in this application. Compact the base to 95% modified proctor density.

Foot-Traffic Pathway will require 6 inches of compacted base material.

Depending upon the method of compaction the installation of base material may require separate lifts. 4 inches can be compacted in a single lift with a minimum 2-ton compaction roller.

Compact the subgrade to 95% Modified Proctor Density using a single or double drum static roller or vibratory compactor.

3.2 WATERSHED MANAGEMENT

Crowns and/or cross-slopes must be incorporated into the compacted base material.

If the slope is 2% or lower, a crown should be incorporated into the pathway.
If the slope is greater than 2%, incorporate a cross-slope.

Note: The addition of crowns and cross-slopes is heavily dependent upon surrounding watershed.

3.3 SPREADING

The use of a paving machine is highly recommended for large projects to evenly spread aggregate at the specified depth. It's recommended to screed the material to ensure the depth is consistent for smaller projects or projects with tight areas.

Spread the loose and uncompacted aggregate over the compacted base material.

Typically, a lift of 4 inches of loose, pre-wet aggregate will compact to the required 3-inch depth for Foot-Traffic Pathways.

3.4 COMPACTION

Make 4-6 passes using a 1-ton double or single static drum roller, or equivalent. A Foot-Traffic Pathway will typically require one lift, compacted to 3 inches.

Compaction will vary with different aggregates due to particle shape and size. It will compact 20-25%, less if using paving machinery. This level of compaction needs to be monitored as early as possible (starting during the test plot) to determine the actual degree of compaction. It is better to put down too much material and to remove it from the top than to put down too little and add a layer later.

Compact to 95% Modified Proctor Density.

Note: Vibratory compaction is acceptable for the base material but generally not suitable for blended aggregate as it risks disassociating the bonds of the stabilized aggregate or allowing the fines and moisture to migrate to the surface, causing the surface to take on a smooth, concrete-like appearance. Blended Aggregates should be compacted using a single or double drum static roller wherever possible. For tight spaces that are not accessible by drum rollers, a hand tamper is recommended. However, in certain circumstances, a vibratory or plate tamper can be used where the installer deems it to be more effective as hand-tamping over large spaces will create inconsistent results.

Provided the moisture content of the blended aggregate is adequate, additional hydration should not be necessary. On dry, sunny days, however, the surface layer may start to dry out while installing, in which case, a light misting would be appropriate to prevent surface cracks from appearing during compaction. Refer to our installation guideline video

https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg_K6VCTUWAuep3zDg_0yCv&index=6&t=40s for more information.

3.5 COMPLETING INSTALLATION

Apply a light spray to the surface of the material to give a clean appearance. Apply water until the water begins to run-off.

Do not allow any traffic on the newly installed pathway until fully cured, a minimum of 24-72 hours.

3.6 REPAIRS AND PROTECTION

Excavate the damaged area and scarify exposed Pathway Aggregate.

Pre-blend the replacement crushed stone aggregate material with blended aggregate at 28-34 lbs. / imperial ton. Apply the material to the excavated area and compact. Thoroughly

water the material to achieve an 8-10% moisture content. Use the "snowball test" to determine moisture content - refer to https://www.youtube.com/watch?v=mzQ-vZu2ynw&list=PL4SwT3V0vLBg_K6VCTUWAuep3zDg_0yCv&index=6&t=40s for details.

Allow the newly installed Pathway Aggregate to cure, but not completely dry out.

Re-compact the material, ensuring that the final grade and crown are maintained.

3.7 MAINTENANCE

All outdoor products require a level of maintenance analysis. It is recommended to do a thorough analysis of your installed blended aggregate 7 days after installation followed by monthly analysis to ensure no alterations are required.

Erosion Damage

The greatest element of concern is rainfall erosion. Often, this problem can be greatly reduced by adjusting the watershed areas surrounding the product itself. The best way to determine how the water is building up, is to examine your project area during a rainstorm. Learning where the water is coming from can lead to water diverting that dramatically reduces the stress on your surface.

Installing culverts, drains, cross slopes, crowns, or diverters can limit the majority of stress causing damage.

If you do experience erosion damage, first look at ways to get the water away or slow the water down, that's causing the damage...secondly, replace the lost material with new material following the guidelines below.

Excess Loose Material

Directly after the installation, the aggregate surface will be smooth because of the weight of the fresh compaction. As the surface weathers with traffic and time, the larger particles of the aggregate will loosen on the surface to create a natural look and feel which is often sought after. The loose aggregate particles on your surface should not exceed 1/4" in depth.

Sweeping off the excess particles can be accomplished in areas where excess 1/4" chip is not detrimental. These loose particles can also be shoveled and removed from site. The remaining surface will eventually chip loose again, so new material is recommended as a top up (see instructions below) after doing this more than once.

If material exceeds a 1/4", redistribute the particles over a greater surface, scarify the surface to a depth of 1" and water to a 1" depth and compact with a roller of no less than 1000-lbs. Keep traffic off for 24-72 hours.

Removing Debris

You can remove grass clippings, soil, debris or organic material by mechanically blowing or hand raking as needed.

Snow Plowing

When plowing snow, use a shoe lift or rubber baffle on the blade of the plow to lift the blade up 1/4" off the surface. Extra precautions should always be taken after the first snow and last snow of the season, as this is when the material is most prone (i.e. the ground is not frozen).

3.8 ADDING NEW BLENDED AGGREGATE MATERIAL TO DAMAGED AREAS

Below the loose surface particles, the firmed material should be stable to resist erosion and support the intended traffic.

If this lower-level material incurs damage, we recommend the following:

Fixing Lightly Damaged Areas

Lightly damaged areas can be repaired by soaking, scarifying with a rake to 1-2 inches and compacting the scarified area using a roller or a hand tamper.

Adjusting Blended Aggregate

The binder gel activates each time it comes in contact with water, which allows for the blended aggregate to be physically broken up, re-worked and returned back to its initial state. This self-healing nature allows for a simplified maintenance procedure that leaves no sign of the maintenance itself.

For example:

If you have to run an irrigation line below your finished pathway, all you need to do is add water, dig the material up, put down your irrigation line, spread the material back in place, then water and compact it using a roller or a hand tamper back to new.

Fixing Larger or More Severely Damaged Areas

Excavate the damaged area to a depth of 2" to an approximate 50% increase in area (i.e. if your area is in a 4-foot radius circle, excavate a total of 6 feet in diameter).

Estimate amount of material lost or material needed to be topped up. Add this amount of preblended aggregate in the area.

Blend this newly blended aggregate in by one of the following methods:

A. Rototill to a Depth of 2 Inches

This needs to be done with multiple passes and should not exceed the depth of the blended aggregate (i.e. avoid disrupting the base material). Spray the surface with a light spray and begin to till this material to achieve a homogeneous blend of the new and existing material. Add further water as you mix to achieve the optimal snowball (as seen in the snowball test).

B. Remove and Blend the Material Off Site

Add the new blended aggregate to the existing material on a clean pad. Using a front-end loader (or shovels for smaller projects) mechanically turn the material over until you achieve a homogeneous blend. Add water into this mixture until you achieve an optimal snowball (as seen in the snowball test).

Spread this newly blended material back into the area where the excavation was completed and compact using a roller or a hand tamper

Note: Maintenance or patching should not be compacted with a vibratory plate compactor because it will rattle and damage the surrounding cured area.

END OF SECTION

SECTION 323300

SYNTHETIC TURF

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions included in the Contract Documents.
- B. Related Work Specified Elsewhere:
 - 1. Section 312300 - Earthwork
 - 2. Section 030001 - Cast in place concrete

1.2 SUMMARY

- A. Furnish all labor, materials, tools, equipment, and services necessary for and reasonably incidental to complete the bocce court as shown on the drawings, or specified, including, but not limited to the following:
 - 1. Synthetic Turf

1.3 SUBMITTALS

- A. Submit manufacturer's product data for each type if factory fabricated item required showing size, materials, and installation procedures.
- B. Submit shop drawings for each custom fabrication showing materials, dimensions and installation procedures.
- C. Submit samples of synthetic turf, all aggregate materials, composite wood perimeter.
- D. Follow Manufacturer's installation requirements rigidly. Submit samples of artificial turf, shock absorption material, and aggregate for approval.

PART 2 - PRODUCTS

2.1 SYNTHETIC TURF

- A. Artificial Turf Manufacturers
 - 1. Synlawn
80 Warren Street
New York, NY 10007
332-334-9211
'Bocce Turf'
- B. Schedule 40 PVC perforated drainpipe.
- C. Aggregate base and drainage course materials as specified by manufacturer.
- D. Geotextile fabric Mirafi 140N.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine subgrades and finish surfaces prior to beginning work. Do not install turf until final surface is complete.
- B. All turf edges shall be anchored into the sideboard as noted on drawings.
- C. Remove loose and extraneous material from bare surface before placing aggregate base courses.

3.2 INSTALLATION

- A. Install all manufactured products per manufacturer's instructions.
- B. Install aggregate base courses, drainage course, and dust fine setting bed per manufacturer's specifications.
- C. Touch up and repair all surfaces damaged during installation.
- D. Install 4" schedule 40 perforated pipe and tie into existing drainage system. Pitch $\frac{1}{8}$ " / foot minimum.

3.3 CLEAN UP

- A. Perform cleaning during installation of work and upon completion of work. Remove from site all excess materials, debris and equipment.

END OF SECTION 323300

SECTION 329000

LANDSCAPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions included in the Contract Documents.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Trees, Shrubs, & Ground covers
- 2. New Lawns
- 3. Restoration of existing Lawn
- 4. Topsoil and soil amendments
- 5. Planting Mixes
- 6. Fertilizers and mulches
- 7. Stakes and guys
- 8. Gator bags for trees

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the General and Special Conditions of the Contract.
- B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
 - 0. Manufacturer's certified analysis for standard products.
 - 1. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
 - 2. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.
- C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.
- E. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 1. Analysis of existing surface soil.
 - 2. Analysis of imported topsoil.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful

landscape establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.
- B. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."
- C. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.
 1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce satisfactory topsoil.
- D. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- C. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by the Professional's. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.
- D. Handle balled and burlapped stock by the root ball.
- E. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.
 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 2. Do not remove container-grown stock from containers before time of planting.
 3. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS

- A. Prior to submitting bid, contractor shall visit and familiarize himself with site and scope of work to be done by others. He is advised to examine all existing conditions not shown on drawings or mentioned in specifications, which would affect the cost of work required under the Contract, and to judge for himself conditions which will exist when he carries out his Contract, as he will not be allowed extra compensation for any additional work required thereby.
- B. The Contractor shall review the plans showing approximate location of existing and proposed utilities

and underground and surface structures. He shall acquaint himself with these features and any damage to them by reason of his performance of work will be his responsibility and shall be repaired at his expense to the satisfaction of the Professional.

- C. Percolation Test: Prior to any tree or shrub planting, the Contractor shall fill a minimum of 25% of the planting pits with water and observe the rate of percolation. If in the opinion of the Contractor, slow percolation indicates a soil condition might endanger the health of materials to be planted, he shall contact the Professional's to establish a mutually acceptable method of providing adequate drainage. Compensation for any necessary drainage provisions shall be at a negotiated price. No claims for additional compensation arising from the loss of plant material due to ground water problems will be accepted unless this procedure is followed.
- D. Protection: The Contractor shall provide at his own expense protection against trespassing and damage to all planting areas. If any areas are damaged, they shall be restored at the Contractor's expense. The Professional's shall approve any means of protection prior to its erection.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate installation of planting materials during specified planting seasons for each type of plant material required.

1.8 WARRANTY

- A. Warrant material and workmanship in accordance with Contract Documents for a period of one year after acceptance or for not less than two full planting seasons, whichever period is greater.
- B. During the warranty period, the Contractor shall replace any plant which, for any reason has died or is in a dying condition, or which has failed to flourish in such a manner or to such a degree that its usefulness or appearance has been impaired, and he shall further make good any other damage, loss, impairment or defect in materials or work where the loss, impairment, destruction, or failure to flourish sufficiently is the result of inferior or defective materials or workmanship, or unfavorable weather conditions. The decision of the Professional's as to the necessity of replacing any plants or materials or repair any defects in workmanship or of the cause of any destruction, loss, impairment, or failure to flourish shall be conclusive and binding upon the Contractor. The Contractor shall also make good all damage to persons or property caused by defective workmanship or materials or by the work required to remedy such defects.
- C. During the warranty period, the contractor shall from time to time, inspect the maintenance operations carried on by the owner and promptly report to the Professional's any methods, practices or operations which he considers unsatisfactory, and not in accord with his interests or good horticultural practices. The failure of the Contractor to so inspect or report shall be construed as an acceptance by him of the Owner's maintenance operations, and he shall not thereafter claim or assert that any defects which may later develop are the results of such methods, practices or operations.
- D. Replacements: All trees, shrubs and ground cover found to be unacceptable, during the warranty period, shall be removed from the site and replaced, with material as originally specified, during the immediate planting season following the Professional's notification.
- E. Lawn Warranty: Warrant all lawn areas for a period of one year after acceptance. At the end of the warranty period, all areas that are in a dead or dying condition shall be replaced.

1.9 TREE AND SHRUB ESTABLISHMENT

- A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or

vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Maintain trees and shrubs until owner acceptance.

1.10 GROUND COVER AND PLANT ESTABLISHMENT

- A. Maintain ground cover and plants by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings until owner acceptance.

1.11 LAWN ESTABLISHMENT

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days or until Substantial Completion whichever is longer.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and mulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm).
 - 1. Water lawn at the minimum rate of 1 inch (25 mm) per week.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
- E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb. per 1000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

1.12 ACCEPTANCE

- A. Acceptance: Upon completion of the planting operations, the contractor shall request, in writing, an inspection by the Professional. If all work is acceptable the Professional will issue a certificate of acceptance and the one year warranty will begin. If any work is found to be defective or incomplete, the Contractor will not be issued an acceptance certificate.
- B. Final Acceptance: At the end of the warranty period, the Contractor shall request an inspection by the Professional. If all work is found to be acceptable, the Professional shall authorize payment of the 10% retention. If replacements and/or remedial work are found to be necessary, this work will be completed by the Contractor and approved by the Professional prior to final payment.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

- A. Inspection: All plants shall be subject to inspection and approval by the Professional. Plants shall be inspected and tagged at the place of growth prior to digging. Inspection and tagging at the place of growth before shipment shall not affect the right to reject such plants if damage has occurred during digging, handling or delivery. Inspection will be for quality and size, variety and color, all other requirements are the responsibility of the Contractor.

The Contractor or his authorized representative shall be present during inspections.

The Contractor shall make a written request to the Professional ten working days in advance for all inspections at the various nurseries and collecting grounds. State the location of the nursery or collecting grounds and list the particular plants which are to be inspected as well as the sizes and quantities of such plants.

If the plants and materials to be inspected are located outside a 20 mile radius of the project site, the cost of inspection shall be paid for by the Contractor at a per diem rate plus travel, lodging and other out-of-pocket expenses.

- B. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- C. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Professional, with a proportionate increase in size of roots or balls.
- D. Label a minimum of one tree and one shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical name and common name. These labels shall remain on plant material until Final Review for Warranty Conformance.

2.2 PLANT MATERIAL

- A. General: Refer to the PLANT SCHEDULE on the drawings for specific types and quantities of plants to be furnished.
1. Plants shall be nursery grown in accordance with good horticultural practices and grown under climatic conditions similar to those in the locality of the project for at least two years. They shall have been root pruned within the last two years.
 2. Plants shall be freshly dug. No heeled-in plants or plants from cold storage will be accepted.
 3. Unless specifically noted otherwise, all plants shall be of specimen quality, exceptionally heavy, symmetrical, tightly-knit plants, so trained or favored in their development and appearance as to be unquestionably and outstandingly superior in form, number of branches, compactness, and symmetry.
 4. Plants shall be sound, healthy and vigorous, well-branched and densely foliated when in leaf, free of disease, insect pests, eggs or larvae, and shall have healthy, well-developed root systems. They shall be free from physical damage or adverse conditions that would prevent thriving with the specified result.
 5. Plants shall be true species and variety and shall conform to measurements specified in the plant schedule except that plants larger than specified may be used if acceptable to the Professional's. Use of such plants shall not increase the contract price. If larger plants are accepted the ball of earth shall be increased in proportion to the size of the plant.
 6. Container grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil together.

2.3 GRASS MATERIALS

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.

1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules at the end of this Section.

2.4 TOPSOIL

- A. Topsoil: Shall be a sandy loam, uniform in composition, free of stones, lumps, plants, roots, noxious weeds, and debris over 1 ½". It shall not contain toxic substances harmful to plant growth. Topsoil shall have a buffer pH of 5.0 to 7.0 and the organic matter shall be a minimum of 1.0%.
- B. On-site topsoil may be used for new and disturbed lawn areas if, when amended, its physical and nutrient properties meet the requirements of these specifications.

2.5 PLANTING MIXES

- A. All planting mixes shall be prepared prior to delivery to site.

1. Tree and Shrub Pit Planting Mix shall be as follows:

3 parts screened topsoil
1 part clean washed coarse sand
1 part peat humus
5 lbs. super phosphate per cubic yard of mix

2. Perennial Mix- Planting shall be as follows:

Soil mixture shall be 50% specified topsoil and 50% mixture of compost and/or peat moss. Add Terrasorb (www.soilservices.co.za/Terrasorb.htm), or approved equal, to overall mixtures as per manufacturer's specifications

3. Soil mix for raised garden beds shall be as follows:

1/3 top soil
1/3 compost
1/3 peat moss

2.6 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 (2.36 mm) sieve and a minimum 75 percent passing a No. 60 (250 micrometer) sieve.

1. Provide lime in the form of dolomitic limestone.

- B. Aluminum Sulfate: Commercial grade, unadulterated.

- C. Sand: Clean, coarse, ungraded, meeting ASTM C33 requirements for mason's sand free of toxic materials.

- D. Humus: Shall be FS Q-P-166E Type IV natural domestic reed peat or sedge peat, but not peat-moss, free from sticks, stones, weeds, roots or other foreign matter and when delivered from stock piles containing between 35-50% moisture, suitable for mulch and of composition to provide

ample water holding capacity and retention of plant food. Dark brown or black in color. Provide humus of the following analysis:

1. Maximum moisture content 70% by weight.
2. pH 5.0 to 7.5.
3. Water absorbing capacity not less than 300% of its own weight (oven dried basis)
4. Organic matter shall test 80% on a dry weight basis (samples dried at 100 degrees C)
5. Humus with organic matter of 75%-80% may be accepted, the deficiency to be made up in the quantity.
6. Low in content of woody material, iron and sulfur. Ash, on dry basis shall not be more than 20%.

E. Herbicides: EPA registered and approved, of type recommended by manufacturer.

F. Water: Potable.

2.7 FERTILIZER

A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

E. Natural Organic Fertilizer: Similar to Milorganite, produced by the Sewerage Commission, Milwaukee Wisconsin having the following analysis:

1. Total Nitrogen (6.5% water insoluble nitrogen)	6.0%
Available Phosphoric Acid	2.0%
Soluble Potash	0.0%
Iron (Fe)	3.0%

2.8 MULCHES

A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs. All beds and tree saucers shall receive 3" inches of approved triple ground clean mulch.

2.9 STAKES AND GUYS

A. Upright and Guy Stakes: Sound white cedar 3 to 3 1/2" inches in diameter by length indicated, pointed at one end.

- B. Guy and Tie Wire: ASTM A 641 (ASTM A 641M), Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.
- C. Hose Chafing Guard: Reinforced rubber hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.
- D. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.10 MISCELLANEOUS MATERIALS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure Professional's acceptance before the start of planting work. Make minor adjustments as may be required.

3.2 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- B. Contractor shall have planting mix prepared prior to delivery to the site.
 - 1. Install planting mix as shown on the drawings.

3.3 LAWN PLANTING PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 6 inches (152 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.
 - 1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture. Total topsoil depth shall be 4" for all new lawn areas.
- C. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:
 - 1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
 - 2. Till surface soil to a depth of at least 6 inches (150 mm). Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
 - 3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- D. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll

and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.

- E. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.4 GROUND COVER, PLANT BED, AND PERENNIAL BED PREPARATION

- A. Remove all existing soil to the required depth as shown on the drawings.
- B. Install new planting mix to a depth as indicated on drawings.

3.5 EXCAVATION FOR TREES AND SHRUBS

- A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.
 - 1. Balled and Burlapped Trees and Shrubs: Excavate a minimum of 1 foot wider than the root ball diameter and equal to ball depth.
 - 2. Container-Grown Trees and Shrubs: Excavate to a minimum of 1 foot wider than the container and equal to the container depth.
- B. Obstructions: Notify the Professional's if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

3.6 PLANTING TREES AND SHRUBS

- A. Planting Season: Plants shall be planted only within the following dates or as specified on the drawings. If special conditions exist which may warrant a variance in the planting dates, a written request shall be submitted to the Professional's stating the special conditions and the proposed variance. Permission for the variance will be given if, in the opinion of the Professional's, the variance is warranted.
 - 1. Deciduous Trees and Shrubs: March 15 to May 31, and Sept. 15 to Nov. 15.
 - 2. Evergreen Trees and Shrubs, Vines, Perennials: March 1 to May 15, and Sept. 1 to Nov. 1.
 - 3. Ground Covers: March 1 to September 15.
- B. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. Place stock on setting layer of compacted planting soil.
 - 2. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
 - 3. Place planting mix around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

- C. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. Carefully remove containers so as not to damage root balls.
 - 2. Place stock on setting layer of compacted planting soil.
 - 3. Place planting mix around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- D. Dish and tamp top of backfill to form a 3-inch- (75-mm-) high mound around the rim of the pit. Do not cover top of root ball with backfill.

3.7 TREE AND SHRUB PRUNING

- A. Prune, thin, and shape trees and shrubs as directed by the Professional's.
- B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by the Professional's, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are size after pruning.

3.8 TREE AND SHRUB GUYING AND STAKING

- A. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1800 mm) above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Guying and Staking: Guy and stake trees exceeding 14 feet (4.2 m) and more than 3-inch (75-mm) caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches (760 mm) long, driven to grade. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.

3.9 PLANTING GROUND COVER AND PLANTS

- A. Space ground cover and plants as indicated.
- B. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.10 MULCHING

- A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.
- B. Organic Mulch: Apply the following average thickness of organic mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.
 - 1. Thickness: 3 inches (50 mm).

3.11 SEEDING NEW LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- B. Sow seed at the following rates:
 - 1. Seeding Rate: 3 to 4 lb. per 1000 sq. ft. (1.5 to 2 kg per 100 sq. m).
- C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.

3.12 RESTORATION OF LAWNS

- A. Restore existing lawn areas as noted on drawings.
- B. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.
- C. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- D. Where substantial lawn remains, mow, dethatch, core aerate, and rake. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- E. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- F. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches (150 mm).
- G. Topdress restored lawn areas by applying 2" of topsoil.
- H. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Provide new planting soil as required to fill low spots and meet new finish grades.
- I. Apply seed and protect with straw mulch as required for new lawns.
- J. Water newly planted areas and keep moist until new grass is established.

3.13 CLEANUP AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

3.15 SEED MIXTURES SCHEDULE

A. General Mix: Provide certified grass-seed blends or mixes, proportioned by weight, as follows:

<u>Proportion</u>	<u>Name</u>	<u>Min. Pct. Germ.</u>	<u>Min. Pct. Pure Sd.</u>	<u>Max. Pct. Weed Sd.</u>
55 pct.	Kentucky bluegrass (Poa pratensis)	80	90	0.50
10 pct.	Perennial rye grass (Lolium perenne)	90	88	0.50
35 pct.	Turf-Type Tall Fescue	85	85	0.50

END OF SECTION 329000



“JOSEPH CAPUTO COMMUNITY CENTER” – SPECIFICATIONS

Village of Ossining, New York

INDUS ARCHITECTS PLLC

June 19, 2026

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SECTION 024119 - SELECTIVE DEMOLITION

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. Work of this Section includes the following:
 - 1. Demolition work of existing construction and building elements indicated on Drawings or by provisions of this Section.
 - 2. Salvage of existing items to be reused or recycled.
- B. Related work of other Sections includes the following:
 - 1. Safety barriers and temporary closures are specified in Division 01 Section "Temporary Facilities and Controls."

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse or store as noted on Drawings.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 DEMOLITION, GENERAL

- A. Carry out all demolition work in a neat and orderly manner. Keep noise, dust, and similar nuisances to a minimum. Do not collapse walls. Do not throw or drop materials.
 - 1. Where material indicated to be removed is suspected of containing asbestos, inform Owner's Representative immediately. Do not disturb materials suspected of containing asbestos until asbestos content has been verified by Owner.
 - 2. **Building to be occupied during construction.** Use extreme caution when cutting into shafts and chases. Shafts and chases may end above occupied areas within building. Take all necessary precautions to prevent debris from falling through openings between floors during demolition operations.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area location in building.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

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

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner's Representative, items may be removed to a suitable, protected storage location off-site during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.2 PROTECTION

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

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect existing utilities and services indicated to remain in service and protect them against damage during demolition operations.
4. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
5. Patch, repair or replace materials and items accidentally damaged during demolition operations.
6. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

a. Confine dust and debris to immediate area of demolition activity to the greatest extent practicable.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.3 DISPOSAL OF DEMOLISHED MATERIALS

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

1. Remove and transport debris in accordance with the Standard General and Supplemental General Conditions.

3.6 RECYCLING OF MATERIALS

A. Not Used.

END OF SECTION 02 41 90

SECTION 061000 - ROUGH CARPENTRY

PART 1. GENERAL

1.01 SUMMARY

A. Section includes:

1. Wood curbs.
2. Wood blocking.

1.02 DEFINITIONS

A. Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated.

1.03 PRODUCT HANDLING

A. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1.04 PROJECT CONDITIONS

A. 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 attachment of other work.

1.05 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product indicated.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that materials comply with requirements.
- B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.

PART 2. PRODUCTS

2.01 LUMBER GENERAL

- A. Lumber Standards: Manufacture lumber to comply with PS 20 “American Softwood Lumber Standard” and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee’s (ALSC) Board of Review.
- B. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. Nominal size are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

2.02 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
- B. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.03 WOOD PRODUCTS, GENERAL

- A. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.04 MISCELLANEOUS LUMBER:

- A. Provide wood for support or attachment of other work including rooftop equipment curbs and support bases, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:
- B. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

C. Grade: Standard Grade light framing size lumber of any species or board size lumber as required. No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No. 3 boards per SPIB rules.

D. Provide all miscellaneous blocking, ledgers, nailers, and mounting strips as required by all trades to provide complete installation

1. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

2. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).

2.05 TIMBER AND MISCELLANEOUS LUMBER

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

1. Blocking.

2.06 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

PART 3. EXECUTION

3.01 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Apply field treatment complying with AWPAC M4 to cut surfaces of preservative-treated lumber and plywood.
- C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners.
 - 2. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.
 - a. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
 - b. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
 - c. Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

END OF SECTION 06 10 00

SECTION 075200 MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Preparation of Substrate to Receive Roofing Materials
- B. Roof Insulation Application to Prepared Substrate
- C. Roof Membrane Application
- D. Roof Flashing Application
- E. Incorporation of Sheet Metal Flashing Components and Roofing Accessories into the Roof System

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Sheet Metal Flashing and Trim

1.03 RELATED SECTIONS

- A. Section [06 10 00] - Rough Carpentry
- B. Section [07 62 00] - Sheet Metal Flashing and Trim

1.04 REFERENCE STANDARDS

References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.

ASTM	American Society for Testing and Materials Philadelphia, PA
FM	Factory Mutual Engineering and Research Norwood, MA
NRCA	National Roofing Contractors Association Rosemont, IL
OSHA	Occupational Safety and Health Administration Washington, DC
SMACNA	Sheet Metal and Air Conditioning Contractors National Association Chantilly, VA
UL	Underwriters Laboratories Northbrook, IL

1.05 DESCRIPTION OF WORK

The basic work descriptions required in this specification are referenced below.

Project Type: Tear Off

Deck: Metal

Slope: Less than 1/2 inch

Insulation - bottom layer: Roofing Coverboard, having a thickness of 1/2 inch, mechanically attached to the existing metal deck.

Temporary Roof: Paradiene 20 TG, torch applied.

Insulation: Tapered polyisocyanurate insulation board, providing for a roof slope of 1/8 inch, applied in Insulation Adhesive.

Insulation - top layer: Roofing Coverboard, having a thickness of 1/2 inch, applied in Insulation Adhesive.

Roof System: Modified bitumen SBS Base roof ply, torch applied;

Modified bitumen SBS granule-surfaced top ply, torch applied. Color to be Bright White.

Protective Walkpads: Modified Bitumen sheets, applied Roofing Cement

Flashing System: PMMA Liquid Flashing System

1.06 SUBMITTALS

All submittals which do not conform to the following requirements will be rejected.

A. Submittals Prior to Contract Award:

1. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.
2. Letter from the primary roofing manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project for the specified guarantee.

B. Submittals Prior to Project Close-out:

1. Manufacturer's printed recommendations for proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.

1.07 QUALITY ASSURANCE

- A. Acceptable Products: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a **single manufacturer** which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.
- B. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001 audit process. A certificate of analysis for reporting/confirming the tested values of the actual material being supplied for the project will be required prior to project close-out.
- C. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.
1. Underwriters Laboratories Class A acceptance of the proposed roofing system (including mopping asphalt or cold adhesive) without additional requirements for gravel or coatings.
 2. Evidence by an accredited independent testing agency or agencies that the roof configuration meets a maximum design windload pressure of - 292.5 psf or greater at the field, perimeter, and corner zones of the roof.
 3. The roof membrane system shall meet the approval requirements of the U.S. EPA Energy Star program.
- D. Acceptable Contractor: Contractor shall have a minimum of 2 years experience in successfully installing the same or similar roofing materials and be **certified in writing by the roofing materials manufacturer to install the primary roofing products.**
- E. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of

the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractor's Association, amended to include the acceptance of a phased roof system installation.

- F. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.
- G. Manufacturer Requirements: Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.

1.08 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.
- B. Storage: Store materials out of direct exposure to the elements on pallets placed over clean, flat and dry surfaces. Storage of pallets over dirt, grass-covered ground or newly placed concrete may result in upward moisture transpiration and contamination of product. Store rolls of roofing on end. For roof-top storage, avoid overloading of deck and building structure. Factory packaging is not intended for job site protection. Slit factory packaging immediately upon arrival at the job site to prevent build-up of condensation and cover materials using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings shall not be used. Store flammable or temperature sensitive materials away from open flame, ignition sources or excessive heat.
- C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.
- D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.09 PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start

1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Environmental Requirements

1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.

C. Protection Requirements

1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
2. Torch Safety: Crew members handling torches shall be trained by an Authorized Certified Roofing Torch Applicator (CERTA) Trainer, be certified according to CERTA torch safety guidelines as published by the National Roofing Contractor's Association (NRCA), and follow torch safety practices as required by the contractor's insurance carrier. Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas during roof construction activity, and for the minimum period required by CERTA guidelines after roofing material application has been suspended for the day.

3. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
4. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
5. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.10 GUARANTEE/WARRANTY

- A. Roof Membrane/System Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the manufacturer's **20 year NDL** labor and materials guarantee covering the rigid insulation, insulation adhesive and roof membrane/flashing system. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and shall be issued at no additional cost to the Owner.

- > 20 year Roof Membrane/System Guarantee

PART 2 PRODUCTS

2.01 ROOFING SYSTEM ASSEMBLY/PRODUCTS

A. Sheathing Panel

1. Roof Panel: A fiber-reinforced cement-based, non-structural panel having a nominal thickness of 1/2 inch. Acceptable types are as follows:
 - a. DensDeck Prime by Georgia Pacific or equal.

B. Temporary Roof Ply Sheet

1. Torchable Modified Bitumen Ply Sheet:

- > Paradiene 20 TG by Siplast or equal.

C. Polyisocyanurate Board Insulation - TCPP Free, Non-Halogenated Polyisocyanurate: A closed cell, rigid polyisocyanurate foam core material manufactured with a non-halogenated flame retardant that contains no tris(chloropropyl) phosphates, integrally laminated between glass fiber reinforced organic facers. Product shall be in full compliance with ASTM C1289 Type II Class 1 Grade 2 (20 psi). Product shall maintain a consistent thermal value throughout the 40°F and 75°F mean temperature range when tested in accordance with ASTM C 518. Product shall maintain Declare, GreenGuard and GreenCircle listings. For Standard Roof Assembly (R-value as required by the drawings in excess of the Energy Conservation Code of New York City):

1. Polyisocyanurate Tapered Roof Insulation: Tapered panels and standard fill panels composed of a closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber facers, in full compliance with ASTM C 1289, Type II, Class 1, Grade 2. The tapered system shall provide for a roof slope of 1/8 inch per foot and a minimum long term thermal value of **R 30**. Acceptable types are as follows.

- > Tapered Paratherm by Siplast or equal.

2. Roof Panel: A fiber-reinforced cement-based, non-structural panel having a nominal thickness of 1/2 inch. Acceptable types are as follows:

- a. DensDeck Prime by Georgia Pacific or equal.

2.02 DESCRIPTION OF SYSTEMS

A. Roofing Membrane Assembly: A roof membrane assembly consisting of two plies of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane, applied over a prepared substrate. Reinforcement mats shall be impregnated/saturated and coated each side with SBS modified bitumen blend and coated one side with a torch grade SBS bitumen blend adhesive layer. The adhesive layer shall be manufactured using a process that embosses the surface with a grooved pattern to

provide optimum burn-off of the plastic film and to maximize application rates. The cross sectional area of the sheet material shall contain no oxidized or non-SBS modified bitumen. The roof system shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14°F (-10°C). Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system.

> SBS Modified Bitumen, BW torchable roof system

1. Modified Bitumen Base and Stripping Ply

- a) Thickness (avg): 114 mils (2.9 mm) (ASTM D 5147)
- b) Thickness (min): 110 mils (2.8 mm) (ASTM D 5147)
- c) Weight (min per 100 ft² of coverage): 76 lb (3.7 kg/m²)
- d) Maximum filler content in elastomeric blend: 35% by weight
- e) Low temperature flexibility @ -15°F (-26°C): PASS (ASTM D 5147)
- f) Peak Load (avg) @ 73°F (23°C): 30 lbf/inch (5.3 kN/m) (ASTM D 5147)
- g) Peak Load (avg) @ 0°F (-18°C): 75 lbf/inch (13.2 kN/m) (ASTM D 5147)
- h) Ultimate Elongation (avg.) @ 73°F (23°C): 50% (ASTM D 5147)
- i) Dimensional Stability (max): 0.1% (ASTM D 5147)
- j) Compound Stability (min): 250°F (121°C) (ASTM D 5147)
- k) Approvals: UL Class listed, FM Approved (products shall bear seals of approval)
- l) Reinforcement: fiberglass mat or other meeting the performance and dimensional stability criteria

> Siplast Paradiene 20 - torchable grade or equal.

2. Modified Bitumen Finish Ply

- a) Thickness (avg): 138 mils (3.5 mm) (ASTM D 5147)
- b) Thickness at selvage (coating thickness) (avg): 118 mils (3.0 mm) (ASTM D 5147)
- c) Thickness at selvage (coating thickness) (min): 114 mils (2.9 mm) (ASTM D 5147)
- d) Weight (min per 100 ft² of coverage): 112 lb (5.4 kg/m²)

- e) Maximum filler content in elastomeric blend: 35% by weight
- f) Low temperature flexibility @ -15°F (-26°C): PASS (ASTM D 5147)
- g) Peak Load (avg) @ 73°F (23°C): 30 lbf/inch (5.3 kN/m) (ASTM D 5147)
- h) Peak Load (avg) @ 0°F (-18°C): 75 lbf/inch (13.2 kN/m) (ASTM D 5147)
- i) Ultimate Elongation (avg.) @ 73°F (23°C): 55% (ASTM D 5147)
- j) Dimensional Stability (max): 0.1% (ASTM D 5147)
- k) Compound Stability (min): 250°F (121° C) (ASTM D 5147)
- l) Granule Embedment (max loss): 2.0 grams per sample (ASTM D 5147)
- m) Approvals: UL Class listed, FM Approved (products shall bear seals of approval)
- n) Reinforcement: fiberglass mat or other meeting the performance and dimensional stability criteria
- o) Surfacing: ceramic granules specially treated for cool roof applications.

> Siplast Paradiene 30 FR TG BW or equal. Color to be Bright White.

B. Catalyzed Acrylic Resin Flashing System: A specialty flashing system consisting of a liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed acrylic resin primer, basecoat and topcoat, combined with a non-woven polyester fleece. The resin and catalyst are pre-mixed immediately prior to installation. The use of the specialty flashing system shall be specifically approved in advance by the membrane manufacturer for each application.

> Parapro 123 Flashing System by Siplast or equal.

2.03 ROOFING ACCESSORIES

A. Roofing Adhesives

1. Insulation Adhesive: A single component, moisture cured, polyurethane foam adhesive, dispensed from a portable, pre-pressurized container used to adhere insulation panels to the substrate as well to other insulation panels.

> Para-Stik Insulation Adhesive by Siplast or equal.

➤ Para-Fast Insulation Adhesive by Siplast or equal.

B. Bituminous Cutback Materials

1. Primer: An asphalt/solvent blend meeting ASTM D 41 requirements.

> Siplast PA-917 Primer by Siplast or equal.

2. Mastics: An asphalt cutback mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges conforming to ASTM D 4586 Type II requirements.

> Siplast PA-1021 Plastic Cement by Siplast or equal.

C. Sealant: A moisture-curing, self levelling elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials. Acceptable types are as follows:

> Siplast PS-209 Elastomeric Sealant by Siplast or equal.

> Siplast PS 715 Elastomeric Sealant by Siplast or equal.

D. Resin Accessories

1. Cleaning Solution/Solvent: A clear solvent used to clean and prepare transition areas of in-place catalyzed resin to receive subsequent coats of resin and to clean substrate materials to receive resin.

> Pro Prep by Siplast or equal.

2. Preparation Paste: A PMMA-based paste used for remediation of depressions in substrate surfaces or other irregularities.

> Pro Paste Resin by Siplast or equal.

3. Fleece for PMMA Membrane Reinforcement: A non-woven, 110 g/m², needle-punched polyester fabric reinforcement as supplied by the membrane system manufacturer.

> Pro Fleece by Siplast or equal.

4. Catalyst: A peroxide-based reactive agent used to induce curing of PMMA-based resins.

> Pro Catalyst Powder by Siplast or equal.

5. Spray Primer for Stainless Steel, Aluminum and Copper Substrates: An enamel spray primer for metal substrates to receive PMMA-based flashings.

> Rust-Oleum™ High Performance V2100 System Enamel Spray Primer by Rust-Oleum or equal.

E. PMMA Primers

1. Cleaning Solution/Solvent: A clear solvent used to clean and prepare transition areas of in-place catalyzed resin to receive subsequent coats of resin and to clean substrate materials to receive resin.

> Pro Prep by Siplast or equal.

2. Preparation Paste: A PMMA-based paste used for remediation of depressions in substrate surfaces or other irregularities.

> Pro Paste Resin by Siplast or equal.

3. Fleece for PMMA Membrane Reinforcement: A non-woven, 110 g/m², needle-punched polyester fabric reinforcement as supplied by the membrane system manufacturer.

> Pro Fleece by Siplast or equal.

4. Catalyst: A peroxide-based reactive agent used to induce curing of PMMA-based resins.

> Pro Catalyst Powder by Siplast or equal.

5. Spray Primer for Stainless Steel, Aluminum and Copper Substrates: An enamel spray primer for metal substrates to receive PMMA-based flashings.

> Rust-Oleum™ High Performance V2100 System Enamel Spray Primer by Rust-Oleum, or equal.

F. Ceramic Granules: No. 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finish ply.

G. Walktread: A prefabricated, puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic-coated granule wearing surface.

> Paratread Roof Protection Material by Siplast or equal.

H. Fasteners

1. Insulation Fasteners: Insulation fasteners and plates shall be FM Approved, and/or approved by the manufacturer of the primary roofing products. The insulation fasteners shall provide attachment required to meet the specified uplift performance and to restrain the insulation panels against the potential for ridging. The fastening pattern for each insulation panel to be used shall be as recommended by the insulation manufacturer and approved by the manufacturer of the primary roofing products. Acceptable insulation fastener manufacturers for specific deck types are listed below.

a) Metal Decks: Insulation mechanical fasteners for metal decks shall be factory coated for corrosion resistance. The fastener shall conform meet or exceed Factory Mutual Standard 4470 and when subjected to 30 Kesternich cycles, show less than 15% red rust. Acceptable insulation fastener types for metal decks are listed below.

- A fluorocarbon coated screw type roofing fastener having a minimum 0.220 inch thread diameter. Plates used in conjunction with the fastener shall be a metal type having a minimum 3 inch diameter, as supplied by the fastener manufacturer.

> Parafast Fastener by Siplast or equal.

- I. Piping Supports: Salvage and reinstall all piping supports during the course of demolition and construction as needed. **Buidling is to be fully occupied during the course of the Work and no interruption to any utilities is contemplated.** Reinstall the existing piping supports as needed at all times.

PART 3 EXECUTION

3.01 PREPARATION

- A. General: Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.
- B. REMOVE ALL EXISTING:
 1. Surface gravel
 2. Roof membrane
 3. Insulation
 4. Base flashings only as needed for roofing installation.
 5. Edge metal only as needed for roofing installation.
 6. Flanged metal flashings only as needed for roofing installation.
 7. Cants, wood blocking
 8. Walkways
 9. Drain assemblies – salvage for reinstallation
 12. Metal trim, counterflashing, etc. only as needed for roofing installation.
- C. Priming: Prime concrete substrate and masonry surfaces with a uniform coating of the specified primer.

3.02 SUBSTRATE PREPARATION

- A. Temporary Roof Application: Torch apply the ply sheets directly to the prepared substrate, lapping sides and ends a minimum of 3 inches. Apply the sheets free of wrinkles, creases or fishmouths and exert sufficient pressure on the roll during application to ensure the prevention of air pockets. Seal each penetration and termination using fiberglass tape and

the specified plastic cement to ensure that the temporary roof configuration is completely water-tight.

B. Insulation: Install insulation panels with end joints offset; edges of the panels shall be in moderate contact without forcing applied in strict accordance with the insulation manufacturer's requirements and the following instructions. Where insulation is installed in two or more layers, stagger joints between layers. Maintain a maximum panel size of 4 feet by 4 feet for polyisocyanurate insulation applied in insulation adhesive.

1. Insulation - multiple layer: Install all layers in an application of the specified insulation adhesive in strict accordance with the requirements of the insulation adhesive supplier. Stagger the panel joints between insulation layers.

3.03 ROOF MEMBRANE INSTALLATION

A. Membrane Application: Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation.

B. Aesthetic Considerations: An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials including granules, and exercise care in ensuring that the finished application is acceptable to the Owner.

C. Priming: Prime metal and concrete and masonry surfaces with a uniform coating of the specified asphalt primer.

D. Bitumen Consistency: Cutting or alterations of bitumen, primer, and sealants will not be permitted.

E. Roofing Application: Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.

1. Apply all layers of roofing perpendicular to the slope of the deck.

2. Fully bond the base ply to the prepared substrate, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the torch applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.
 3. Fully bond the finish ply to the base ply, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the torch applicator. Stagger end laps of the finish ply a minimum 3 feet. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying base ply.
 4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2 inch per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.
- F. Granule Embedment: Broadcast mineral granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot or the adhesive is soft, to ensure a monolithic surface color.
- G. Catalyzed Acrylic Resin Flashing System: Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer.
- H. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.04 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS

- A. Walktread: Cut the walktread into maximum 5 foot lengths and allow to relax until flat. Adhere the sheet using the specified plastic cement. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walktread manufacturer. Walk-in each sheet after application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.
- B. Sealant: Apply a smooth continuous bead of the specified sealant at the exposed finish ply edge transition to metal flashings incorporated into the roof system.

3.05 FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.
- B. Notification Of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- C. Final Inspection
 - 1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
- D. Issuance Of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

SECTION 076200 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section describes complete systems using proven details to exclude water from the building at copings, base flashings and other locations commonly closed by sheet metal.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 07 52 00 - Modified Bituminous Membrane Roofing

1.3 REFERENCES

- A. NAAMM: National Association of Architectural Metal Manufacturers
 - 1. Metal Finishes Handbook; Metal Finishes Manual for Architectural and Metal Products
- B. NRCA: National Roofing Contractors Association
 - 1. NRCA Roofing Manual, Membrane Roof Systems
- C. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association, Inc.
 - 1. SMACNA Architectural Sheet Metal Manual

1.4 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak-proof, secure, and noncorrosive installation.

1.5 SUBMITTALS

- A. Submit the following.

1. Product Data: Submit metal manufacturer's specifications, installation instructions and general recommendations for flashing and trim applications, with complete list of materials proposed for use.
2. Shop Drawings:
 - a. Show the manner of forming, jointing and securing the metal to form flashings and trim. Show waterproof connections to adjoining work and at obstructions and penetrations. Identify adjoining materials.
 - b. Clearly identify design modifications recommended under System Description article below.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this work and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.7 SYSTEM DESCRIPTION

- A. Allow for field adjustments for proper anchoring or joining to other items.
- B. The requirements shown by the details are intended to establish basic dimensions, profiles and sightlines. Within these limitations, the Contractor will be responsible for the design of the sheet metal flashing and trim assemblies and may make whatever modifications of and additions to the details as may be required to prevent water and air penetration. Maintain the visual design concept as shown, including member sizes, profiles and alignment of components.

1.8 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather

without failure due to defective manufacture, fabrication, installation, or defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

- B. Fabricate and install all metal flashings capable of resisting the following forces according to the following recommendations:
 - 1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft.: 90-lbf/sq. ft. perimeter uplift force, 120-lbf/sq. ft. corner uplift force, and 45-lbf/sq. ft. outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store materials on the roof which have the potential to become foreign object debris.
- B. Obtain approval from the Port prior to storing materials on the roof overnight or storing them within rooftop mechanical penthouses.
- C. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

- D. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.
- E. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- F. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- G. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering.

1.10 PROJECT CONDITIONS

- A. Scheduling: Promptly cover exposed edges of completed roofing.

1.11 WARRANTIES

- A. Contractor's Quality of Work Warranty: Warrant that all sheet metal flashings are installed in accordance with the contract documents and will be free from defective quality of the work and or remain watertight and weatherproof with normal usage for a period of two years following Final Acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A167, Grade 2D, Type 304, soft temper, smooth finish No. 2B bright; cold rolled finish. Minimum 0.025-inch thick (24 gauge).
- B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A653M, G90 coating designation; structural quality. Minimum 22 gauge.

- C. Self-Adhered Underlayment: High temperature, minimum 30-mil- (.76-mm-) thick, SBS or butyl-based rubberized sheet; maximum permanence rating of 0.05 perm, self-adhering sheet with thermoplastic film on exterior face and release-paper backing.
1. Henry Blueskin PE 200 HT.
 2. Grace Ultra.
 3. Carlisle WIP 300 HT.
 4. Or pre-bid approved equal.

2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, flat head screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
1. Fasteners: Series 300 Stainless Steel with EPDM washers.
 2. Concealed Fasteners: Series 300 Stainless Steel, with pan heads and EPDM washers.
 3. Rivets: Stainless Steel with stainless steel mandrel.
- C. Stainless Steel Clamping Bands; sizes as dictated by conditions, screw type tightening system.
- D. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

G. Plastic Cement: ASTM D4856, asbestos free, of consistency required for application.

H. Splice Materials:

1. Wash: Solvent based effacing solution, manufactured for the purpose of cleaning EPDM membrane surfaces prior to performing seaming activities, as manufactured and/or recommended by roof membrane materials manufacturer.
2. Primer: Synthetic polymer based, black adhesive, as recommended and approved by roof membrane materials manufacturer.
3. Adhesive: Synthetic polymer based, black adhesive, as recommended and approved by roof membrane materials manufacturer.
4. Tape: Cured EPDM based butyl adhesive tape, 30 mils minimum thickness, as approved by roof membrane materials manufacturer.

2.3 FABRICATION

- A. Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before commencing shop fabrication.
- B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks, and true to line and levels indicated.
- C. Seams for Stainless Steel and Lead: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges shall be seamed and soldered.
- D. Fabricate all horizontal surfaces to provide drainage with minimum 5 percent slope.
- E. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant according to SMACNA recommendations.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate exposed cleats from same material as accessory being anchored.

- H. Vent Pipe and Electrical Conduit Flashings: Fabricate from lead. Solder all joints watertight.
- I. Soldering: Completely penetrate or sweat the joint. Pre-tin surfaces with the use of non-corrosive resin flux. Remove flux residue after soldering or tinning.
- J. Cleats: Cut from material at least one gage heavier than the material to be fastened, continuous.

2.4 SHEET METAL FLASHINGS

- A. Counter Flashing: Fabricate with profiles as shown on the drawings.
 - 1. Joint Style: Lapped and sealed.
 - 2. Stainless Steel: 0.025-inch thick, painted to match existing copings.
 - 3. Zinc Coated (Galvanized) Steel: 0.048-inch thick, painted to match existing copings.
- B. Counter Flashing Receiver on Curbs: Fabricate with profile as shown on the drawings.
 - 1. Joint Style: Lapped and sealed.
 - 2. Stainless Steel: 0.025-inch thick, painted to match existing copings.
 - 3. Zinc Coated (Galvanized) Steel: 0.048-inch thick, painted to match existing copings.
- C. Coping: Fabricate with profiles as shown on the drawings.
 - 1. Joint Style: Interlocking, seamed, and soldered. Pop-rivet for extra strength where required.
 - 2. Stainless Steel: 0.025-inch thick, painted to match existing copings.
 - 3. Zinc Coated (Galvanized) Steel: 0.048-inch thick, painted to match existing copings.
- D. Miscellaneous Flashings: Fabricate with profiles as shown on the drawings and from sheet metal materials indicated.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that substrates are sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. Examine substrates, areas, and conditions, with installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
- C. Proceed with installation only after conditions are satisfactory.

3.2 INSTALLATION

- A. General: Anchor sheet metal flashing and trim and other components of the work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Protect membrane and adjacent surfaces during welding activities .
 - 2. Torch cutting of sheet metal flashing and trim is not permitted .
 - 3. SMACNA Details: Except as otherwise shown or specified, comply with applicable recommendations and details of SMACNA's "Architectural Sheet Metal Manual."
 - 4. Manufacturer's Recommendations: Except as otherwise shown or specified, comply with the recommendations and instructions of the manufacturer of the sheet metal being installed.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
- C. Self-Adhered Underlayment: Install in accordance with the manufacturers requirements and where shown on the drawings.

- D. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- E. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and butyl sealant.
- F. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- G. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- H. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1 1/4 inches for nails and not less than 3/4 inch for wood screws. Use stainless-steel fasteners.
- I. Seal joints with butyl sealant as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants in accordance with manufacturer's published installation instructions.
- J. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1 1/2 inches except where pre-tinned surface would show in finished work.
 - 1. Pre-tinning is not required for lead.

2. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

3.3 ROOF FLASHING INSTALLATION

- A. Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Anchor to resist uplift and outward forces according to applicable New York State codes and regulations.
- C. Field measure all site conditions prior to fabrication and installation.
- D. Coordinate installation of sheet metal flashings with installation of roof membrane materials.
- E. Insert counter flashing behind adjacent flashings and fit tightly to base flashing.
- F. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- G. Secure new flashing intersections to existing flashings, as required, providing weathertight performance.

3.4 MISCELLANEOUS FLASHING INSTALLATION

- A. Pre-manufactured Flashing: Install in accordance with manufacturer's written instruction, and these contract documents.

3.5 CLEANING AND PROTECTION

- A. Clean and neutralize flux materials. Clean off excess solder and sealants. Not applicable to stainless steel and painted or coated steel and aluminum.
- B. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed.
- C. Upon completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Roof drains.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

- A. Cast-Iron, General-Purpose Roof Drains, to be installed in existing drain locations:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Plumbing Products Group; Z100 or comparable product by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.

- c. Smith, Jay R. Mfg. Co.
 - d. Tyler Pipe, Wade Div.
 - e. Watts Water Technologies, Inc.
-
- 2. Standard: ASME A112.6.4, for general-purpose roof drains.
 - 3. Body Material: Cast iron.
 - 4. Dimension of Body: Nominal 15-inch diameter.
 - 5. Combination Flashing Ring and Gravel Stop: Required.
 - 6. Roof Sump Receiver: Required.
 - 7. Underdeck Clamp: Required.
 - 8. Flow-Control Weirs: Not required.
 - 9. Outlet: Bottom.
 - 10. Extension Collars: Required – 6 inch.
 - 11. Expansion Joint: Not required.
 - 12. Sump Receiver Plate: Not required.
 - 13. Dome Material: Cast iron, Dura-Coated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
 - 1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 - 2. Position new roof drains in existing roof drain piping locations.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 22 14 13 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Refer to roofing drawings and Section 07 52 00 for flashing requirements.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423